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PART 1 - PROJECT DESCRIPTION AND SITE INFORMATION

1.01 This project involves the full finish-out of Floors 20, 21 and 22 (G20, G21 and G22, respectively) in MD Anderson's inpatient tower above the Albert B. and Margaret M. Alkek Hospital building (Alkek Hospital). Under the project, floors G20, G21 and G22, currently in a "shelled" condition, will be fully finished-out to accommodate forty-eight (48) inpatient rooms on each floor. Upon completion of the project, one hundred and forty-four (144) new inpatient rooms are to become available. The Alkek Hospital is part of MD Anderson's Main Building and is located north of Holcombe Boulevard within the Texas Medical Center at the intersection of Bertner Avenue and Bates Street. For a General Site Location Plan, refer to the attachments to this Design Criteria Package.

1.02 The project area is directly above Floor 19 (G19), which is a fully activated inpatient care unit and directly below Floor 23 (G23), which houses building care and operations staff and work areas. The public elevator lobby on G22 is active as it is the transfer point for people going to the Observation Deck on Floor 24.

PART 2 - INFORMATION RELATED TO THE DESIGN REQUIREMENTS

2.01 The existing floor plates cover approximately 47,300 sf. When finished-out each floor is to resemble current floors G15 through G19 in terms of the basic floor plan and general layout. Minor design adjustments from the existing floor plans may be required to incorporate suggested changes that have arisen from working within the existing spaces. The design for each floor is to include space and infrastructure to accommodate patient rooms, reception areas, storage needs for equipment, clean and dirty linen, staff break rooms, staff office/work rooms, consult areas, and waiting areas for patients' families, etc.

2.02 Prior to beginning the design phase of the project, the design-build firm will assist in the completion of the Pre-Design Report for the project. As a minimum, the design-build firm will be required to review the Pre-Design Report, complete a project site walk-through and identify a list of any issues that will need to be resolved prior to completion of the design phase. In addition, the design-build firm will be required to identify the date by which each issue will need to be resolved to avoid impacting the completion of the design phase.

2.03 During the preconstruction phase the design-build firm will be required to review and develop alternate means of accessing the project site. This analysis will include considering the feasibility of installing a buck hoist on the outside of the Alkek Hospital.

2.04 The design-build firm will be required to provide interior design services to include, but not necessarily be limited to, designing architectural elements and developing finish schedules for MD Anderson's review and approval, prior to issuing them for construction.

2.05 The design-build firm will be required to provide comprehensive furniture selection, planning and procurement services, including, but not necessarily limited to, furniture to be purchased by MD Anderson in addition to any furnishings to be procured by the design-build contractor.

2.06 The design-build firm will be required to provide comprehensive equipment and related infrastructure planning and procurement services including, but not necessarily limited to, all equipment regardless of classification like architecturally significant equipment as well as any contractor provided, contractor installed, minor movable equipment.

2.07 The design-build firm will be required to provide Life Safety Code consulting as needed to support the project including, but not necessarily limited to, assisting M. D. Anderson in developing interim life safety measures as needed over the life of the project.

2.08 The design-build firm will be required to provide commissioning services to include the authoring of pre-functional and functional testing criteria, utilized by the subcontractors to validate the functionality of their systems. MD Anderson will validate test criteria and witness tests, either directly or through a separate contractor.

2.09 The design-build firm will be required to provide all engineering and design services needed to distribute mechanical, electrical, plumbing, information technology and security services throughout the floors. Generally, these services are available on each floor at centrally located utility rooms. The air handlers that serve these floors are located on Floor 13 and the main trunk lines have already been installed to each floor. As the design evolves, the design-build firm will be required to confirm that sufficient utilities will be available at each floor.

PART 3 - INFORMATION RELATED TO THE CONSTRUCTION REQUIREMENTS

3.01 The construction is to include the full finish-out of G20, G21 and G22. The construction will also involve demolition needed to remove any temporary partitions that must be removed to support the finish-out as well as to facilitate modifications to the mechanical, electrical and plumbing distribution systems on each floor.

3.02 As noted above, the finish-out will include the distribution of mechanical, electrical, plumbing, information technology and security utility services throughout each floor. This work may include the re-working of air duct work and sprinkler systems that was originally installed to serve the “shelled” floors.

3.03 Access to the floors is expected to be impacted by ongoing operations. The design-build firm will be required to closely schedule delivery of materials to the site and may be limited to delivering materials to the floors during non-peak, operating hours.

PART 4 - SPECIAL EQUIPMENT REQUIREMENTS

4.01 The design-build firm will be expected to provide a minor medical equipment planning and minor medical equipment procurement assistance and installation coordination services.

PART 5 - INFRASTRUCTURE REQUIREMENTS

5.01 Mechanical, electrical, plumbing, information technology, and security infrastructure systems are available at each floor. For a more detailed description as to the anticipated scope of work related to these systems, see Part 2, Information Related to The Design Requirements, above.

PART 6 - BUDGET ESTIMATE

6.01 MD Anderson has established a design-build budget limitation (DBBL) of $38.5 million for the project. This amount is the maximum amount that could be paid to the design-build firm and includes the Preconstruction Services Fee, which includes all Design Services fees, all Costs of the Work, all General Conditions Costs, the Construction Phase Fee, all construction contingencies and any Owner's Special Cash Allowances. For a more detailed explanation as to what is included in the DBBL, refer to the draft agreement attached to the Request for Qualifications.

PART 7 - MILESTONE SCHEDULE

7.01 Refer to the Request for Qualifications, section 2.5, Project Planning Schedule.

7.02 During the Preconstruction Phase, the design-build firm will be expected to work with MD Anderson to determine to what extent the project will be divided into separate stages for implementation. However MD Anderson anticipates that the project will involve a minimum of two phases with the first phase encompassing the finish-out of G21 and G22. Upon the completion of this first phase, MD Anderson would relocate the occupants on G19 to G22. The second phase would encompass the finish-out of G20. During this phase, G19 and G21 would remain unoccupied so as to help mitigate the adverse impacts the construction activities might have on patients and staff.

PART 8 - APPLICABLE CODES AND STANDARDS

8.01 The codes and standards that are applicable to this project are set forth in the Owner's Design Guidelines that are included as an attachment to this Design Criteria Package.

PART 9 - ATTACHMENTS

A. General Site Location Plan

B. Typical Alkek Expansion Inpatient Floor Layout (Floors 15 – 19)

C. Existing Floor Plan Layouts for G20, G21 and G22

D. Owner's Design Guidelines

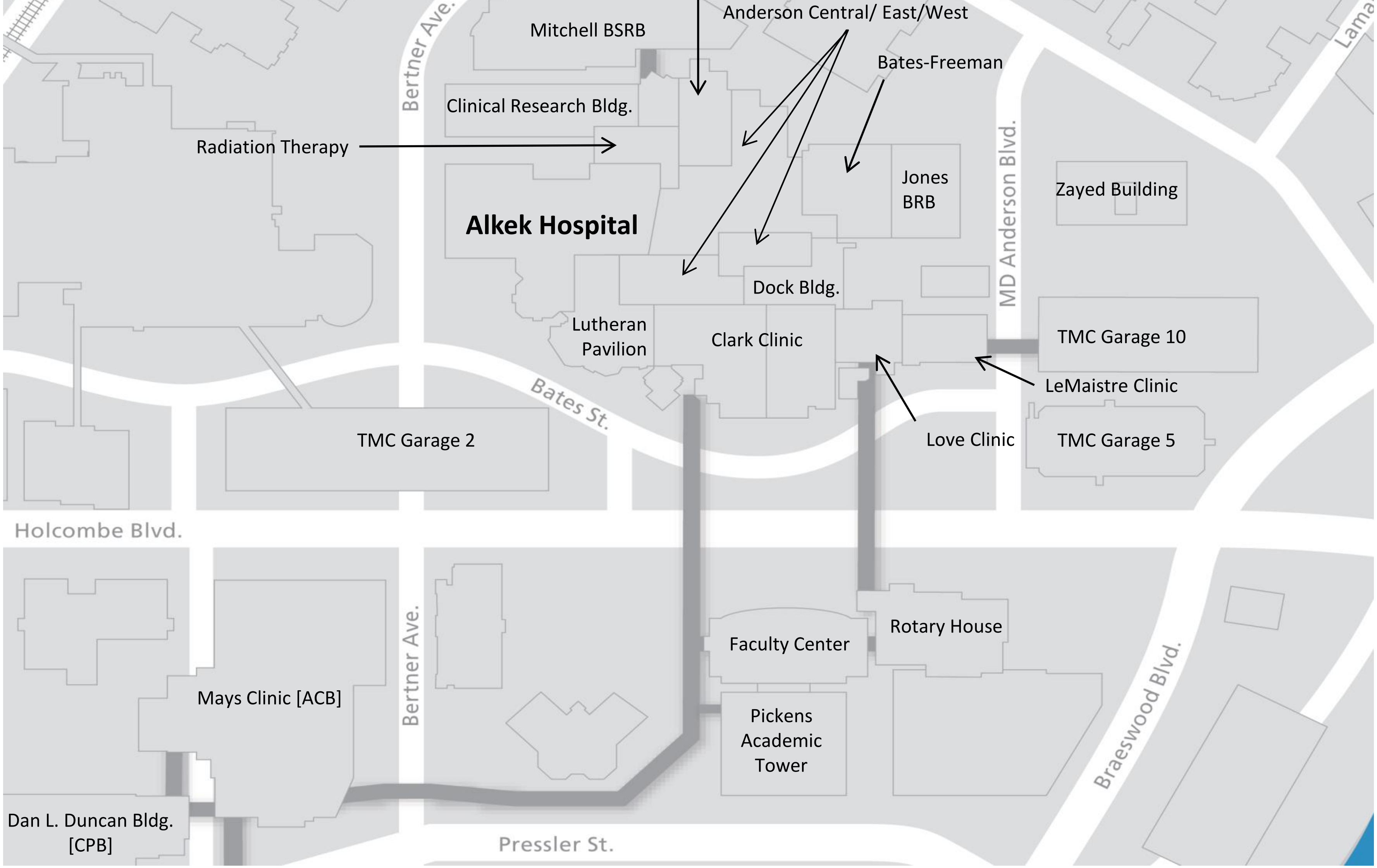
END OF DESIGN CRITERIA PACKAGE

ATTACHMENTS FOLLOW

Attachment A

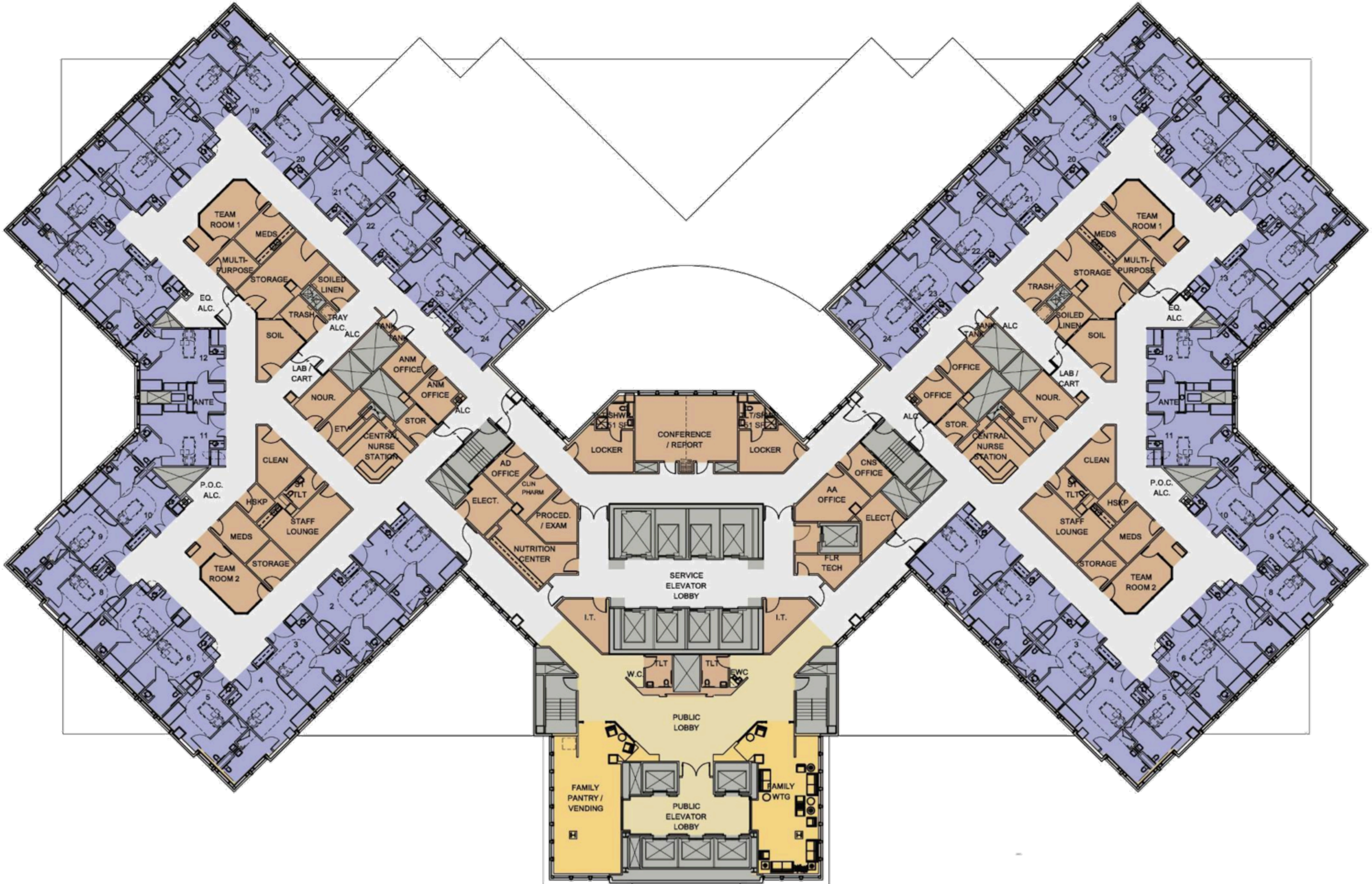
General Site Location Plan

The University of Texas
MD Anderson Cancer Center
Inpatient Floors 20, 21 & 22 Finish-out
FPDC Project No. 140757
General Site Location Plan



Attachment B

Typical Alkek Expansion Inpatient Floor Layout (Floors 15 – 19)

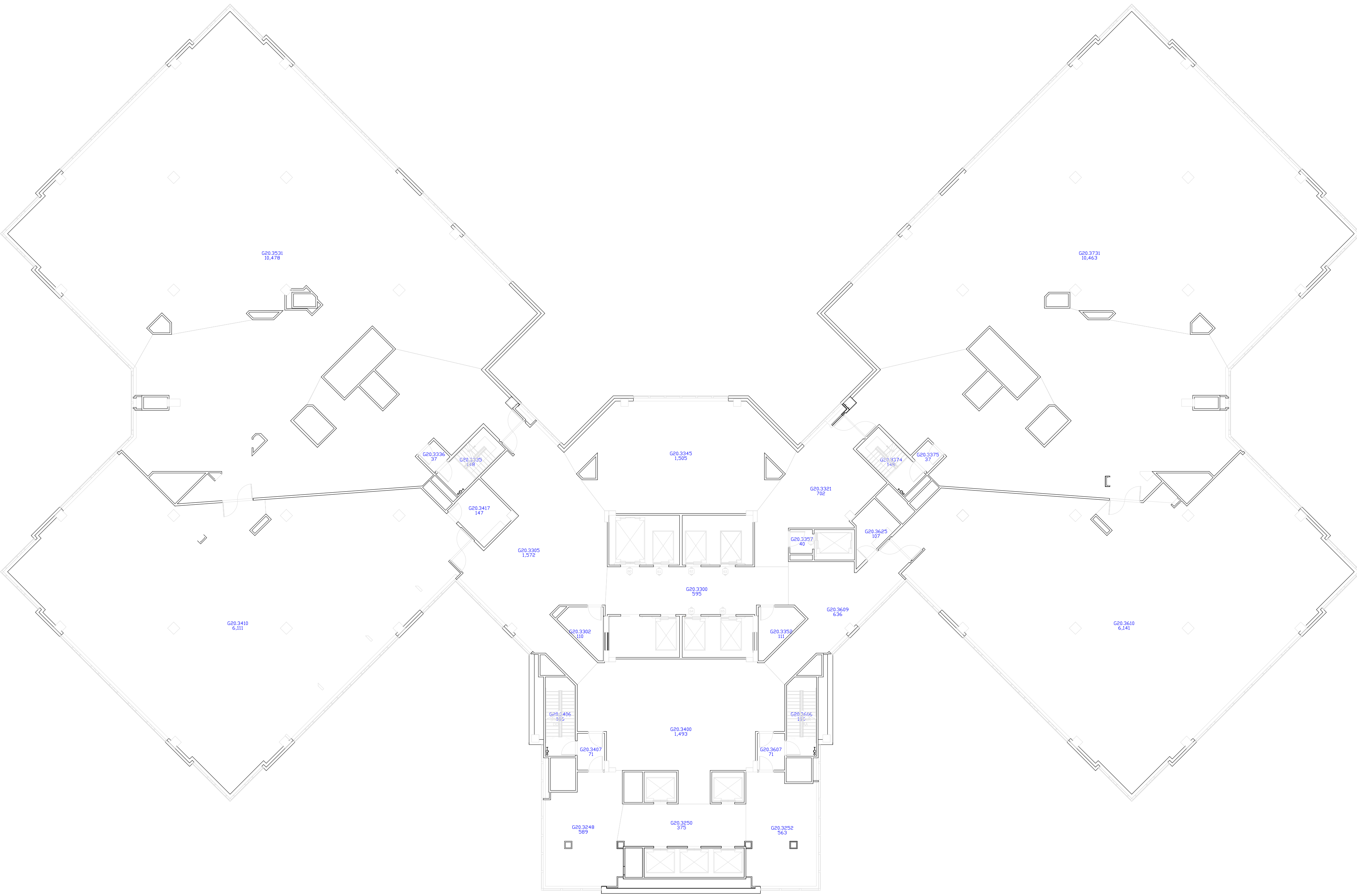


MD Anderson Project No.: FPDC-140757
Inpatient Floors 20, 21 and 22 Finish-out
Typical Existing Inpatient Floor Layout

THE UNIVERSITY OF TEXAS
MD Anderson ~~Cancer~~ Center

Attachment C

Existing G20, G21 and G22 Layouts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G20.3375
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G20.3300
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G20.3609
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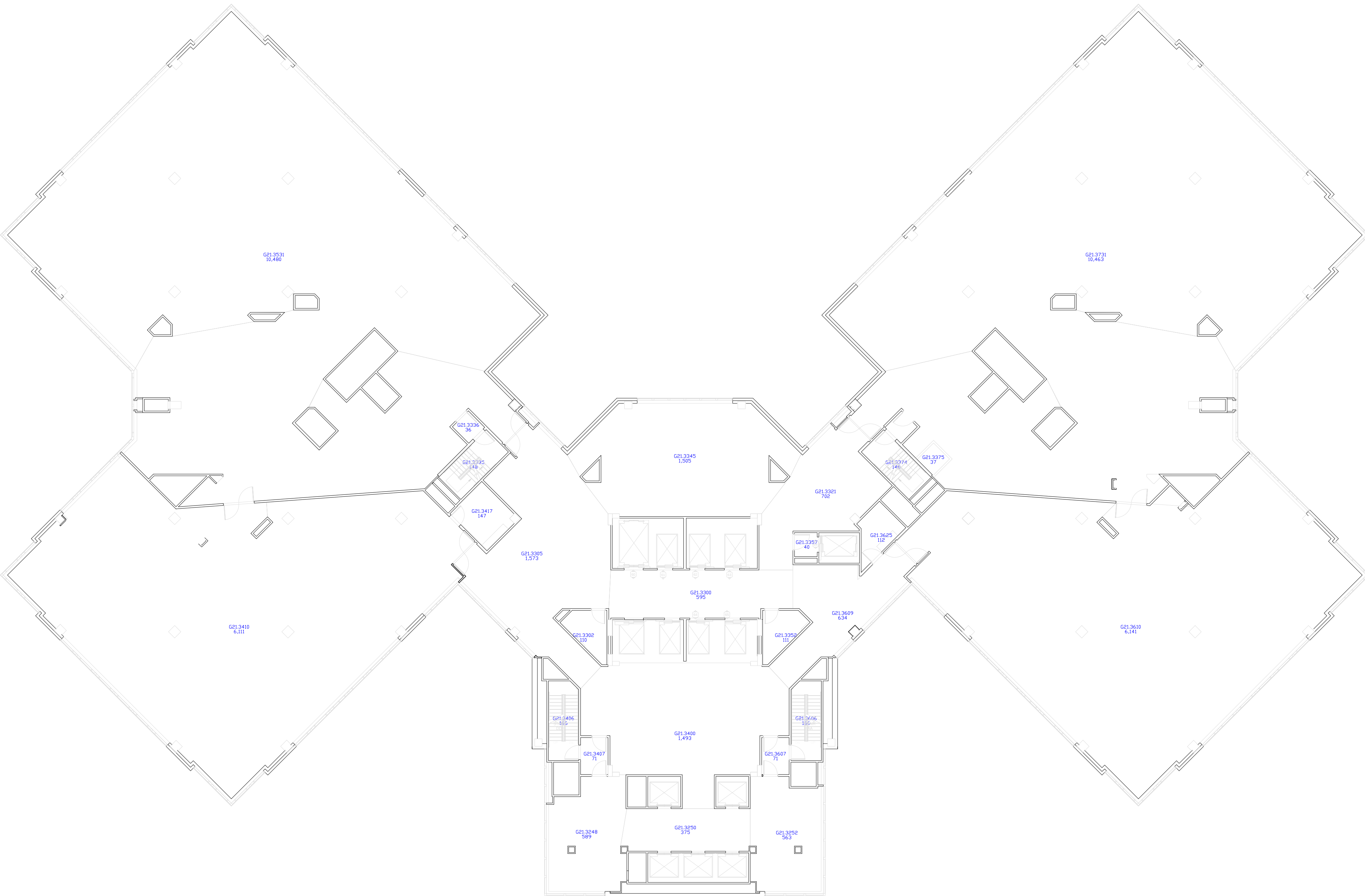
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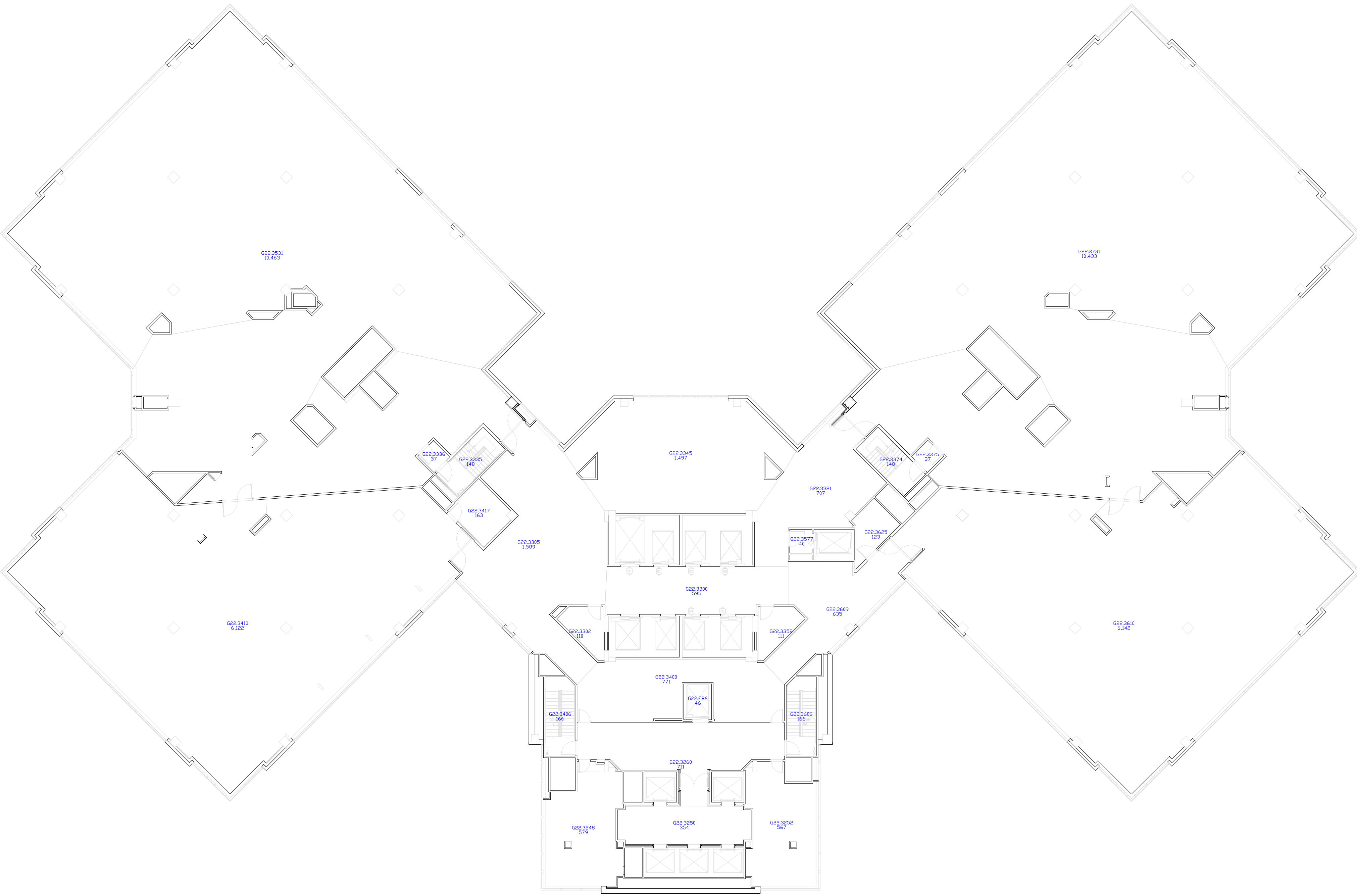
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567

Attachment D

Owner's Design Guidelines

Nursing Inpatient Floors G20, G21 & G22

FPDC Project No. 14-0757

REQUEST FOR QUALIFICATIONS
FOR DESIGN-BUILD CONTRACTOR

July 15, 2014

Owner's Design Guidelines

Prepared by:
Facilities Management Department of
Facilities Planning Design & Construction

THE UNIVERSITY OF TEXAS
MD Anderson Cancer Center

Making Cancer History®

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Intent and Usage

PART 1 - INTRODUCTION

1.01 OVERVIEW

A. The University of Texas MD Anderson Cancer Center Design Guidelines, referenced in the Architect/Engineer Agreement as "Owner's Design Guidelines", define design criteria for renovation and new construction projects. The Owner's Design Guidelines include technical design criteria and references additional institutional standards that together with a separate Facility Program document or Pre-Design Report comprise the Owner's basis for designing the Project.

B. Producing complete, accurate, and coordinated contract drawings and specifications is the primary goal of the design effort. To help achieve this goal, it is The University of Texas MD Anderson Cancer Center's (referenced hereinafter as "Owner" or "MD Anderson") objective to define the construction systems and methods appropriate for the type of project being proposed.

PART 2 - ORGANIZATION

2.01 CONSTRUCTION SYSTEMS AND ASSEMBLIES

A. This section includes technical design criteria for building system components presented in the UNIFORMAT II format structure, Elements A (Substructure) through Element G (Building Sitework). Information contained in each Design Guideline Element is organized in the following format:

1. "Part 1 - General" describes the application of information within the individual Design Guideline Element.

2. "Part 2 - Design Criteria" describes MD Anderson's requirements for designing the systems within the scope of the Design Guideline Element.

3. "Part 3 - Special Contract Documents Requirements" identifies any special requirements that MD Anderson wishes to include within the Project Drawings or Specifications.

4. "Part 4 - Products" describes unique product components of the described system(s) that MD Anderson requires.

2.02 ELEMENT Z - GENERAL DESIGN REQUIREMENTS

A. Element Z10 references additional institutional standards and documents applicable to the Project. These documents, such as Master Construction Specifications and Computer Aided Design (AutoCAD) Standards, are stand-alone documents to be furnished to the A/E separate from the Design Guideline Elements.

B. Element Z20 contains supplementary Project requirements provided with these Owner's Design Guidelines, including Codes and Applicable Regulatory Agencies, Design Submittal Requirements, and Structural Criteria.

C. Element Z40 contain criteria for room standards, typically found within MD Anderson facilities.

PART 3 - INTENT

3.01 GENERAL

A. The criteria described within the Owner's Design Guidelines are minimum standards for the design of the Project and contain some, but not all, of the criteria pertinent to the design of the Project facility system components. Note that where technical design criteria contained in the Owner's Design Guidelines is lacking in detail or missing, the architectural and engineering consultants (A/E) shall follow industry standards such as NFPA, ASHRAE, etc. for guidance.

B. Based on the A/E's professional experience, the A/E is encouraged to recommend in writing for the Owner's consideration alternative products, systems, means, methods, etc. that add value to the Project by:

1. Meeting or exceeding the minimum standard specified at a cost savings to the Owner;
2. Exceeding the standards specified for the same cost to the Owner; or
3. Achieving significantly greater levels of performance with minimal increases to the Project cost.

C. The proposed Project will have very unique requirements that are not yet defined. Therefore, the A/E must be proactive in identification of all design issues that contradict or are not identified within the Owner's Design Guidelines and communicate such concerns to the Owner's Project Manager in writing during the design phase to allow resolution in sufficient time to meet Project schedule obligations.

D. Under no circumstances is the A/E to unilaterally deviate from the minimum standards described herein without prior consent of the Owner as stipulated in the Agreement.

E. The terms "Owner" and "MD Anderson" have the same meaning as used throughout this document. For Design-Build project delivery methods, the terms "A/E" and Project "Architect/Engineer" as used throughout this document shall have the same meaning as "Design-Build Contractor".

PART 4 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-05-13	Various editorial changes throughout document.	SAK
Rev. 2			
Rev. 3			

END OF PREFACE

2010 Instructions for the Preparation of Project Manuals

PART 1 - GENERAL

1.01 OVERVIEW

A. The purpose of this document is to assist the Project Architect/Engineer (A/E) in the appropriate use of The University of Texas MD Anderson Cancer Center (referenced hereinafter as “Owner” or “MD Anderson”) Master Construction Specifications on MD Anderson Projects. The A/E shall prepare the Project Manual as instructed within this Design Guideline Element.

B. The A/E shall prepare the Project Manual in accordance with the current edition of The Construction Specifications Institute (CSI) Manual of Practice and MasterFormat Master List of Titles and Numbers for the Construction Industry except to the extent this Design Guideline Element departs from those recommendations.

C. MD Anderson maintains Master Construction Specifications in electronic format for use on institutionally managed, new construction and renovation projects. Use of the Master Construction Specifications does not remove or diminish the A/E’s responsibilities under State of Texas laws that regulate the practice of Architecture, Engineering, Interior Design, and Landscape Architecture. The A/E retains the same responsibilities and liabilities as if the Master Construction Specifications were not available.

D. The Master Construction Specifications are provided as an aid to the A/E in the development of Project Manuals and are not for use "as-is" for a construction document. The Master Construction Specifications are intended as a basis for the development of Contract Specifications for a particular project. The A/E shall edit carefully to coordinate with specific project requirements. The A/E must determine suitability of each specification section in whole or part for a particular project.

E. Some documents referenced herein require completion or modification to suit the individual project. Other documents must be reproduced directly, without alterations of any kind, and are identified in these instructions.

F. The A/E shall be responsible for content of the entire Project Manual as issued for bids and the professional’s seal shall be applicable to all Contract Documents, including those specification sections based on the Owner’s Master Construction Specifications. Include and locate professional licensing seals per Texas licensing board requirements.

PART 2 - PROJECT DELIVERY METHODS

2.01 GENERAL

A. During the Project pre-design phase, Owner will select the appropriate project delivery method. The project delivery method will determine the contract type and methodology for organizing the Project Manual. Refer to ‘Attachment A’ to this Design Guideline Element, Project Manual Organization, for an index of documents and an explanation of how the documents are to be organized within the Project Manual in accordance with the project delivery method and associated contract type.

B. Since some documents are not required to be issued with every Project Manual, the A/E must thoroughly review these instructions and coordinate directly with the Owner's Project Manager prior to assembling the Project Manual. MD Anderson construction projects will typically fall under one of the following project delivery methods:

1. Job Order Contracting (JOC)

    a. Job Order Contracting (JOC) allows MD Anderson Cancer Center to expedite numerous, commonly encountered projects through a single, competitively bid contract. JOC reduces unnecessary levels of engineering, design, and contract procurement time along with construction project procurement costs by awarding multi-year contracts to various contractors for a wide variety of renovation, repair and construction projects.

    b. The Owner hires an A/E to prepare the construction documents and then awards the construction contract to the JOC contractor to perform the work. Refer to 'Attachment A', Table 1.

2. Competitive Sealed Bidding

    a. Competitive sealed bidding is the traditional method for procuring construction services where the Owner hires an A/E to prepare the construction documents and then issues a Request for Bids soliciting confidential bids from contractors to perform the work. MD Anderson typically does not use this project delivery method.

    b. The Owner is required to award the construction contract to the responsible bidder who submits the best price without consideration of any other factors or without an opportunity to negotiate the scope of the project before entering into an agreement. Refer to 'Attachment A', Table 2.

3. Competitive Sealed Proposals (CSP)

    a. Under the Competitive Sealed Proposal methodology, the Owner hires the A/E directly and then issues a Request for Proposals (RFP) to select and negotiate a contract with a contractor based on pre-established selection criteria. The RFP includes construction documents, contractor selection criteria, estimated budget, project scope, schedule, and other necessary information.

    b. Upon receipt of bids, MD Anderson determines which bidder represents the best value to the institution based on the published selection criteria and on its ranking evaluation. Refer to 'Attachment A', Table 2.

4. Construction Manager-at-Risk (CM-R)

a. Under a CM-R contract delivery method, MD Anderson selects an A/E under a separate procurement process to prepare the project construction documents. The CM-R is selected under a one or two-step process, where MD Anderson prepares and publishes a Request for Qualifications (RFQ) and may be followed by an RFP to those firms qualified to progress to the RFP stage. Selection is based on the proposal which offers the best value to the institution.

b. The CM-R provides pre-construction (design) and construction phase services for a fee and acts as a general contractor to deliver the work within a Guaranteed Maximum Price. The CM-R must publicly advertise and solicit either competitive bids or competitive sealed proposals from trade contractors and subcontractors. Refer to 'Attachment A', Table 3.

5. Design/Build (DB)

a. Under a Design/Build contract delivery method, MD Anderson prepares and publishes a Request for Qualifications (RFQ) followed by an RFP to those firms qualified to progress to the RFP stage. Design/Build teams are comprised of a general contractor, architect, and engineering consultants. MD Anderson contracts directly with the contractor under this project delivery method. To procure trade contractors and subcontractors, the DB firm must publicly advertise and solicit either competitive bids or competitive sealed proposals. Refer to 'Attachment A', Table 3.

PART 3 - APPLICATION OF BIDDING REQUIREMENTS AND CONTRACT FORMS

3.01 GENERAL

A. Documents outlining the contractual terms and conditions of the construction contract are placed at the beginning, or front end, of the Project Manual. They are followed in order by the construction specifications. For this reason the contractual terms and conditions are often referred to as the "Front End" documents. Front End documents include:

1. Owner's Bidding Requirements and Contract Forms.

a. Owner's Sourcing and Contract Management department maintains these documents. For contractor solicitation, Owner will post these documents with the procurement solicitation on Owner's procurement website.

2. Conditions of the Contract.

a. Includes the Uniform General Conditions and Division 00 documents.

B. Conditions of the Contract are subject to revision at any time. Therefore, the A/E shall verify applicability of the documents with the Owner's Project Manager before preparing the Project Manual.

3.02 OWNER'S BIDDING REQUIREMENTS AND CONTRACT FORMS

A. Request for Bids/Proposal

1. Owner will prepare the Request for Bids or Request for Proposal with draft agreement to solicit the contractor under Competitive Sealed Bidding and Competitive Sealed Proposal project delivery methods.

2. Owner will prepare the Request for Qualifications and Request for Proposals with draft agreement for Construction Manager-at-Risk and Design/Build Firm solicitations.

3.03 CONDITIONS OF THE CONTRACT

A. 2013 Uniform General Conditions for University of Texas System Building Construction Contracts: No completion required; do not alter.

B. Section 00 25 00: Owner's Special Conditions. The A/E shall customize the Owner's Special Conditions to suit the Project. The A/E shall review the Owner's Special Conditions with the Owner's Project Manager and recommend Owner's Special Conditions items to retain, modify, add, and delete.

1. Attachment "A": Minimum Wage Rate Determination

2. Attachment "B": Facilities Planned Utility Outages Policy

3. Attachment "C": Project Sign Layout [May not be applicable to all Projects]

4. Attachment "D": Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements [Applicable to Bastrop Projects only]

C. Section 00 73 16: Project Insurance [for Owner Controlled Insurance Program – OCIP, If applicable to the Project]

D. The Project Architect/Engineer (A/E) shall organize the Project Manual in accordance with requirements described within Attachment "A" for the various project delivery types.

PART 4 - APPLICATION OF DIVISION 01 SPECIFICATIONS – GENERAL REQUIREMENTS

4.01 GENERAL

A. The Project Architect/Engineer (A/E) shall organize the Project Manual in accordance with requirements described within Attachment "A" for the various project delivery types.

B. For CM-R and DB trade contractor or subcontractor solicitation, Construction Manager-at-Risk and Design-Build Firm shall furnish Division 01 documents as executed with the CM-R or DB Agreement directly to the A/E for preparation of the Project Manual.

C. The following list identifies the Owner furnished Division 01 specification sections. The A/E may provide additional sections as required to meet specific Project requirements:

1. Section 01 31 00: Project Administration.
2. Section 01 32 00: Project Planning and Scheduling.
3. Section 01 35 16: Alteration Project Procedures. (This Section applies to all Projects).
4. Section 01 35 23: Project Safety. (For OCIP Projects).
5. Section 01 35 25: Owner Safety Requirements. (This Section applies to all Projects).
    a. Attachment "A": Maintaining Indoor Air Quality During Construction and Maintenance Activities Policy.
6. Section 01 45 00: Project Quality Control.
7. Section 01 57 23: Temporary Storm Water Pollution Control.
8. Section 01 57 25: Dust Control Plan.
9. Section 01 77 00: Project Closeout Procedures.
10. Section 01 79 00: Demonstration and Training
11. Section 01 91 00: General Commissioning Requirements.

PART 5 - APPLICATION OF TECHNICAL SPECIFICATIONS (DIVISIONS 02-33)

5.01 GENERAL

A. It is the responsibility of the A/E to use the most current version of each applicable Master Construction Specification section available at the start of the Design Development Phase for each Procurement Package. The A/E shall edit applicable Master Construction Specification sections specifically for construction systems and assemblies appropriate for the Project to accurately depict specific Project requirements.

B. Where Master Construction Specifications for products and methods are not provided, as listed in the Project Manual Index, the A/E must furnish specifications written to meet specific Project requirements. Specifications furnished by the A/E must be submitted for Owner review and approval prior to issuance in the Project Manual.

C. Where the A/E considers that compliance with any requirement stated within the Master Construction Specifications is not feasible or advisable, the A/E shall communicate such concerns to the Owner's Project Manager in sufficient time to allow resolution during the Project Design Development phase and to meet contract schedule obligations.

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D. In general, the A/E shall use Master Construction Specifications for Divisions 02-13 only for redevelopment or renovation projects within existing MD Anderson facilities.

1. EXCEPTIONS: The following Master Construction Specifications shall be incorporated into the Project Manual for new construction (non-redevelopment / non-renovation) projects when applicable to the Project Scope:

a. 10 14 16 - Cast Bronze Dedicatory Building Plaque and 10 14 16 A - Attachment “A” Building Plaque Drawing

b. 10 44 00 - Fire Extinguisher Cabinets and Accessories

E. Relevant Master Construction Specifications for the Facilities Services Subgroup, Divisions 14, 20 through 28, 32 and 43 must be used for all projects, including redevelopment, renovation, and new construction.

5.02 OWNER REVIEW PROCESS

A. The A/E shall submit all proposed modifications to the Master Construction Specifications and any supplemental Specification Sections generated by the A/E to the Owner for approval prior to inclusion into the Contract Documents. For review purposes, the A/E shall highlight non-standard items, revisions, or additions to the Master Construction Specifications in red, electronically, and on printed documents via the Microsoft Word “track changes” tool. Standard text of the Master Construction Specification Section proposed to be deleted shall be shown with a strikethrough. The A/E shall provide hard copies of the draft Specifications with proposed revisions for Owner's review during various Design Phase Submittals as indicated in the A/E Agreement.

B. The A/E’s Design Phase review submittal transmittal letters shall identify Specification Sections generated by the A/E and individual Master Construction Specification Sections that include proposed revisions. The A/E shall resolve all Owner review comments and incorporate all necessary revisions prior to submission to the Owner for final design review. The final design review Specification submittals shall be clean copies, free of hidden, instructional, shaded, highlighted, bold, or strikethrough text.

PART 6 - PRODUCTS

6.01 GENERAL

A. In order to achieve competitive bidding of products and enable the greatest number of vendors to participate in procurement opportunities, every attempt has been made to indicate multiple and comparable selections for all categories of products throughout the technical Specifications. The A/E shall ensure that no proprietary manufacturers are listed in the Project’s final Specification documents unless approved via Owner or otherwise indicated herein.

B. Changes in technologies, introduction of new products, phasing out of product lines, and changes in a manufacturer's ownership can quickly render a Specification obsolete. While MD Anderson will endeavor to maintain the Master Construction Specifications current, critical judgment and research is required on the part of the A/E to ensure that errors and omissions are avoided. Avoidance of such errors and omissions is the responsibility of the A/E.

6.02 PROPRIETARY PRODUCTS

A. Proprietary products may be specified for MD Anderson Projects when appropriately justified.

1. Obtain MD Anderson written request and justification for all proprietary products specified for a specific Project.

2. The following text shall be included in capitalized letters within the specifications for each justified proprietary item:

    a. **NO SUBSTITUTIONS ALLOWED. THE UNIFORM GENERAL CONDITIONS FOR UNIVERSITY OF TEXAS SYSTEM BUILDING CONSTRUCTION CONTRACTS ARTICLE 8.3.5 IS NOT APPLICABLE**.

PART 7 - CREATING AND EDITING SPECIFICATIONS

7.01 GENERAL

A. When a Master Construction Specification section is not available for a particular system or component, the A/E must furnish supplemental specifications written to meet specific project requirements. The supplemental specifications must follow the same conventions as the Master Construction Specifications.

B. The following criteria are required for all Specifications that will be included in the Project Manual.

1. Electronic Format: Microsoft Word

2. Specification Organization: Follow the Construction Specifications Institute's MasterFormat and SectionFormat for the basic layout of Divisions 00 through 49.

3. Formatting: All new Specification Sections shall be created using the Owner's template, CSI_STYLES.dot. Refer to 'Attachment B'. An electronic version of the template is available for download on the Owner's Design Guidelines website:

    http://www2.mdanderson.org/depts/cpm/standards/specs.html

4. Page Margins:

    a. Top / bottom = 0.75" / 0.5"

2010 Instructions for the Preparation of Project Manuals

b. Left / right = 1”

c. Footer location - 0.5” from edge

5. Font, including header and footer: Arial - 10pt.

6. If a PART is not to be used in an A/E generated Specification, i.e., a PART 2 PRODUCTS or PART 3 EXECUTION, enter “Not Used” under the heading.

7. At the end of the last Specification Section included within the Project Manual, include both "END OF SECTION ## ## ##" and "END OF SPECIFICATIONS".

7.02 HEADERS AND FOOTERS

A. Typical Header: A/E shall edit the header to suit the Project.

Header Content:

Owner’s Project Number	OWNER’S PROJECT NAME
A/E Name	Issue Description
A/E Project Number	Issue Date

Header Example:

FPDC 130623	Endoscopy Anesthesia - R5
ABC	Issued For Construction
00100-05	Dec 29, 2013

B. Typical Master Construction Specification Footer: Footers within Master Construction Specification Sections must not be edited.

Footer Content:

The University of Texas	SECTION TITLE
MD Anderson Cancer Center	CSI Section Number
Owner’s Control Number	Page Number, Number of Pages

Footer Example:

The University of Texas	HYDRONIC PIPING
MD Anderson Cancer Center	23 21 13
MS010107	Page 1 of 15

C. Typical A/E Generated Specification Footer: A/E shall not remove the Owner’s name or page numbering. A/E must delete Owner’s Control Number and include the applicable CSI Section Title and Number.

Footer Content:

The University of Texas	SECTION TITLE
MD Anderson Cancer Center	CSI Section Number
MS######	Page Number, Number of Pages

2010 Instructions for the Preparation of Project Manuals

Footer Example:

The University of Texas	XXXXXXXX XXXXXX
MD Anderson Cancer Center	XX XX XX
	Page 1 of 15

D. If a PART is not to be used in an A/E generated Specification, i.e., a PART 2 PRODUCTS or PART 3 EXECUTION, enter “Not Used” under the heading.

E. At the end of the last Specification Section included within the Project Manual, include both "END OF SECTION ## ## ##" and "END OF SPECIFICATIONS".

2010 Instructions for the Preparation of Project Manuals

PART 8 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Clarified application of Project Safety and Project Insurance sections. Part 3, paragraph A, 4. and Attachment A, Table 1, B.	DOS
Rev. 2	05-24-07	Revised Part 2, Project Delivery Methods; revised Part 3, Application of Bidding Requirements and Contract Forms; revised Tables 1 and 2, Attachment A.	SAK
Rev. 3	04-08-08	Included requirement for M.D. Anderson master specification section 14 21 00 – Electric Traction Elevators to be used for all projects, including redevelopment, renovation, and new construction. Revised paragraph Part 5, 5.01, D. and Attachment "A" Tables 1 & 2.	DOS
Rev. 4	03-02-10	Updated Tables directing application of Project Insurance and Project Safety Specifications; revision to Owner Safety Requirements, Attachment "A".	SAK, DOS
Rev. 5	08-12-10	Added summary description of Job Order Contracting (JOC), paragraph 2.01 B. 1.a. & 1.b. ; Added instruction table for Job Order Contracting, Table 1 - Attachment "A" ; Added instructions requiring A/E to utilize Division 10 Building Plaque and Fire Extinguisher Cabinet Master Construction Specification sections for new construction projects, paragraph 5.01 D. 1.a. & b. and Table 3. Added instructions and requirements for specifying proprietary products, paragraph 6.02.	DOS
Rev. 6	03-31-11	Deleted "by the Contractor" for documents issued under separate cover for JOC in Attachment "A". Added Project Insurance and Project Safety OCIP sections for CSB and CSP in Attachment "A" and clarified that confirmation shall be obtained from the OPM for inclusion.	SAK
Rev. 7	08-02-11	Changed the 2005 UGC reference to 2010 UGC throughout document.	DOS

2010 Instructions for the Preparation of Project Manuals

Issue	Date	Revision Description	Reviser
Rev. 8	03-15-12	Paragraph 3.03 B. - Changed Project Sign Layout from Attachment "B" to Attachment "C" to Owner's Special Conditions section 00 25 00. Added Facilities Planned Utility Outages Policy - Attachment "B" to Owner's Special Conditions section 00 25 00. Added Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements. - Attachment "D" to Owner's Special Conditions section 00 25 00. Paragraph 4.01 B. 3. - Added requirement that section 01 35 16 "Alteration Project Procedures" is applicable to all Projects. Paragraph 5.01 E. - Added requirement that Division 32 and 43 Owner's master specification sections be used for all Projects when applicable to scope. Attachment A Table 1 - Changed Project Sign Layout from Attachment "B" to Attachment "C" to Owner's Special Conditions section 00 25 00. Added Facilities Planned Utility Outages Policy - Attachment "B" to Owner's Special Conditions section 00 25 00. Added Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements. - Attachment "D" to Owner's Special Conditions section 00 25 00. Added Divisions 32 and 43 to specifications group. Attachment A Table 2 & 3 - Changed Project Sign Layout from Attachment "B" to Attachment "C" to Owner's Special Conditions section 00 25 00. Added Facilities Planned Utility Outages Policy - Attachment "B" to Owner's Special Conditions section 00 25 00. Added Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements. - Attachment "D" to Owner's Special Conditions section 00 25 00. Added requirement to include section 01 35 16 - Alteration Project Procedures in Project Manual. Added Divisions 32 and 43 to specifications group.	DOS
Rev. 9	06-11-13	Paragraph 1.01 F. and Attachment “A” - Clarified application of AE certification (professional licensing seals)	SAK
Rev. 10	10-22-13	Revised UGC reference title throughout document from “2010 Uniform General and Supplementary General Conditions for Building Construction Contracts for The University of Texas System” to “2013 Uniform General Conditions for University of Texas System Building Construction Contracts”.	DOS

2010 Instructions for the Preparation of Project Manuals

Issue	Date	Revision Description	Reviser
11	01-14-14	Clarified application of Division 00 and 01 specification sections. Paragraphs 3.03 D. and 4.01. Added section 01 79 00 Demonstration and Training to list of Owner furnished specification sections. Paragraphs 4.01 B.,and Attachment "A".	DOS

END OF ELEMENT 2010

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

The Project Architect/Engineer (A/E) shall organize the Project Manual in accordance with requirements described within this Attachment and as based on the following examples for project delivery types.

For projects that require multiple bid packages, documents included in the Project Manual for each bid package, must be applicable to the scope of the bid package issue.

TABLE 1. JOB ORDER CONTRACTING (JOC)			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
OWNER'S BIDDING REQUIREMENTS AND CONTRACT FORMS			
Not Applicable (N/A)	Request for Proposal for a General Contractor	No	Issued by Owner under separate cover for contractor procurement.
N/A	Respondent's Pricing and Delivery Proposal	No	
N/A	Draft Agreement between Owner and Contractor including Performance and Payment Bond templates	No	
N/A	Rider 1 to the Agreement, Joint Commission on Accreditation of Healthcare Organizations (JCAHO)	No	
N/A	Historically Underutilized Business (HUB) Subcontracting Plan	No	
N/A	Rider 105, Contractor's Affirmations and Warranties	No	
N/A	Rider 106, Premises Rules	No	
N/A	Rider 107, Travel Policy	No	
N/A	RFI – Request for Information Form	No	
INTRODUCTORY INFORMATION			
00 01 01	Project Title Page	Yes	
00 01 10	Table of Contents	Yes	Edit to suit Project. For phased release of bid packages, the Table of Contents must reference all documents with their associated issue date and issue description. Note documents previously issued as "Issued under separate cover".

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

TABLE 1. JOB ORDER CONTRACTING (JOC)			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
CONDITIONS OF THE CONTRACT			
	2013 Uniform General Conditions for University of Texas System Building Construction Contracts	No	Issued Under Separate Cover.
00 25 00	Owner's Special Conditions	Yes	A/E and Owner's Project Manager must edit for Project requirements.
00 25 00 A	Attachment "A": Minimum Wage Rate Determination	No	Issued Under Separate Cover
00 25 00 B	Attachment "B": Facilities Planned Utility Outages Policy	Yes	
00 25 00 C	Attachment "C": Project Sign Layout	No	Not Applicable to Job Order Contracts.
00 25 00 D	Attachment "D": Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements	See Notes	Applicable to Bastrop Projects only.
B – Specifications Group			
DIVISION 01 – GENERAL REQUIREMENTS			
01 31 00	Project Administration	No	Issued Under Separate Cover.
01 32 00	Project Planning and Scheduling	No	Issued Under Separate Cover.
01 35 16	Alteration Project Procedures	No	Issued Under Separate Cover.
01 35 25	Owner Safety Requirements	No	Issued Under Separate Cover.
01 35 25 A	Attachment "A": I.A.Q. Activities Policy	No	Issued Under Separate Cover.
01 45 00	Project Quality Control	No	Issued Under Separate Cover.
01 57 23	Temporary Storm Water Pollution Control	No	Issued Under Separate Cover.
01 57 25	Dust Control Plan	No	Issued Under Separate Cover.
01 77 00	Project Closeout Procedures	No	Issued Under Separate Cover.
01 79 00	Demonstration and Training	Yes	A/E and Owner's Project Manager must edit for Project requirements.
01 91 00	General Commissioning Requirements	No	Issued Under Separate Cover.

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

TABLE 1. JOB ORDER CONTRACTING (JOC)			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
B – Specifications Group			
DIVISIONS 02 THROUGH 19 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	Refer to Project Manual Index for complete listing of Master Construction Specifications.	Yes	A/E must edit to suit Project requirements; A/E shall furnish specification sections for required products and components not listed in the Project Manual Index.
DIVISIONS 20 THROUGH 28, 32 & 43 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	Refer to Project Manual Table of Contents for complete listing of Master Construction Specifications.	Yes	A/E must edit to suit Project requirements; A/E shall furnish specification sections for required products and components not listed in the Project Manual Index.

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

The Project Architect/Engineer (A/E) shall organize the Project Manual in accordance with requirements described within this Attachment and as based on the following examples for project delivery types.

For projects that require multiple bid packages, documents included in the Project Manual for each bid package, must be applicable to the scope of the bid package issue.

TABLE 2. COMPETITIVE SEALED BIDDING AND COMPETITIVE SEALED PROPOSALS			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
OWNER'S BIDDING REQUIREMENTS AND CONTRACT FORMS			
Not Applicable (N/A)	Request for Proposal for a General Contractor	No	Issued by Owner under separate cover for contractor procurement.
N/A	Respondent's Pricing and Delivery Proposal	No	
N/A	Draft Agreement between Owner and Contractor including Performance and Payment Bond templates	No	
N/A	Rider 1 to the Agreement, Joint Commission on Accreditation of Healthcare Organizations (JCAHO)	No	
N/A	Historically Underutilized Business (HUB) Subcontracting Plan	No	
N/A	Rider 105, Contractor's Affirmations and Warranties	No	
N/A	Rider 106, Premises Rules	No	
N/A	Rider 107, Travel Policy	No	
N/A	RFI – Request for Information Form	No	
INTRODUCTORY INFORMATION			
00 01 01	Project Title Page	Yes	
00 01 10	Table of Contents	Yes	Edit to suit Project. For phased release of bid packages, the Table of Contents must reference all documents with their associated issue date and issue description. Note documents previously issued as "Issued under separate cover".

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

TABLE 2. COMPETITIVE SEALED BIDDING AND COMPETITIVE SEALED PROPOSALS			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
CONDITIONS OF THE CONTRACT			
	2013 Uniform General Conditions for University of Texas System Building Construction Contracts	Yes	Do not edit.
00 25 00	Owner's Special Conditions	Yes	A/E and Owner's Project Manager must edit for Project requirements.
00 25 00 A	Attachment "A": Minimum Wage Rate Determination	Yes	Do not edit.
00 25 00 B	Attachment "B": Facilities Planned Utility Outages Policy	Yes	Do not edit.
00 25 00 C	Attachment "C": Project Sign Layout	See Notes	Do not edit. Include if applicable; confirm with Owner's Project Manager.
00 25 00 D	Attachment "D": Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements	See Notes	Applicable to Bastrop Projects only.
00 73 16	Project Insurance (OCIP.)	See Notes	Do not edit. Include if applicable; confirm with Owner's Project Manager.
B – Specifications Group			
DIVISION 01 – GENERAL REQUIREMENTS			
01 31 00	Project Administration	Yes	Do not edit.
01 32 00	Project Planning and Scheduling	Yes	Do not edit.
01 35 16	Alteration Project Procedures	Yes	Do not edit.
01 35 23	Project Safety (OCIP)	See Notes	Do not edit. Include if applicable; confirm with Owner's Project Manager.
01 35 25	Owner Safety Requirements	Yes	Do not edit.
01 35 25 A	Attachment "A": I.A.Q. Activities Policy	Yes	Do not edit.
01 45 00	Project Quality Control	Yes	Do not edit.
01 57 23	Temporary Storm Water Pollution Control	See Notes	Do not edit. Include if applicable; confirm with Owner's Project Manager.
01 57 25	Dust Control Plan	See Notes	Do not edit. Include if applicable; confirm with Owner's Project Manager.
01 77 00	Project Closeout Procedures	Yes	Do not edit.

01 79 00	Demonstration and Training	Yes	A/E and Owner's Project Manager must edit for Project requirements.
01 91 00	General Commissioning Requirements	Yes	Do not edit.

TABLE 2. COMPETITIVE SEALED BIDDING AND COMPETITIVE SEALED PROPOSALS

B – Specifications Group

Electronic File Name	Document Name	Include in Project Manual?	Notes
DIVISIONS 02 THROUGH 19 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	Refer to Project Manual Index for complete listing of Master Construction Specifications.	Yes	A/E must edit to suit Project requirements; A/E shall furnish specification sections for required products and components not listed in the Project Manual Index.
DIVISIONS 20 THROUGH 28, 32 & 43 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	Refer to Project Manual Table of Contents for complete listing of Master Construction Specifications.	Yes	A/E must edit to suit Project requirements; A/E shall furnish specification sections for required products and components not listed in the Project Manual Index.

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

TABLE 3. CONSTRUCTION MANAGER-AT-RISK (CM-R) AND DESIGN/BUILD (DB)			
A – Procurement And Contracting Requirements Group			
Electronic File Name	**Document Name**	**Include in Project Manual?**	**Notes**
INTRODUCTORY INFORMATION			
00 01 01	Project Title Page	Yes	
00 01 10	Table of Contents	Yes	Edit to suit Project. For phased release of bid packages, the Table of Contents must reference all documents with their associated issue date and issue description. Note documents previously issued as “Issued Under Separate Cover”.
CONDITIONS OF THE CONTRACT			
	2013 Uniform General Conditions for University of Texas System Building Construction Contracts	Yes	Include original document as executed in the Agreement between CM-R or DB Firm and Owner.
00 25 00	Owner’s Special Conditions	Yes	A/E and Owner’s Project Manager must edit for Project requirements.
00 25 00 A	Attachment “A”: Minimum Wage Rate Determination	Yes	Do not edit.
00 25 00 B	Attachment “B”: Facilities Planned Utility Outages Policy	Yes	Do not edit.
00 25 00 C	Attachment “C”: Project Sign Layout	Yes	Do not edit.
00 25 00 D	Attachment “D”: Bastrop Visitation and Tour Policy Statement and Medical Documentation Requirements	See Notes	Applicable to Bastrop Projects only.
00 73 16	Project Insurance (OCIP)	Yes	Include original document as executed in the Agreement between CM-R or DB Firm and Owner.
B – Specifications Group			
DIVISION 01 – GENERAL REQUIREMENTS			
01 31 00	Project Administration	Yes	Include original document as executed in the Agreement between CM-R or DB Firm and Owner. (Typical Division 01 documents).
01 32 00	Project Planning and Scheduling	Yes	
01 35 16	Alteration Project Procedures	Yes	
01 35 23	Project Safety (OCIP)	Yes	

TABLE 3. CONSTRUCTION MANAGER-AT-RISK (CM-R) AND DESIGN/BUILD (DB)			
B – Specifications Group			
Electronic File	**Document Name**	**Include in**	**Notes**

ATTACHMENT A
PROJECT MANUAL ORGANIZATION

Name		Project Manual?	
01 35 25	Owner Safety Requirements	Yes	Include original document as executed in the Agreement between CM-R or DB Firm and Owner. (Typical Division 01 documents).
01 35 25 A	Attachment "A": I.A.Q. Activities Policy	Yes	
01 45 00	Project Quality Control	Yes	
01 57 23	Temporary Storm Water Pollution Control	Yes	
01 57 25	Dust Control Plan	Yes	
01 77 00	Project Closeout Procedures	Yes	
01 79 00	Demonstration and Training	Yes	
01 91 00	General Commissioning Requirements	Yes	
DIVISIONS 02 THROUGH 19 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	A/E shall edit A/E's own Specifications.	See Notes	Use Master Construction Specifications only for redevelopment / renovation Projects within existing Owner facilities. EXCEPTIONS: Include Division 10 & 14 Master Construction Specification Sections listed below when applicable within Project Scope.
10 14 16	Cast Bronze Dedicatory Building Plaque	Yes	Confirm application with Owner's Project Manager.
10 14 16 A	Attachment "A": Building Plaque Drawing	Yes	
10 44 00	Fire Extinguisher Cabinets and Accessories	Yes	Required only when fire extinguisher cabinets are included within Project Scope.
14 21 00	Electric Traction Elevators	Yes	Required only when traction elevators are included within Project Scope.
DIVISIONS 20 THROUGH 28, 32 & 43 – CONSTRUCTION SPECIFICATIONS			
File name is specification division number (typical).	Refer to Project Manual Table of Contents for complete listing of Master Construction Specifications.	Yes	A/E must edit to suit Project requirements; A/E shall furnish specification sections for required products and components not listed in the Project Manual Index.

SECTION ## ## ## – TITLE (CMT)

PART 1 - GENERAL (PRT)

1.01 RELATED DOCUMENTS (ART)

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. (PR1)

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them. (PR1)

1.02 SUMMARY (ART)

A. (PR1)

1.03 REFERENCE STANDARDS (ART)

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date. (PR1)

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project. (PR1)

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references: (PR1)

1. (PR2)

2. (PR2)

3. (PR2)

1.04 DEFINITIONS (ART)

A. (PR1)

B. (PR1)

C. (PR1)

1.05 QUALITY ASSURANCE (ART)

A. (PR1)

B. (PR1)

C. (PR1)

1.06 SUBMITTALS (ART)

A. Product Data: (PR1)

B. Record Documents: (PR1)

C. Operation and Maintenance Data: (PR1)

1.07 DELIVERY, STORAGE AND HANDLING (ART)

A. (PR1)

B. (PR1)

1.08 EXTRA MATERIALS (ART)

A. (PR1)

PART 2 - PRODUCTS (PRT)

2.01 GENERAL (ART)

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction. (PR1)

B. (PR1)

2.02 (ART)

A. (PR1):

1. (PR2)

2. (PR2)

B. (PR1):

1. (PR2)

2. (PR2):

a. (PR3)

b. (PR3)

c. (PR3)

1) (PR4)

2) (PR4)

C. (PR1):

1. (PR2)

2. (PR2)

3. (PR2)

a. (PR3)

b. (PR3)

1) (PR4)

2) (PR4)

a) (PR5)

b) (PR5)

PART 3 - EXECUTION (PRT)

3.01 PREPARATION (ART)

A. (PR1)

B. (PR1)

3.02 INSTALLATION (ART)

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction. (PR1)

B. All installation shall be in accordance with manufacturer’s published recommendations. (PR1):

1. (PR2)

2. (PR2)

3.03 TESTING (ART)

A. (PR1)

B. (PR1)

1. (PR2)

2. (PR2)

3. (PR2)

C. (PR1)

END OF SECTION ## ## ##(EOS)

A1010 Standard Foundations

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes wall and column foundations, bridge foundations, foundation walls, excavation, backfill, and compaction.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Design foundations in accordance with recommendations of the Geotechnical Investigation Report, as applicable to the Project. Owner will furnish this document to the A/E during the Design Phase.

B. Provide waterproofing at walls below grade. Extend the sub surface waterproofing system up to flood protection elevation required by Facility Program.

C. Provide perimeter subsoil drainage at perimeter of building if recommended by the Geotechnical Investigation Report.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Not Applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted requirements considered to be project-specific.	DBB
Rev. 2	07-08-10	Revised extent of waterproofing.	JP/JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT A1010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes standard slabs on grade, trenches, pits and bases.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Design the first floor at an elevation nominally one-foot above the 500-year flood plain elevation per the latest FEMA data.

B. Design the first floor as a concrete slab on compacted select fill.

C. Provide a waterproof membrane system under slab on grade.

D. Provide subsoil drainage system under slab connected to perimeter drainage system, with sump and pumps, where Project includes occupied spaces below grade and where recommended by the Geotechnical Investigation Report.

E. Identify equipment that will require a recessed slab such as for computer floors, floor duct, or utility trenches.

F. Identify equipment that will require additional slab thickness / reinforcing to accommodate its weight.

G. Provide a mud slab for Projects with underfloor crawl spaces, which occur below grade.

H. Identify areas with special floor finishes, such as terrazzo, which require a recessed slab.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. If required for the Project, specify flood protection devices consistent with devices currently in use with the MD Anderson Main Campus FEMA flood mitigation project (1515 Holcombe).

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted requirements considered to be project-specific.	DBB
Rev. 2	09-16-10	Added 2.01 H	JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT A1030

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes floor structural frame, bridge structural frame, slabs and decks as applicable to the Project.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Building areas that require heavier floor loading for equipment, including equipment access pathways, or for future flexibility shall be arranged in increments of entire structural bays.

B. Steel braces, concrete shear walls, and/or concrete moment frames shall resist lateral loads as determined by a structural system study.

C. Floor design live load criteria:

Office, Assembly, Public Areas, Stairways, and Patient/Clinical Spaces	100 psf live load plus partition loads at columns, girders, floor slabs and beams. 2000 lbs. concentrated load at any 6.25 sf within a structural bay with increased capacity as required for specific equipment.
Laboratories, Laboratory Support Zones	125 psf, with increased capacity as required for specific equipment.
Mechanical Rooms/ Penthouse and selected Electrical and Telecommunications Rooms	150 psf
High Density Storage	150 psf
Loading Dock	250 psf

D. Floor elevation construction tolerance: ¼-inch over any span of 10 feet-0 inches but no more than ¾-inches on any floor. Confirm stricter requirement for specific equipment.

E. The sizing of openings for penetrations shall take into account net free, and uninterrupted, area requirements. Design details for openings shall be coordinated with the particular type of waterstop and fire/smoke seal that must typically be provided at each penetration.

2.02 FACILITIES WITH RESEARCH LABORATORIES

A. For facilities with sensitive equipment, provide vibration control in the structure to equal a V_{rms} Velocity Curve of 2000 μ in/s. Provide stiffer system if required for specific equipment.

B. Develop a planning grid that can adapt to laboratory, clinical, and vivarium functions.

C. Develop a structural grid to be consistent with the planning grid.

D. Shift structural grid approximately one (1) foot off planning grid in order to locate beams and girders out from under walls and benches wherever possible.

E. In vivarium areas, slope floor to drain where drains are provided.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

A. Drawings shall note the requirement that the underside of all post-tensioned concrete beams be identified with the words “POST TENSIONED BEAM - DO NOT DRILL”. The painted labeling is to be 3” high, red stenciled lettering, and be repeated at 20’ intervals, maximum, for beams longer than 20’.

B. Drawings shall note the requirement that the underside of all post-tensioned concrete slabs be identified with the words “POST TENSIONED SLAB - DO NOT DRILL”. The painted labeling is to be 3” high, red stenciled lettering, and be placed in each structural bay and at a maximum of 500 square feet intervals.

PART 4 - PRODUCTS

4.01 GENERAL

A. Not applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted requirements considered to be project-specific; revised floor design live load criteria for laboratories; revised vibration control requirement for research laboratories.	DBB
Rev. 2	02/24/09	Added paragraph 2.01 E. to address penetrations.	JC, DB
Rev. 3	11/22/11	Added special contract document requirements 3A and 3B for labeling of post-tensioned beams and slabs.	JC
Rev. 4			
Rev. 5			

END OF ELEMENT B1010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes roof structural frame, roof deck, and slab.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The structural system for the roof shall be a continuation of the system for the rest of the building.

B. Concrete surfaces to receive roofing shall have a floated finish with roughened texture to enhance adhesion of the roofing membrane. Concrete finish shall be approved by the Chief Engineer, Administrative Facilities & Campus Operations.

C. Slope to drain may be achieved through use of sloped structure, or use of flat structure in combination with tapered insulation. Both options should be carefully considered. Regardless of the insulation type selected, its overall thickness at building perimeter must be factored in to the attainment of the required forty two inch (42”) parapet height, as measured from finished roof surface adjacent to parapet.

D. Roof design live load criteria will be 35 psf with higher capacity for roof-mounted equipment.

E. Provisions shall be made at multiple locations for the attachment and support of swing-stage scaffolding used in cleaning, repair, and maintenance operations for the building exterior.

F. If included in the Project, provisions shall be made for multiple communications antennas, satellite dishes, and accessory control/monitoring spaces at the roof.

G. Vibration criteria is not required except to minimize effects on occupied floors.

H. Tie-backs are required on all roofs. Where top of parapet height exceeds 90 feet, provide both tie-backs and davit bases. OSHA 29 CFR 1910.66 pertains.

I. Roof design shall include fall protection compliant with OSHA 29 CFR 1910, OSHA 29 CFR 1910.66, OSHA 29 CFR 1926 Subpart M, and ANSI Z359-2007.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Not applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted references to structural system study; revised criteria on davits and tie-backs; added fall protection criteria, Part 2, note “G”.	DBB
Rev. 2	9-16-10	Added references to concrete finish and slope to drain, 2.01 B and C.	JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT B1020

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes exterior wall construction with facing materials, back-up construction, framing, insulation, vapor retarders, louvers, and soffits.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Exterior wall u-values and air leakage shall meet or exceed the values noted in ANSI/ASHRAE/IESNA 90.1.

B. Minimize horizontal projections in exterior wall systems and carefully detail to reduce soiling of building exterior.

C. Provide double row of sealant at exterior joints wherever feasible. Inner row of sealant should be weeped. Where two rows of sealant are not feasible or at exposed horizontal joints, flashing should be combined with sealant. All sealant joints shall be ¼" wide, minimum, and include a backer rod.

D. Sealant color shall match adjacent wall components.

E. At upward oriented (more than 90 degrees to the ground plane) horizontal joints, avoid exposed beads of sealant without a flashing back up.

F. Edge protection (parapets, guardrails, or combinations of these) shall be a minimum of 42 inches high above the adjacent completed roofing system surface. The inner face of parapets shall be a durable, water-resistant material capable of receiving cap flashing and counter-flashing for roofing base flashing.

G. At parapets, provide a metal coping or cap flashing, the top of which slopes away from the exterior of the building. A secondary flashing membrane shall be provided under the metal coping / cap flashing.

H. Provide parapet scuppers if overflow drains are not utilized on the roof. Where overflow drains discharge at or near ground level, provide a removable stainless steel wire screen at opening.

I. Where precast panels are used, the mix design for precast panels shall belong to MD Anderson Cancer Center.

J. Where brick veneer walls are used, design walls with adjustable wire brick ties, screwed through damp-proofing membrane and Dens-Glass type sheathing into structural metal studs. Provide insulation between studs and gypsum wallboard on the inside face, or at the outer face of gypsum sheathing, as appropriate. Locate uppermost brick ties one course from the top. Corrugated ties shall not be used in brick veneer construction.

K. Design shall include fall protection compliance with OSHA 29 CFR 1910, OSHA 29 CFR 1926 Subpart M, OSHA 29 CFR 1910.66, ANSI Z359-2007, ANSI/IWCA 1-14.1, and ASME A120.1.

L. Soffits shall be designed to withstand both positive and negative wind loads in accordance with applicable building code. Soffit systems utilizing flexible wire suspension shall incorporate rigid framing members or other means to comply with negative pressure design requirements.

M. Where “rain screen” type metal panel systems are included in the design, they shall not be used in a horizontal, upward oriented (more than 90 degrees to the ground plane) application. Only materials/systems designed as waterproof shall be used as parapet caps and at areas with similar exposure.

N. Use of vapor retarders in exterior wall construction must be carefully considered. Confirm by calculation method the optimal location at wall for vapor retarder, and identify locations where its placement should be avoided, or if it should be omitted entirely

O. Avoid mitered corners at stone and concrete panels. Owner preference is for use of lap joints where feasible, Provide quirk miter joints at panels where lap joints are not practical.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable

PART 4 - PRODUCTS

4.01 GENERAL

A. Specify louvers to be storm proof type for most applications. Determine actual sizes by confirming maximum allowable air velocity as well as the required free area, including reductions for screens, to avoid introducing rain into the building.

B. Specify a high performance water repellent for all vertical and horizontal concrete, pre-cast reinforced concrete, masonry or natural stone surfaces on all new construction. The purpose of the sealant is to reduce the frequency of exterior building cleaning and to preserve and protect the cladding system or horizontal construction.

1. Water repellent shall be breathable, shall penetrate the surface, shall bond chemically with the substrate, and shall not discolor or change the surface appearance of the exterior cladding systems or horizontal surfaces.

2. Specify the repellent system based on the type of material to be protected, such as brick, stone, concrete, pre-cast, or masonry, and the primary areas of concern, such as skid resistance, water vapor transmission, and water permeability.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted requirements considered to be project-specific; relocated criteria on louvers and sealant system from Part 2 to Part 4; added requirement for secondary flashing membrane, Part 2, Note “G”.	DBB
Rev. 2	07-08-10	Clarified edge protection height requirements.	JP/JC
Rev. 3	09-16-10	Expanded 2.01 C and H; Added 2.01 L,	JC
Rev. 4	03-31-11	Added 2.01 M and 2.01 N	JC
Rev. 5	04-17-12	Clarified joint and panel orientation in 2.01 E and M; Added brick tie information in 2.01 J; Added 2.01 O; Added air velocity confirmation in 4.01 A.	JC

END OF ELEMENT B2010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes windows, curtainwalls, and storefronts.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Windows shall include four-sided capture of the glass in painted aluminum frames with structural sealant joints allowed within the frames. Configure windows for ease of cleaning. Glass shall be insulated, low – E type, and shall meet or exceed u-value, solar heat gain coefficient, and gross wall area requirements per ANSI/ASHRAE/IESNA 90.1.

B. The curtainwall system shall include full capture of the glass and prefinished architectural metal panels at the perimeter painted aluminum frames. Structural sealant joints shall be allowed at other locations. Configure curtain wall elements for ease of cleaning. Glass shall be a combination of low-E and spandrel types. Test curtainwall in accordance with ASTM E1105.

C. Provide insulated spandrel glass wherever the interior space will not benefit from vision glass or where unfinished spaces or elements will be exposed if vision glass is used.

D. Storefront systems shall be painted aluminum frames and glass.

E. If wall construction requires a sill extension at windows, provide painted aluminum to match window frame. Sill extensions shall be sharp corner extruded aluminum, in lieu of brake metal type.

F. Windows and curtainwall shall have sill pans with end dams that extend from the exterior face of the frame and turn up two (2) inches on the interior.

G. Provide features that enable safe window cleaning operations, particularly for securing points on the face of the building to stabilize lines, davits and tie-backs on the roof and for availability of water and electrical power at each roof level. Comply with recommendations of the International Window Cleaners Association, ANSI/IWCA 1-14.1, ASME A120.1, and requirements of OSHA 29 CFR 1910.66, OSHA 29 CFR 1926 Subpart M, and ANSI Z359-2007.

H. The need for mounting of operable shades at exterior window heads shall be anticipated in the design. Owner preference is for a design which conceals the shade enclosure from view, by use of ceiling offset, recessed pocket, or other means.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Curtainwall manufacturer shall prepare and seal all shop drawings.

PART 4 - PRODUCTS

4.01 GENERAL

A. Not applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Deleted requirements considered to be project-specific; clarification on sill extensions and window cleaning.	DBB
Rev. 2	9-16-10	Added 2.01 H.	JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT B2020

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes personnel doors and overhead doors.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Entrances shall be painted aluminum and glass. Owner prefers building entrances to be designed in a vestibule configuration, with motor operated sliding doors provided in high traffic locations and in all patient care facilities.

B. Solid exterior doors shall be galvanized, primed and painted, full flush hollow metal doors with closed top rail in welded hollow metal, galvanized frames. Doors shall meet u-value requirements of ANSI/ASHRAE/IESNA 90.1.

C. Overhead doors shall be painted metal with motor operators.

D. Doors and frames shall be factory prepped to receive hardware, and security and fire alarm devices. Confirm power availability and electronic interconnections.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable

PART 4 - PRODUCTS

4.01 GENERAL

A. Not applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Clarification 2.01A.	DBB
Rev. 2	04-17-12	Added top rail requirement to 2.01 B; Added 2.01 D	JRC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT B2030

B3010 Roof Coverings and Support Structures

PART 1 - GENERAL

1.01 OVERVIEW

A. This Design Guideline includes modified bitumen roof membranes, roof coating, expansion joints, roof insulation, flashings, and trim. Design criteria concerning davits and tiebacks are also contained in this Design Guideline Element.

B. Major considerations for this Design Guideline Element are to attain an extended roof system service life of thirty years or more through the use of high quality product systems and methods to decrease thermal stress to the roofing system, and to achieve ease of maintenance and compatibility with ongoing Owner's maintenance and repair operations.

C. The materials referenced in this Design Guideline shall be used to construct a finished and warranted roof system. To that end, all adhesives and field and flashing membranes shall be of the same manufacturer. All other materials such as insulation, fasteners, wood, coatings etc. shall be compatible with one another and shall be acceptable for use with one another by the roofing material manufacturer and/or all parties providing a warranty.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The roof system shall be a cold process, two-ply atactic polypropylene (APP) modified bitumen membrane system with heat welded seams and flashings that meet ASTM 6223-02 or later.

1. As an option, and with the Owner's and manufacturer's consent, the field membrane may also be heat welded when necessary to meet wind load and uplift requirements, or when the Project site does not carry odor restrictions due to proximity to occupied buildings.

B. At a minimum, the roof system shall consist of a dual scrim 160-mil fire rated (FR) modified bitumen smooth base ply with a dual scrim 180-mil fire rated (FR) light colored granule surfaced cap sheet coated with a highly reflective white elastomeric acrylic top coat. The basis of design for this system is the Performance Roofing System's Derbigum product line with a Acrylink acrylic elastomeric coating system consisting of a light grey primer and brilliant white top coat.

1. At normal weight and light weight concrete decks, a non-ventilating 80-mil smooth modified bitumen sheet, such as a Derbibase Base Sheet, shall be torch applied to the cleaned and primed deck. This is a sacrificial membrane to be used to waterproof the roof until all roof related equipment installation work is completed. Installation of the primary roofing system shall not begin until all roof mounted equipment is set in place.

C. Roof u-values shall meet or exceed requirements of ANSI/ASHRAE/IESNA 90.1.

D. Roof Systems shall be Energy Star and LEED roof-compliant, high-reflectance and high emissivity. A minimum of 75 percent of the roof surface shall have an initial reflectance of at least 0.76 and 3-year-aged reflectance of at least 0.71 (which may be achieved by washing) when tested in accordance with ASTM C-1549 and minimum thermal emittance of 0.9 when tested in accordance with ASTM C-1371 and ASTM E408.

E. Where walk or traffic pads are specified, an extra layer of the granule cap sheet shall be applied and coated. The membrane beneath the extra layers shall not be coated prior to the installation of the walk pad. Liquid applied membranes are not permitted. Owner does not use walk pads except at the entrance/exit points to roofs, or in extremely high traffic volume areas where the roof top is used for regular transit to rooftop mechanical rooms or equipment. Walk pads are not typically required in the roof open field. Walk pad use and locations shall be approved by the Owner.

F. Roof insulation shall be located above the roof deck and consist of combinations of flat and tapered insulation boards and be applied using a dual component, low rise, polyurethane adhesive, such as OlyBond 500, unless mechanical fastening is required. Perlite insulation shall not be used on MD Anderson projects. The key objective in roof insulation is to select a product that will maintain both its structural integrity and performance characteristics if wetted by a roof leak. Unless dictated by other considerations, light weight insulating concrete is not required if a rigid polyisocyanurate insulation board is used and is mechanically fastened to a steel pan roof deck.

G. Design the roofing and roof insulation systems for applicable wind load and uplift criteria for the Project Site, whether for Houston, Smithville or Bastrop campuses. This criteria changes with the height of the structure and proximity to the coast line. Wind related design guidelines for all MD Anderson buildings shall be governed by FM Global standards and the provisions of ASCE 7-10 for wind load design. Submit all deviations from FM Global standards to the Owner for approval. Ensure that the roofing systems identified for the various levels of the structure are selected to meet the appropriate wind loadings.

H. Cants, equipment curbs and supports, nailers, and other blocking shall be treated wood, #2 grade or better, straight and without splits or cracks, and shall be treated for moisture resistance with a waterborne preservative to a minimum retention level as required to meet Ground Contact use/exposure classification. The maximum moisture content of the wood when installed shall be 19 percent or less. Plywood used in roof construction shall be marine grade. Fasteners shall be galvanized (G90, or better) or stainless steel, as recommended by the manufacturer of the wood treatment process in use. Refer to governing codes for possible fire rating requirements for all lumber and wood products used on MD Anderson roofs.

I. Nailers are required at all insulation terminations such as a roof edge, an expansion joint, and at any change in the vertical profile of the roof such as at a parapet wall. All curbs shall be constructed from treated wood. Pre-formed metal curbs and insulated curbs are not permitted. For large changes in vertical profile, an approved plywood faced “stud wall” nailer with all voids filled with unfaced fiberglass batt insulation may be used. All construction shall be of treated wood. Cast in place reinforced concrete curbs are suggested as the base for all large roof structures such as major ventilation fan units or HVAC units.

J. Provide a two-ply modified bitumen base flashing with the top ply being the same as the cap sheet and coated, in combination with 18 gage galvanized counter flashing with all seams welded. All joints shall have a minimum 6-inch wide, top mounted cover plate installed with the ends crimped top and bottom, and shall be constructed out of 20 gage material, minimum. Stainless steel flashing may be used as an alternative counter flashing material. All flashings shall be installed in accordance with manufacturer’s published data sheets and SMACNA guidelines, and in accordance with MD Anderson standard flashing details. Submit all project roofing details to the Owner for approval.

K. Unless otherwise specifically approved in writing, all MD Anderson buildings shall be provided with a parapet wall that is a minimum of 42-inches above the highest adjacent point of the finished roof system for fall protection as dictated by OSHA. The height may be achieved by the combination of a parapet wall and guardrail, guardrail alone, or parapet wall alone. This requirement is waived on single story roof structures if tieback systems and lifeline systems are in place. The use of demarcation lines is required six feet from the roof edge on these larger single story roof systems where no parapet or railing is present. Penthouse structures that are immediately adjacent to the edge of the structure shall be treated in the same manner as the main roofs on a structure, and shall have a parapet wall for fall protection. Penthouses that are centered in the open field of the main roof and twelve feet or less in height may use a demarcation system in lieu of parapet if appropriate fall protection is installed.

L. Roof top mounted tiebacks shall be provided on all structures. Safety line attachments shall be provided at all roof levels to ensure OSHA fall protection guidelines are met. A lifeline cabling system is required so that a harnessed worker can safely move along a non-parapet protected roof top for maintenance purposes. The A/E shall consider the needs of window cleaners using bosun’s chairs and the use of suspended scaffolding systems when determining tieback locations. Type and location of tieback systems shall be approved in writing by the Chief Engineer, Administrative Facilities & Campus Operations.

M. Davits shall be provided on all structures exceeding six stories in height. Tiebacks shall be provided to operate in conjunction with the davit systems, and for stand-alone use. Where both tiebacks and davits are provided, they shall be supported by separate and independent structural systems. Require load performance testing for a minimum of one out of every ten installed davits if they are attached to the structural system of the building. Retrofit davits shall require testing for each installed unit. Davits shall be designed with a 5,000 lb. maximum load capacity and shall be down- rated to a 1,250 lb. normal operating load. Tiebacks shall be designed to the same pullout capacity as davits. The Owner shall identify if an MD Anderson - provided davit arm system is available for use on capital projects, and the A/E shall inspect and certify the unit for use. Provisions for storage of davit arms in roof level mechanical rooms shall be provided in the project design. This may be in the form of wall mounted brackets or an appropriate laydown area. Type and location of davit systems shall be approved in writing by the Chief Engineer, Administrative Facilities & Campus Operations.

N. Provide two-piece continuous unpolished stainless steel flashing under stone or precast concrete sills, copings and similar conditions. Provide sheet neoprene as a secondary backup at roof expansion joints and at internal gutters. Backup system shall be water tested prior to installation of primary system.

O. All metal decks used in the roofing system shall be of galvanized steel construction. Securement patterns for metal decks shall be based on current FM Global and ASCE 7-05 design loading requirements and shall be certified by a Structural Engineer. On metal decks where light weight insulating concrete is used, the deck shall be vented.

P. Provide ladders or stairs and roof hatches as required to access all roof levels. Ladders and roof hatches shall have OSHA required fall protection systems designed in place to prevent falls. Roof hatch fall protection barriers shall have a self closing gate style closer. Safety chains shall not be used. Roof hatches that are placed within ten (10) feet of the roof edge shall not open facing the edge of the roof. There shall be no access to roofs via windows without the expressed approval in writing by the Chief Engineer, Administrative Facilities & Campus Operations. Absolutely no roof access will be permitted via windows in laboratory or patient care spaces, in order to protect against contamination. All roof access points will afford the maximum fall protection and ease of access for maintenance personnel.

Q. Skylights, if designed in the building, must be protected with fall protection screening, barriers, or be certified that they are rated as safe for meeting the fall protection criteria.

R. Absolutely no roofing membrane flashing higher than 12 inches above the finished roof is permitted on any parapets. Roofing membrane shall not be used as a finish material on parapet walls. No deviation from this requirement is permitted without the expressed and written consent of the Chief Engineer, Administrative Facilities & Campus Operations.

S. Any modifications or deviations from this Design Guideline Element direction shall require written approval from the Owner.

T. Owner preference is to avoid the use of internal roof gutters in the design; however, if they must be used, they shall incorporate two stand-alone water barrier systems. Flashing for these gutters must extend to a height such that water will not enter the building if the gutter completely fills.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The Owner’s Project Manager will provide MD Anderson’s typical roof details for penetrations, flashing, counter flashing and curbs for use by the A/E. No deviation may be made from MD Anderson’s details without the expressed approval in writing by the Chief Engineer, Administrative Facilities & Campus Operations. When MD Anderson provides written specifications for a specific project element or the project itself, no deviations are permitted from the specification without the expressed approval in writing from the Chief Engineer.

B. Require that a submittal be provided which indicates graphically each tieback and davit location, coverage zones for each item, and locations of available electrical and water connections. Submittal shall require the approval signature/stamp of the Chief Engineer, Administrative Facilities & Campus Operations.

C. Building section drawings shall indicate, for all conditions at roof, dimensions for parapet height above finished roof surface as well as insulation thickness (abutting parapet) above top of structural deck.

PART 4 - PRODUCTS

4.01 GENERAL

A. Roof systems shall be selected based on performance characteristics that meet or exceed the Performance Roofing System's Derbigum product line as a design basis. Alternate roofing manufacturers and product lines that meet or exceed the performance requirements of the Derbigum product line are acceptable to be included in the Project Specifications. Use of an alternate manufacturer's product/specification is subject to compliance with the specific criteria and requirements in this Design Guideline Element. The basis of design system information can be obtained at: http://www.derbigum.us/.

B. Material manufacturers shall be ISO 9002 and ISO 14001 Certified. Any manufacturer can be used as long as the manufacturer's system meets or exceeds the design roofing systems' performance specifications.

C. Manufacturer shall provide a minimum twenty (20) year No Dollar Limit labor and materials warranty, and the roofing contractor shall provide a minimum two (2) year installation warranty. The roofing contractor shall have a minimum five (5) year verifiable installation record with the manufacturer as a certified installer. Owner will review and approve the installer's qualifications. The installer's performance on previous projects at MD Anderson or other hospital or education and research projects will be considered before approval is granted to use the proposed installer. Approval must be granted by the Owner, as represented by Administrative Facilities & Campus Operations.

D. Only APP modified bitumen membranes shall be used on M.D. Anderson facilities and there shall be no deviation from this design guideline.

E. MD Anderson uses a roof coating system produced by Isothermal Protective Coatings, Inc. of Houston, Texas on all its facilities. All modified bitumen roofs at MD Anderson shall use this product applied at 3 gallons per 100 square feet in accordance with the manufacturer's recommendations. No alternative coating systems are authorized unless approved by the Chief Engineer, Administrative Facilities & Campus Operations. Product information can be obtained at: http://www.acrylinkg.net/index.htm.

F. The use of products that contain silicone and that will be in contact with the roof system is expressly prohibited.

G. MD Anderson has an interest in addressing roofing systems specifically on ambient temperature penthouses. The Owner desires that the roofing systems used above temperature controlled and occupied spaces should not be reproduced for convenience on ambient temperature penthouses. This design direction is to be specifically addressed on all new roof systems installed. MD Anderson encourages the A/E to address a more sustainable design by reducing the material footprint on penthouse roofing verses the open field roofing systems while still maintaining a high quality, long life end result. Particular regard must be paid to roof drainage and suitability for craftsman access to work on roof top systems.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 2: wood shall be moisture resistant only.	SAK
Rev. 2	03-13-08	Complete revision based on updated MD Anderson requirements.	J.E. Power
Rev. 3	07-01-08	Revisions to Part 2, Design Criteria; Revisions to Part 4; Products.	J.E. Power
Rev. 4	10-22-09	Removed Johns Manville from list of acceptable roofing product manufacturers. Paragraph 4.01 D.	J.E. Power
Rev. 5	03-02-10	Complete revision of Element.	J.E. Power
Rev. 6	07-08-10	Miscellaneous revisions to all sections.	JEP and JRC
Rev. 7	9-16-10	Added tieback and davit approvals by Chief Engineer in Part 2; added submittal requirements in Part 3; relocated several paragraphs from Part 3 to Part 2 and Part 4; revised 2.01 B 1 and 4.01 A.	JEP and JRC
Rev. 8	03-31-11	Added 2.01 T.	JRC
Rev. 9	04-17-12	Revised top coat product in 2.01 B; Clarified use of base sheet in 2.01 B1.; updated ASCE 7 number in 2.01 G; Added SMACNA in 2.01 J; Reduced davit down-rating in 2.01 M; Clarified flashing type and added backup system in 2.01 N; Clarified approvals in 3.01 A; Added website in 4.01 A; Revised coating product in 4.01 E.	JRC

END OF ELEMENT B3010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes fixed partitions, moveable partitions, interior windows, and storefronts.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Typical interior partitions shall be 3-5/8 inch wide, 22 gage (or structurally equivalent) metal studs at 16 inches on center with one layer of 5/8 inch gypsum drywall each side.

B. Provide sound attenuation batts in the wall cavities of toilet rooms, conference rooms, private offices and other specialized rooms as appropriate to achieve additional sound control. Provide STC55 or better sound rated partitions at mechanical rooms or other noise generating areas.

C. Provide wider and/or heavier than twenty-two gage studs as required for extra unsupported height or wall–mounted shielding or equipment per the Facility Program.

D. For clinical and research applications, typical interior partitions shall be full height to the structure above.

E. Provide full height partitions at core elements such as mechanical, electrical, security, and telecommunications rooms, stairs, elevator shafts, chases and toilets, at fire rated walls, private offices, conference rooms, and break rooms. Additionally, it may be determined for budgetary or special-use reasons that selected partitions should terminate at the underside of ceiling. Confirm locations with Owner’s Project Manager. At multi-person offices, provide partitions that terminate at the ceiling.

F. Brace and reinforce partitions as required to support wall mounted equipment, furniture, and casework.

G. Provide double 20 gage (or structurally equivalent) studs at each door jamb.

H. Provide moisture resistant gypsum wallboard at all wet areas and toilet rooms. Provide tile backer board at walls surrounding showers.

I. Interior windows shall be clear or patterned glass. Windows shall be set in aluminum or hollow metal frames, to match door frame material. Safety glass shall be provided in lieu of standard glass only where required by applicable Code, or where special circumstances warrant its use. Confirm special locations with Owner’s Project Manager.

J. Partitions at dock receiving areas leading to a service elevator shall be 6” minimum concrete masonry.

K. For facilities with TECO steam service, provide concrete masonry partitions to isolate steam pressure reducing station from other building spaces.

L. Provide non-magnetic construction at MRI rooms.

M. For shell spaces, delete inner layer of gypsum drywall unless required for fire rated construction.

N. All penetrations through new fire/smoke rated partitions shall be sealed to provide a rating equal to or greater than the rating of the partition. Existing noncompliant penetrations through rated partitions in a Project area shall be identified, and properly sealed as a part of the scope of work for the Project.

O. Partitions surrounding elevator shafts shall be designed and sized to accommodate all internal structural members completely within the required fire resistance rated construction, while maintaining the shaft wall rating without interruption.

P. Partitions supporting grab bars at toilet rooms shall be designed to support a weight of 400 lbs at any point along the length of grab bar. In–wall blocking for attachment of grab bars shall be sized and installed accordingly.

Q. Partitions surrounding fire resistance rated exit enclosures and exit passageways shall not be penetrated by mechanical/electrical utilities which do not serve the enclosure/passageway, except as permitted by Code.

R. Design folding panel partitions to function in all possible multi-room sizes/configurations. Ensure partition manufacturer's system is designed to accommodate any and all potential configurations. In rooms with acoustical panels, Owner preference is for fabric finish on fixed and folding panels to match.

S. Avoid use of reveals in partitions in laboratory and direct patient care areas.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Where applicable, include a note on Drawings referencing the need to coordinate with the Mechanical Contractor for locations where penetrations of fire dampers and associated ductwork are to be removed at existing partitions.

C. Drawings shall clearly identify where non-rated partitions are to be constructed in front of rated walls and note that additional labeling shall be provided on the non-rated partition to identify the rated wall if the non-rated partition extends more than12 inches above ceiling line. [Example of additional labeling: "2-Hour Fire Rated Barrier Behind This Partition - Do Not Penetrate."].

D. The location, size, and quantity of back boxes, enclosure panels, and similar items which are mounted in, and penetrate the membrane of, fire resistance rated partitions shall be coordinated with limiting requirements contained in the governing Codes. Drawings shall indicate by detail drawing and, or notation the limitation/allowance criteria for each type of listed and non-listed (non-rated) item that may be installed in fire resistance rated partitions.

E. Drawings shall include complete reproductions of all UL designs for fire resistance rated partitions and associated joints which are referenced on the Project. Indicate appropriate UL designs for joints at head and base of wall, as well as joints within the wall, to accompany the selected UL design for each fire resistance rated partition. Refer to UL online certifications directory database for complete listing of joint designs.

F. Detail termination of reveals at change of finish, especially at base. Avoid gaps and holes at reveal termination, and ensure ease of finish application in reveal design. Call for application of final finish, where possible, to the back of reveal prior to construction of remainder of reveal.

G. Fully detail fire resistance rated walls to extend around /behind unrated items mounted in the wall, such as fire extinguisher cabinets, safety showers, etc.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Added requirement for full height partitions at private offices; sound rated partitions at mechanical rooms.	SAK
Rev. 2	08/14/08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 3	02/24/09	Add paragraph 2.01 N. to address penetrations.	JC, DB
Rev. 4	11/10/09	Add requirements to identify locations where partitions are applied in front of rated walls. Paragraph 3.01 B.	SH
Rev. 5	09/16/10	Added paragraphs 2.01 O and P. Added paragraph 3.01C.	JC
Rev. 6	03-31-11	Added information on safety glass to 2.01 I; Added 2.01 Q. Added U.L. documentation requirements to paragraph 3.01 D.	JC
Rev. 7	11-22-11	Added use of structurally equivalent studs to 2.01 A. and G.	JC
Rev. 8	04-17-12	Added 2.01 R, 2.01 S, 3.01 E and 3.01 F.	JC
Rev. 9	03-05-13	Added requirement to add note on Drawings for coordination of fire, smoke, fire/smoke damper removal. Paragraph 3.01 B.	JC

END OF ELEMENT C1010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes solid core wood doors, steel doors and frames, aluminum and glass doors and frames, and door hardware.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Provide 3-ply or 5-ply solid core wood doors with plastic laminate faces, particle board core, 1-1/16 inch to 1-1/2 inch wide solid hardwood stiles, 5 inch minimum hardwood or structural composite lumber top rail, 5 inch minimum hardwood or structural composite lumber bottom rail where concealed door seal or kickplate is scheduled, and additional blocking as required for mortised locks or exit devices. Edges of doors shall be painted or stained to match plastic laminate faces. Surface mounted astragals and frames for glass lights shall be painted to match door edge according to Owner's Interior Guideline Standards. Refer to Planner/Designer for specification and/or approval.

B. Where required, provide painted full flush steel doors in welded steel frames.

C. Typical door frames for office suites shall be hollow metal or prefinished extruded aluminum to match clerestory/sidelight and partition top cap. Confirm with Owner's Project Manager.

D. Office suite entries consisting of swing doors and sidelights shall be clear glass in prefinished extruded aluminum (or hollow metal) frames to match typical door frames. Confirm with Owner's Project Manager.

E. Provide cylindrical latch and locksets at typical interior doors. Mortised and electrified locksets may be provided at special use locations and as required for use with other security hardware. All latch and lockset cores shall be by Best Access Systems, no substitutions. Typically provide Best 93K series with #14 lever handle, "C" rose and S3 strike package, all with 626 finish. Office doors shall typically be provided with a coat hook on the back.

F. Provide ball bearing hinges typically at doors except where minimal usage is expected.

G. Use wall mounted door bumpers or overhead stops in lieu of floor mounted bumpers wherever possible. Ensure wall stops are located, or designed, so as not to lock pushbutton locksets.

H. Factory prep doors and frames to receive security hardware/devices, as well as fire alarm devices where required. Confirm power availability and electronic interconnections.

I. Provide automatic door openers and protection plates at doors where pallet or cart traffic or stretcher/bed traffic occurs.

J. Doors in vivarium spaces may be reinforced fiberglass or stainless steel, fully sealed top and bottom.

K. Provide stainless steel door frames in animal holding rooms.

L. Provide shielded doors with heavy-duty pivot hinges as required by equipment. Shielded doors shall be provided with a closer or power operator.

M. Door closers on wood doors shall be attached using sex bolts.

N. Provide tactile lever hardware at entrances to hazardous areas, such as electrical rooms and chemical storage rooms.

O. Provide rated access doors into chases as required.

P. Power operated swinging fire and smoke doors shall have a connected fire alarm input provided as part of the design. The alarm signal shall deactivate the power operator and cause the door to close at the time of fire. Door operation shall comply with NFPA 101 and NFPA 80 requirements.

Q. Motorized overhead coiling doors shall incorporate features such that no special knowledge or work is required to re-set the door after activation by the fire alarm system. Re-setting of door shall be accomplished by clearing of the signal from the fire alarm system, and pushing the “OPEN” button at the door control station.

R. Where there is an infrequent need for a wider than normal opening, Owner preference is to provide a 3 foot wide active leaf door in combination with a narrower inactive door leaf. The inactive door leaf shall be provided with a top and bottom deadlock (keyed differently from the active leaf), hinges, strike plate, and astragal if required. For fire rated doors, this hardware arrangement is subject to Code review/compliance.

S. Typical hollow metal door frames shall be welded, wrap around type with 2” face width. Knock down frames are to be avoided unless conditions require them. At CMU partitions, provide non-standard door height where required in order to maintain a 2” frame width at head. Seal open gaps at bottoms of frames to flooring finish. At hollow metal borrowed lites, provide glazing stops on the secure, non-public side of the frame.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Include requirements within Contract Documents to insure that the door hardware installer shall have a minimum of 5 years experience on commercial projects of similar type.

C. Include requirements within Contract Documents to insure that the installation of a manufacturer supplied construction core or temporary plastic core at all locksets shall provide protection from internal damage prior to installation of permanent cores.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Revised criteria on solid core wood doors.	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 3	02-11-10	Added requirements for power operated swinging doors and overhead coiling doors. Paragraphs 2.01 P & Q.	JC
Rev. 4	04-17-12	Added coat hook requirement in 2.01 E; Added wall stop requirement in 2.01 G; Added prep requirements in 2.01 H; Added requirement for closers/operators in 2.01L; Added 2.01 R and 2.01 S.	JC
Rev. 5	12-13-12	Added requirements for construction cores under 3.01 B & C.	JC

END OF ELEMENT C1020

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes marker and tack boards, lockers, storage shelving, handrails and wall protection, access doors, aquariums, fire extinguishers, and signage.

PART 2 - DESIGN CRITERIA

2.01 MARKER AND TACK BOARDS

A. Marker boards shall be white porcelain on steel with aluminum frame, and be suitable for use with magnetic accessories.

B. Provide 8 foot long porcelain enamel steel marker walls at both sides of large and intermediate sized conference rooms if required by the Facility Program.

C. In selected corridors of research facilities, provide extruded wall mounted track for suspension of stationary marker boards and tack boards. Track system shall be designed for use with track mounted products by same manufacturer, and to facilitate easy removal and relocation of these items upon the track.

D. Tack boards surface shall be colored cork.

2.02 LOCKERS

A. Lockers shall be painted steel or plastic laminate covered. Lockers for use by patients, the general public, and most employee groups are typically plastic laminate (woodgrain) covered. Confirm material to be used, as well as locations where enhanced locking design is required, with Owner’s Project Manager.

B. Manufacturer’s logo shall not be exposed to view on lockers.

C. Exposed ends of lockers shall be provided with a finished panel.

D. Coordinate locker numbering and locking system with Owner’s Project Manager.

E. Provide sloped panels or furring at top of lockers.

2.03 STORAGE SHELVING

A. Storage shelving shall typically be included in the Owner-furnished furniture package. Provide high density storage system where required by the Facility Program.

2.04 HANDRAILS AND WALL PROTECTION

A. Decorative handrails shall be stainless steel and glass.

B. Provide PVC handrail, 8 inch bumper guard, and corner guards in clinical corridors used by patients.

C. In staff corridors with frequent cart or stretcher traffic, provide PVC corner guards, 6 inch crash rail, and 8 inch bumper guard.

D. Provide full height surface-applied corner guards at corners subject to damage. Where PVC sheet material wall protection is provided, it shall be fully adhered, and all trim edges shall be sealed.

E. At service areas, provide steel plate wall protection.

2.05 ACCESS DOORS

A. Ceiling and wall mounted access doors shall be operable by screwdriver typically. Where access doors are located in fire resistance rated walls/ceilings, provide rated door assemblies with latching methods as are required by, and appropriate to, rating and surrounding construction.

B. Single, as well as double interlocked pass-through access panels and doors shall be tested / rated as appropriate to the fire resistance rated partition in which they are located. Frame and hardware must be included as a part of the tested and approved pass-through assembly.

2.06 AQUARIUMS

A. Provide a GFCI type receptacle adjacent to planned aquarium location.

B. Confirm any special requirements such as cabinetry clearances and support structure, etc. with aquarium vendor.

2.07 FIRE EXTINGUISHERS

A. Fire extinguisher cabinets shall typically be recessed metal type, with solid door and recessed handle, sized to accommodate a 5 lb. CO_2 and 2 ½ gallon water extinguisher. Individual 5 lb. ABC dry chemical or 10 lb. ABC dry chemical extinguishers are at times used in lieu of the CO_2 and water extinguishers. Confirm with Owner's Environmental Health and Safety group which extinguisher type(s) are applicable to a specific project.

B. Provide a bracket-mounted 10 lb. ABC dry chemical extinguisher in mechanical rooms and bracket-mounted 5 lb. ABC dry chemical extinguishers in primary lab spaces. Refer to Division 10, specification 10 44 00 for additional specialty type fire extinguishers for MRI, industrial kitchens, and certain areas within health care and ambulatory health care occupancies.

C. Cabinets shall be appropriately labeled/rated when mounted in fire resistance rated walls if rated walls are not constructed, uninterrupted, around the cabinets.

2.08 SIGNAGE

A. Provide electrical power and support structure for exterior building identification signage located on the site and at face of building. Owner will typically provide and install exterior identification signage.

B. Room identification and wayfinding shall be Owner-furnished and installed.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Coordinate types of products and mounting locations with Owner.

C. Specify that when metal back plates at PVC handrails are cut, they shall be de-burred before installation.

D. Expansion joint assemblies shall be consistent throughout a project. Confirm design compatibility of proposed floor and wall expansion joint assemblies with Owner's Project Manager.

E. Items with a factory-paint finish which are installed in partitions and ceilings shall not have additional finish applied unless approved by Owner.

1. This requirement is applicable to such items as access doors, pass-through doors, fire extinguisher cabinets, utility service panels, automated external defibrillator cabinets, toilet accessories, and fire hose cabinets, etc.

2. Colors for these items shall typically be selected from the standard range available from the manufacturer, and shall be appropriate to the application so as to avoid the need for changes.

3. Where use of additional field-applied paint is required/approved for use on operating surfaces, such as hinges, every effort shall be made to ensure, through application technique and use of appropriate film thickness, etc., that it does not chip, peel, or is otherwise worn off through use.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Revised Contractor-furnished toilet and bath accessories	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 3	07-08-10	Added requirements for flooring as well as track systems at research facilities; clarified marker board type as well as locations for use of each locker type.	JC
Rev. 4	09-16-10	Edited 1.01 A and added 2.01 O, P, and Q	JC
Rev. 5	03-31-11	Added 2.01 R.	JC
Rev. 6	11-22-11	Added 2.01 S regarding the requirement not to field- paint items in partitions and ceilings which have a factory finish.	JC
Rev. 7	06-14-12	Added additional included items to 1.01 A; Added/revised locker requirements in 2.01F; Added additional shade requirements in 2.01P; Added 2.01 T, 2.01 U, 2.01 V, 2.01 W, 2.01 X, 2.01 Y, and 3.01 C.	JC
Rev. 8	03-05-13	Reorganized Part 2 and Part 3; moved toilet and bath accessories to Element Z4030; moved window shade and banquette requirements to Element E2010; moved finishes related requirements to Elements C3010 and C3020; revised fire extinguisher requirements. Added "Interior Specialties" to title.	JC

END OF ELEMENT C1030

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes fabricated toilet partitions and urinal screens.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Typical toilet partitions shall be ceiling hung, plastic laminate faced with black phenolic resin core. Urinal screens shall be supported from the wall, and be of the same construction as toilet partitions. (Painted steel partitions and screens are used only in special cases, such as for vivariums. Project manager approval is required.)

B. All partition and urinal screen hardware, including brackets and fasteners, shall be stainless steel with satin finish.

C. All fasteners shall be tamper proof, and spaced at approximately 12-inch o. c. along brackets.

D. Provide sight-proof continuous piano hinges at stall doors. The strike side of doors shall be sight–proof, through use of a rabbetted edge at door/pilaster, or other similar detail.

E. Brackets for urinal screens, divider panels, and end panels shall extend full length of the panel, thru-bolt to panel, and have double ears for attachment to wall.

F. Pilasters shall be attached to the wall using continuous brackets. Brackets shall thru-bolt to pilaster, as well as provide a single ear (oriented to inside) for attachment to wall.

G. Partition and urinal screen faces shall be Formica #744-58 Lacewood (matte) HGS plastic laminate, and exposed core edges shall be radiused and polished. Plastic laminate grain shall be oriented vertically.

H. Partition panels and urinal screens shall be ½-inch - ¾-inch thick, and doors and pilasters shall be ¾-inch thick, minimum.

I. Provide 24-inch wide doors at typical stalls, and 36-inch out-swinging doors at accessible stalls.

J. Provide a coat hook/rubber bumper at all doors.

K. All hardware and brackets shall be free of sharp edges.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, include provisions described within this Element in the Project Contract Documents.

B. Drawings shall indicate dimensions of each toilet stall and urinal screen, and its relationship to the centerline of the associated plumbing fixture.

PART 4 - PRODUCTS

4.01 GENERAL

A. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	08-14-08	Initial Adoption of Element	JC
Rev. 1	10-09-08	Clarified where steel partitions are allowed, in 2.01, A.	JC
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT C1031

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes plastic laminate casework and headwalls. For metal casework typically used in a laboratory setting, refer to Owner’s Design Guidelines Element C1039, Laboratory Casework and Equipment.

PART 2 - DESIGN CRITERIA

2.01 PLASTIC LAMINATE CASEWORK

A. Provide plastic laminate faced casework with flush overlay reveal design. Comply with AWI Custom Quality Standards, Section 400 for minimum requirements, and as modified by these Guidelines.

B. Substrate Material: 3/4” grade B birch or maple, or grade BB maranti plywood typically; Provide exterior grade plywood at special locations subject to high moisture levels. All plywood to be formaldehyde-free product. Particle board and MDF shall not be used in casework; however, MDF may be used as substrate for paneling.

C. Facing Materials: Combinations of horizontal and vertical grade plastic laminate on all exposed to view components; HGS 0.048” thickness at horizontal surfaces, VGS 0.028” thickness at vertical surfaces, and CLS /BKL 0.020” thickness at liner and backer panels. Provide solid surface material accents and trim at nurse stations and other high profile locations.

D. Edging: 1 and 3 millimeter thick pvc edging in color to match face laminate. Provide material with self locking serrated tongue and radiused edges.

E. Typical Construction:

1. Cabinet Boxes: Plastic laminate on faces; 1 mm edging; CLS liner on hidden surfaces.
2. Exposed Shelving: Plastic laminate on faces; 1 mm edging.
3. Concealed Shelving: CLS liner on faces; 1mm edging, or self edge.
4. Cabinet doors: Plastic laminate on exposed and hidden faces; 3 mm edging.
5. Drawers: Plastic laminate on exposed face; 3 mm edging; drawer body constructed of either solid red oak at all sides and red oak plywood bottom, with dovetail joints and transparent finish, or CLS liner covered plywood at sides and bottom.
6. Trash Drawers: Same construction as Drawers, with all interior joints sealed.
7. Wall Cabinets, Underside: VGS plastic laminate at panel and closure faces.

8. Typical Countertops: Plastic laminate faces on 1” thick plywood; 3 mm edging. Provide backer sheet on concealed surfaces. Provide laboratory grade plastic laminate at areas subject to chemical exposure. Provide exterior grade plywood at countertops containing sinks.

9. Typical Splashes: Plastic laminate faces on 3/4” thick plywood; 3 mm edging or self edge. Provide sealant to match color of wall or casework at joints where splash abuts wall, and sealant to match countertop where splash and countertop meet. Silicone sealant shall be used at countertops containing sinks.

10. Toe Space: 4” high toe space at base cabinets; Provide continuous backup for attachment of rubber base.

F. Design Requirements:

1. Sink Base Cabinets: Width of base cabinet shall be in proportion to sink size, without excessive left over space in cabinet; Paint any semi – exposed wall surface behind cabinet; Install escutcheons at all pipe penetrations through the wall or back of cabinet; Insure the design provides access to cleanouts; In patient care areas, provide locked doors or removable panels at sink base units.

2. Countertops and Splashes in selected high profile areas, and at typical patient care areas: Solid surface material (SSM). Details shall be approved by Owner prior to fabrication. Refer to Owner’s Design Guidelines Element Z4030 for special requirements at SSM countertops in toilet rooms. Corners of SSM countertops shall be rounded off. At SSM countertops with under-mount sinks, provide continuous silicone sealant at joint between countertop and sink. All SSM countertops containing sinks shall be provided with a raised edge at top, a chemically welded joint at abutting splash, and a sloped top surface at splash, all as per Owner’s Installation Detail AF-064023-01 which is available on the Owner’s Design Guidelines website:
http://www2.mdanderson.org/depts/cpm/standards/details.html

3. Provide grommets in countertops for power and communications cords as required and requested.

4. Provide horizontal cable trays or wireways where required to prevent hazards to user and insure protection of equipment.

5. Plastic laminate with directional patterning or “grain” shall be installed with the pattern/grain in adjacent panels oriented parallel with one another. At exposed shelves, orient the “grain” parallel to the length of shelf. At wall and base cabinets, typically orient the “grain” to run vertically.

6. Coordinate size and location of doors and drawers such that their operation does not interfere with adjacent surfaces or items. Maximum cabinet door width shall be 21”.

7. Provide fillers and closures to eliminate gaps between cabinet units and wall or adjacent cabinets. Joints between cabinets/countertops and the wall shall be sealed. Sealant color shall match either the casework or the wall.

8. Conceal fasteners wherever possible. Cover exposed screw heads with PVC “buttons”.

9. At locking pairs of cabinet doors, provide a lock at each leaf in lieu of one lock with adjacent self–activating latch.

10. Power and telecommunication outlets below countertops: Avoid locating behind base cabinets; Do not locate behind base cabinet units containing drawers or roll-out shelves.

11. Configure casework to maximize storage capacity at inside corners of wall cabinets and base cabinets. This may be accomplished through use of blind corner units, or other standard manufactured units.

12. Furr downs: Owner preference in patient care and administrative areas is for the use of plastic laminate covered cabinetry which extends to the ceiling, in lieu of providing drywall furr downs. Confirm with Owner’s Project Manager if user preference is for full height cabinet doors, or shorter doors with blank cabinet face above. Owner preference in laboratory areas is for the use of furr downs above metal cabinetry unless user or project conditions dictate otherwise. Regardless of its location or use, cabinetry which terminates below the ceiling without a furr down shall extend up no closer than 18” from the ceiling.

13. Wall cabinetry shall provide adequate vertical clearance for anticipated countertop mounted equipment. Confirm equipment for planning purposes with Owner’s Project Manager. Typically provide 26 inches minimum clear to underside of wall cabinet where coffee makers will be present, and 30 inches minimum clear (based on 12 inch deep cabinet) to underside where cabinet is located above a sink.

G. Hardware:

1. Hinges: Concealed, adjustable, 170 degree swing, all metal, self closing; Blum model 100 series.

2. Door and drawer pulls: Wire pulls; Stanley #4483 ½ US32D.

3. Drawer slides: 100 lb. rated, full extension; 45 lb. rated with full extension at pencil drawers; Knape and Vogt Manufacturing Co.

4. Adjustable shelf supports: Drilled holes with removable metal pins.

5. Locks: Best cylinders, 5L series, compatible with Owner’s locking system.

2.02 PATIENT ROOM HEADWALLS

A. Provide full height flush panel, plastic laminate over formaldehyde free product with wood stiffening as required. Provide with provisions for power, light controls, telecommunications, nurse call, and medical gases.

B. Design Requirements:

1. Design headwalls without open spaces or ledges that can accumulate dust or dirt. Details which create infection control issues shall be avoided.

2. Do not locate nurse call outlets directly above power outlets.

3. Provide adequate clearance at medical gas outlets for installation of regulators, canisters, etc.

4. If budget allows, provide balanced medical gas, power, nurse call, switches and other similar devices on either side of the bed.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Coordinate electrical device mounting heights and mounting methods with casework.

B. In addition to incorporating all applicable life safety and building code requirements, include provisions described within this Element in the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	12-04-08	Initial Adoption of Element (information revised, and moved from E2010)	JC
Rev. 1	07-08-10	Revised furr down requirements.	KB
Rev. 2	04-17-12	Revised MDF requirement in 2.01 B; Clarified color and type of sealant to be used in 2.01 E9.; Added sealant, splash, and corner requirements, and updated element reference in 2.01 F2; Clarified grain direction in 2.01 F5; Added furr down requirements in 2.01 F12; Added 2.01 F13.	JC
Rev. 3	06-14-12	Added requirements for SSM countertops with sinks in 2.01F2.	JC
Rev. 4			
Rev. 5			

END OF ELEMENT C1038

C1039 Laboratory Casework and Equipment

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes steel laboratory casework, laboratory fume hoods, and heavy duty equipment racks. For plastic laminate clad casework, refer to Owner's Design Guidelines Element C1038, Casework.

PART 2 - DESIGN CRITERIA

2.01 STEEL LABORATORY CASEWORK

A. Provide painted steel base cabinets and wall cabinets for use at sinks and other applications where heavy duty equipment racks are not used.

B. Typical Countertops: 5/8" thick solid color Trespa TopLab Plus phenolic resin work surface, with backsplash of same material.

C. Typical Island Utility Chase: ½" thick Trespa TopLab Plus phenolic resin panel at four sides in color to match countertop, with internal metal frame support structure.

D. Provide stainless steel casework and/or countertops in selected areas such as surgeries, radioisotope rooms, etc.

E. For casework and equipment racks not located adjacent to a wall, provide utilities by way of shared, ceiling mounted service utility panels. Confirm use of ceiling panels with Owner's Project Manager.

2.02 LABORATORY FUME HOODS

A. Provide by same manufacturer as laboratory casework.

B. Typical Fume Hood: 6 foot wide, restricted bypass type, fixed baffle, split sash, painted steel exterior, Type 304 stainless steel interior and work top, two integral stainless steel cup sink as required, water, gas and electrical service outlets as required, external independent air flow monitor if required. Hoods can be manifolded with general laboratory exhaust system.

C. Radioisotope Hood: 5 foot wide, similar to typical hood, but with single sash, and without cup sinks or water service. Provide dedicated exhaust system which may be manifolded with similar hoods or Class II, Type B2 biological safety cabinets.

D. 8 Foot Fume Hood: Similar to typical fume hood, but with combination vertical/horizontal sliding sash.

E. Provide ventilated acid and flammable storage cabinets under each hood.

2.03 MOBILE CASEWORK AND HEAVY DUTY EQUIPMENT RACKS

A. Mobile casework and equipment racks are typically Owner furnished/Owner installed, and are provided by approved vendors that meet institutional standards.

B. Heavy duty movable laboratory casework and equipment racks shall be provided as a modular dimensioned system of vertical upright support structures and cantilevered support frames.

C. All mobile casework and equipment rack support frame legs shall be equipped with heavy duty leveling swivel casters. Support frames/casters shall include an adjustment mechanism that raises the casters (to prevent unintentional rolling of the unit once the caster is in the raised position) and allows the support frame legs to directly support the casework and be leveled. Each support frame leg shall be provided with a non-skid pad. Neither pads nor wheels shall mar, mark, damage or otherwise deface flooring in any way.

D. Provide with 5/8” thick solid color Trespa TopLab Plus phenolic resin work surface.

E. Heavy duty equipment racks shall be tested and certified to support a minimum live load of 2,600 lbs.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Coordinate electrical device mounting heights and mounting methods with casework.

B. In addition to incorporating all applicable life safety and building code requirements, include provisions described within this Element in the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Interior Finishes Standards. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	12-04-08	Initial Adoption of Element (information revised, and moved from E2010)	JC, KD
Rev. 1	07-08-10	Revised widths of typical and radioisotope fume hoods.	KB
Rev. 2	03-31-11	Added requirements for utility chase, ceiling utility panel, and 8' hoods; revised countertops as well as sash/cup sink at 5' and 6' hoods.	JC

END OF ELEMENT C1039

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes construction of stairs and associated railings.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Stairs shall consist of reinforced concrete filled metal pan treads, steel risers, and structural channel stringers. Intermediate landings shall be of reinforced concrete metal pan construction with steel channel supports suspended from surrounding structure using threaded steel rods.

B. Handrails at both sides of stairs shall be 1-1/4 inch diameter standard weight steel pipe.

C. Handrails shall typically be mounted at 2 ¼” (clear) from wall per Life Safety Code requirements. Exception: Stairs that are required to comply with the Texas Accessibility Standards shall have handrails mounted at 1 ½” (clear) from wall.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. A two-hour fire resistance rated enclosure is required around the stairs. Notes and details shall clearly delineate construction providing this rating as continuous, and without any gaps or interruptions.

C. Contract Documents shall be carefully coordinated to ensure that only those devices and utilities (piping, ducts, etc.) allowed by Code are located within the stair/exit enclosure.

D. If required by Code, per Project requirements, stair enclosures shall be provided with a stair pressurization system. The stair enclosures shall exit directly to the building exterior at the level of exit discharge.

PART 4 - PRODUCTS

4.01 GENERAL

A. For renovation projects, refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Various revisions throughout document eliminating project specific requirements.	JC
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT C2010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes paint, tile, wall coverings, and special finishes.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The following table indicates finishes for various room types within Owner's facilities. Confirm finishes with Owner's Project Manager/Planner Designer. .

Room Type	Wall Finish
Offices, Corridors in Office/Administration Areas, Storage, Work Rooms, Business Centers	Gypsum wallboard with paint, satin finish.
Public Lobbies (Office)	Gypsum wallboard with paint, satin finish.
Mechanical/Electrical Equipment Rooms, Maintenance, Building Services, Security, Telecommunications Rooms	Gypsum wallboard with paint, semi-gloss finish.
Food Preparation	FRP panels. Confirm with Owner's Project Manager/Planner Designer.
Waiting, Public Corridors, Staff Corridors in Clinical areas, Stairs	Gypsum wallboard with paint, satin finish. Confirm with Owner's Project Manager/Planner Designer.
Conference Rooms	Gypsum wallboard with paint, satin finish.
Reception desk/counter areas	Gypsum wallboard with vinyl wall covering.
Nurse Station Corridors	Gypsum wallboard with satin paint and PVC sheets.
Patient Rooms, Nurse Stations, Break Rooms, Locker Rooms, Pharmacy, Family Lounges, Exam Rooms	Gypsum wallboard with paint, satin finish.
Clean Workrooms/Clean Supply, Soiled Workrooms/Soiled Holding, Service Elevator Lobby, Janitor Closets	Gypsum wallboard with epoxy paint and PVC sheets.
Laboratory Spaces, Stairs	Gypsum wallboard with paint, semi-gloss finish. For Stairs, confirm with Owner's Project Manager/Planner Designer
Public Lobbies, Waiting Areas, Elevator Lobbies	Combination of gypsum wallboard with paint, satin finish; vinyl wall covering, stone wainscots and plastic laminate decorative panels. Confirm with Owner's Project Manager/Planner Designer.
Patient Room Toilets/Showers	Moisture resistant gypsum wallboard, tile backer board and polished ceramic tile field; full height on all walls, with one accent color.

Room Type	Wall Finish
	At toilet rooms for radioactive patients, provide a seamless, cleanable wall finish.
Public and Staff Restrooms	Moisture resistant gypsum wallboard with polished ceramic tile and one accent color; full height on walls behind and at sides of water closets, urinals, and wall-hung lavatories. Other walls, semi-gloss paint.
Vivarium and Vivarium Support Functions	Concrete masonry units with water-based epoxy paint, or moisture/impact resistant gypsum board. Confirm with Owner's Project Manager/Planner Designer.
Shell Space	No finish.
Ballrooms	Acoustical wrapped panels and gypsum wallboard with paint, satin finish.
Training Auditoriums	Acoustical wrapped panels and gypsum wallboard with paint, satin finish.
Training Classrooms	Gypsum wallboard with paint, satin finish.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Vapor impervious wall coverings or other such interior finish material shall not be scheduled for use at exterior walls. Avoid unprotected edge terminations of wall covering, particularly at vertical corners. Avoid use of reveals in walls to receive wall covering. Confirm use of fabric and wall coverings at patient care areas. Typically, use of fabric at these areas is to be avoided.

B. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

C. Specify that areas requiring touch up paint shall be indistinguishable, matching exactly the color, sheen and texture of adjacent areas. Labels on rated doors shall not be painted. Painting of mechanical, electrical, and plumbing items shall be limited to exposed natural gas piping (yellow) and exposed fire sprinkler piping (red), as confirmed by Owner's Project Manager.

D. Sealant shall be provided in the joint between wall tile and door frame.

E. Where sealing a joint between two surfaces of different colors, select a sealant that matches one of the surfaces, or provide a paintable sealant that is painted to match one surface.

F. Provide an easily cleanable finish on walls adjacent to casework from which food will be served, such as in typical conference rooms. Avoid use of fabric covered panels at these type locations.

G. Where acoustical wall panels are used, a hard substrate shall be provided below chair rail height. Avoid concave curved surfaces when fabric is to be field-applied.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 2	07-08-10	Revised finish at vivarium and vivarium support functions.	KB
Rev. 3	06-14-12	Revised finish at "Waiting, Public Corridors, Staff Corridors in Clinical areas" to paint in lieu of VWC; Added "Reception desk/counter areas" category and its finish; Revised "Vivarium and Vivarium Support Functions" to add gypsum board; Revised 3.01 A to include additional wall covering requirements; Added 3.01 C, 3.01 D, 3.01 E, and 3.01 F.	JC
Rev. 4	02-26-13	Added 3.01G.	JC
Rev. 5	03-21-13	Added "Stairs" (two locations) in 2.01A	JC

END OF ELEMENT C3010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes carpet, terrazzo, stone, resilient flooring, quarry tile, ceramic tile, concrete, and, hardeners and sealers.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The following table indicates finishes for various room types within Owner's facilities. Confirm finishes with Owner's Project Manager/Planner Designers

Room Type	Floor Finish
Conference Rooms, Corridors, Offices, Waiting Areas, Family Lounges, Break Rooms	Carpet tile. (Provide seamless sheet vinyl flooring adjacent to counters in Break Rooms)
Dining Areas	Confirm with Owner's Project Manager/ Planner Designer.
Public Lobbies	Confirm with Owner's Project Manager /Planner Designer.
Toilet Rooms, Shower Rooms, Patient Toilets/Showers, Public/Staff Toilets	Porcelain ceramic tile with solid surface material door threshold. Refer to Typical Restroom Door Threshold detail located on the Owner's Design Guidelines website. At patient toilets, provide a seamless floor system in toilet rooms for radioactive patients. Provide non-slip flooring at patient shower areas. At Shower Rooms and Patient Toilets/Showers, provide a waterproof membrane under the floor finish in the entire room.
Storage, Building Services, Security, (all at non-patient care areas)	Vinyl composition tile (VCT).
Mechanical/Electrical Equipment Rooms, Shops, Telecommunications Rooms	Sealed concrete. (Antistatic sealer at Telecommunications Rooms)
Food Preparation	Quarry tile.
Nurse Station Corridors, Public Corridors in Clinical Areas	Seamless sheet vinyl flooring with heat welded seams. Accent colors of same seamless sheet vinyl used for wayfinding purposes. Confirm with Owner's Project Manager/ Planner Designer.

Room Type	Floor Finish
Patient Rooms, Nurse Stations, Clean Workrooms/Clean Supply, Soiled Workrooms/Soiled Holding, Clinical Corridors, Isolation Rooms, Procedure Rooms, Pharmacy, Clinical Areas, Operating Rooms, and the following in patient care areas: Storage, Locker Rooms, Staff Corridors, Staff Elevator Lobbies, Service Elevator Lobby, Janitor Closets, Work Rooms	Seamless sheet vinyl flooring with heat welded seams. Confirm with Owner's Project Manager/ Planner Designer
Freight Elevator Lobby, Dock Receiving, Material Movement Corridor	Fluid-applied epoxy resin or sealed concrete.
Laboratories, Lab Support Areas, Tissue Culture Rooms, Dark Rooms, Flex Rooms and Shared Equipment Areas	Seamless sheet vinyl flooring with heat welded seams
Research Laboratory Special Function Rooms (Glasswash, Liquid Nitrogen Storage Rooms)	Fluid applied epoxy resin
Vivarium and Vivarium Support Functions	Fluid applied epoxy resin
Shell Space	No finish
Selected Imaging Equipment Rooms	Raised access flooring vinyl finish.
Stairs (treads, risers, and landings)	Textured rubber flooring

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Where terrazzo is the scheduled finish for an area occupying more than one structural bay, a "sand cushion" terrazzo system with depressed floor slab shall be utilized. Depressed slab and all membranes/materials beneath the terrazzo shall be fully detailed. Confirm use of sand cushion system with Owner's Project Manager.

C. Indicate that flooring materials shall be installed using adhesives/products which are recommended for use by the manufacturer. Require that shop drawing submittals for flooring material include information on the proposed installation product(s) and substantiate that they are as recommended for use by the manufacturer. Indicate that in cases where products differ from those recommended by the manufacturer, the installer/contractor shall bear sole responsibility for any resulting deficiencies.

D. Require that flooring materials be installed as late in the construction schedule as practical, and be protected from damage from construction operations and placement of equipment and fixtures during the remainder of the construction period. Require use of protection methods recommended in writing by manufacturer and installer that ensure the flooring material is without damage or deterioration at time of Substantial Completion.

E. Indicate that immediately prior to Substantial Completion inspections, resilient flooring (sheet vinyl and vinyl composition tile) is to have a floor finish applied and be buffed / burnished as recommended by the manufacturer to a level acceptable to Owner.

F. Schedule walk off carpet in lieu of using recessed mats at building entrances.

G. Select floor joint assemblies that are appropriate for expected traffic.

H. In research laboratories and associated support areas, note that flooring shall be installed under all loose and fixed casework except for units containing permanently connected plumbing fixtures.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 2	07-08-10	Revised finish at Laboratories, and added more types of spaces to the category; Added Research Laboratory Special Function Rooms; Deleted Special Function Room.	KB
Rev. 3	09-16-10	Added 3.01 B.	JRC
Rev. 4	08-02-11	Deleted "Non-static" from the floor finish type for Storage, Building Services, Security and Telecommunications Rooms. Paragraph 2.01 A.	JRC
Rev. 5	11-22-11	Added 3.01 C, D, and E related to installation product approval, protection during construction, and final finish application prior to inspection. Changed finishes for telecom and break rooms.	JRC
Rev. 6	04-17-12	Added Operating Rooms in table; Added 2.01 F and 2.01 G.	JRC
Rev. 7	08-02-12	Revised Table 2.01 A. to differentiate between patient care and non-patient care storage room floor finishes.	JRC
Rev. 8	02-26-13	Added 3.01H.	JRC
Rev. 9	03-21-13	Added “Stairs” in 2.01A	JRC

END OF ELEMENT C3020

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes base finishes for carpet, rubber, terrazzo, stone, and resilient flooring.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The following table indicates finishes for various room types within Owner’s facilities. Confirm finishes with Owner’s Project Manager/Planner Designer.

Room Type	Base Finish
Clinical Areas, Laboratories, Storage Rooms, Break Rooms, Locker Rooms, Waiting Areas, Offices, Conference Rooms, Work Rooms, Public and Staff Corridors, Administrative Suites, Patient Rooms, Nurse Stations, Nurse Station Corridors, Pharmacy, Dining Rooms, Family Lounges, Building Support Areas, Public Elevator Lobbies, Staff Elevator Lobbies, Stairs	4-inch high, coved, 100% vulcanized rubber.
Public Lobbies typical for first floor applications.	4-inch high terrazzo or granite, straight or integral with floor finish. Confirm with Owner’s Project Manager/ Planner Designer
Public Restrooms, Public/Staff Toilet Rooms, Patient Room Toilets/Showers	Polished porcelain ceramic tile, base, coved or straight, on all walls. At toilet rooms for radioactive patients, provide a seamless base integral with floor finish.Patient Showers to be solid surface material or ceramic tile.
Clean Workrooms/Clean Supply, Soiled Workrooms/Soiled Holding, Service Elevator Lobby, Janitor Closets, Operating Rooms	Seamless sheet vinyl integral with floor finish.
Vivarium and Vivarium Support Functions Research Areas: Glasswash, Liquid Nitrogen Storage	Fluid applied epoxy resin integral with floor finish.
Mechanical/Electrical Equipment Rooms, Dock Receiving Areas, Shell Space	No base required.
Food Preparation	Quarry tile
Freight Elevator Lobby	Fluid applied epoxy resin integral with floor finish or 4” high covered rubber

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Where design requires rubber base to wrap 180 degrees around a panel 1 ½” thick or less, specify or detail requirement that straight bottom base be used, and that it be fully adhered tight to substrate.

C. Inside and outside corners of rubber base shall be job formed.

D. Rigid base materials such as stone or wood, when used at curved walls, shall be faceted in lieu of curved.

E. Extent of base at millwork and casework built-ins shall be fully detailed.

F. Where the gap between the floor and underside of shimmed casework, or between end of casework and wall exceeds ½”, provide a galvanized steel backup plate for rubber base. This requirement is especially important at GMP facilities.

G. Where base is integral with flooring, top edge of base trim shall be sealed to wall.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner’s Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner’s Master Construction Specifications and Interior Finishes Standards. These are available on the Owner’s Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 2	07-08-10	Added Research Areas under Vivarium and Vivarium Support Functions.	KB
Rev. 3	04-17-12	Added 3.01 B, 3.01 C, 3.01 D, 3.01 E, 3.01 F, and 3.01 G.	JC
Rev. 4	03-21-13	Added “Stairs” in 2.01A	JC
Rev. 5			

END OF ELEMENT C3025

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes acoustical tiles, gypsum wallboard, plaster, and exposed ceiling finishes.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The following table indicates finishes for various room types within Owner’s facilities. Confirm finishes with Owner’s Project Manager / Planner Designer.

Room Type	Ceiling Finish
Conference Rooms, Dining Areas, Public Lobbies	Combination of 2 x 2 lay-in acoustical tile and suspended gypsum wallboard; painted, flat finish.
Offices, Work Rooms, Staff Corridors, Public Spaces, Clinical Areas, Public and Clinic Restrooms, Storage, Building Services, Shops, Telecommunication MDF Rooms, Service Elevator Lobbies	2 x 2 lay-in acoustical tile.
Mechanical/Electrical Equipment Rooms, Dock Receiving, Security, Telecommunication IDF Rooms	Painted exposed concrete structure, satin finish, no finish at exposed steel/fire-proofing structure.
Patient Bedroom Toilets, Isolation and Procedure Rooms, Clean Workrooms/Clean Supply, Soiled Workrooms/Soiled Holding, Janitor Closets, Shower Rooms	Gypsum wallboard with semi-gloss paint.
Operating Rooms	Gypsum wallboard with epoxy paint.
Pharmacy, Nutrition	2x2 cleanable acoustical tile.
Selected Imaging Rooms	Combination of acoustical tile, 2’X2’ and unistrut metal grid to support overhead equipment
Laboratories	Combination of acoustical tile, 2’X2’ grid and suspended gypsum wallboard; painted, satin finish; to coordinate with ceiling service panel.
Vivarium and Vivarium Support Functions	Suspended gypsum wallboard; painted, water-base epoxy.
Tissue Culture Rooms	Cleanable ceiling tile, 2’x2’ grid
Shell Space	No finish.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Typically, at lay-in ceilings provide a suspended white galvanized exposed tee, intermediate duty system. Provide aluminum grid at areas subject to high humidity or wash-down conditions.

C. Avoid conditions where drywall ceilings/furring intersects lay-in ceilings at the same plane.

D. Detail terminations of partitions at continuous grid ceilings.

E. Where suspended “floating” ceiling elements are used, provide a design which conceals or shields from view all related supports, mechanical items, lighting fixtures, conduit, and piping, etc.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner’s Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner’s Master Construction Specifications and Interior Finishes Standards. These are available on the Owner’s Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Updated room types for 2x2 lay-in acoustical tile; revised finishes at equipment rooms, dock, etc.	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, JC, DB
Rev. 3	07-08-10	Revised Laboratory finishes.	KB
Rev. 4	04-17-12	Added Operating Rooms to table; Added 3.01 B, 3.01 C, 3.01 D, and 3.01 E	JC
Rev. 5	10-30-12	Revised Service Elevator Lobbies finish to be 2x2 lay-in acoustical tile. Article 2.01 A.	JC
Rev. 6	01-31-13	Clarified ceiling finish for toilet rooms. Article 2.01 A.	JC

END OF ELEMENT C3030

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes passenger elevators and service elevators. Please note that Owner’s elevator types are the following three categories: Public, Staff and Freight. For details of each cab type, refer to Owner’s Elevator Cab Finishes Standards. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. All elevators shall be traction or hydraulic type, depending on facility requirements.

B. All traction elevators with speeds greater than or equal to 400 fpm shall be gearless traction elevators. If traction elevators serve 8 stops or fewer and are slower than 400 fpm, geared traction elevators are acceptable.

C. Machine room-less elevators are not an acceptable substitute for traction elevators.

D. All guide rails (car and counterweight) for traction and hydraulic elevators shall be machined or planed.

E. Door operator systems shall be closed loop.

F. All elevators shall have stainless steel doors and frames. Doors shall have Warnock/Hersey Label.

G. All hoist ropes shall be steel.

H. All elevators shall have cab control panels on each side of door.

I. Provide two (2) coax cables with the traveling cable.

J. Provide necessary conductors to accommodate in-cab card readers. Coordinate requirements with the security contractor.

K. Blocking shall be provided for cameras to be corner-mounted in each car. Provide one (1) GFI outlet on top of the car for the camera; coordinate location with Owner and with elevator supplier.

L. All elevator indicator illumination / signalization shall be LED type.

M. Hall lanterns shall illuminate green for up and red for down. Hall audibles shall be chime type.

N. All car subfloors shall be marine grade plywood. Confirm finishes with the Owner’s Project Manager/Planner Designer.

O. All cars shall have the capability to be monitored from a remote location via modem line.

P. Public, Staff and Freight elevator cab finishes shall be per Owner's Elevator Cab Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html. Confirm all finishes and lighting with the Owner's Project Manager/ Planner Designer.

Q. All finishes in elevator cabs serving parking garages shall be a durable vandal-resistant design.

R. All Braille pieces shall be mechanically fastened.

S. All instructions shall be engraved.

T. No manufacturer's logos shall be present in the elevator.

U. Hydraulic elevators shall be equipped with viscosity control and oil coolers.

V. Owner preference is for use of guide rails that span floor-to-floor without intermediate supports. If intermediate brackets and related support structure must be provided, the elevator shaft and surrounding wall shall be designed and sized to allow continuation of the fire resistance rated shaft wall construction without interruption by support structure.

W. Elevator speed, capacity, cab size, etc, shall be industry standard. Any custom variations must be approved in writing by MD Anderson Administrative Facilities and Campus Operations department (AFCO).

X. The number of stops for each elevator in a bank shall be consistent. No single unit shall serve more stops than the balance of units. Any variations must be approved in writing by AFCO.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Perform an elevator study to confirm quantity, capacity, size, and speed of elevators. Provide a copy of the elevator study to the Campus Operations Representative.

C. Refer to MD Anderson Main Campus Elevator Standards as applicable to the Project, to be confirmed with the A/E.

D. Cab lighting shall comply with requirements of Master Construction Specifications and ANSI/ASHRAE/IESNA 90.1.

E. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Warranty shall include a 12-month parts and 3-month continued, full maintenance warranty.

B. New spare parts to be available for a minimum of ten (10) years after installation.

C. MD Anderson to be provided any proprietary tools, manuals, adjuster manuals, part lists, software/hardware updates for the life of the equipment at no additional cost.

D. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Part 2: Revised Design Criteria on elevator speeds; Added notes S through V.	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, SH, DB
Rev. 3	07-08-10	Added paragraph 2.01 V.	JC
Rev. 4	02-03-11	Added notes W and X to Section 2.01.	RB
Rev. 5			

END OF ELEMENT D1010

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes escalators.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Project may include escalators from Level 1 to Levels 2 and/or 3, or as indicated in the Project Summary.

B. If included, escalators shall be a width that balances volume with the potential for falls. The consultant shall discuss these issues with the Project Team.

C. Escalator handrails and steps shall be black..

D. The Owner’s preference is to have stainless steel side panels at patient care areas (building) and glass side panels at business/administration areas (building).

E. Escalator speed shall not exceed 90 fpm.

F. Escalator landings shall have three (3) step landing system.

G. Escalator turn back to next level to be an immediate turn at each level, wherever possible.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Obtain approval from Owner’s Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. For renovation projects, refer to Owner’s Master Construction Specifications and Interior Finishes Standards. These are available on the Owner’s Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Part 2, Design Criteria: Added notes C, D, and E.	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, SH, DB
Rev. 3	03-10-09	Deleted 40" width and glass side panel requirements, paragraph 2.01 B.; Changed step finish to be black instead of stainless steel, paragraph 2.01 C.; Clarified side panel materials to be installed within patient care and business/admin areas, paragraph 2.01 D.	SH, DB, RB
Rev. 4			
Rev. 5			

END OF ELEMENT D1020

PART 1 - GENERAL

1.01 OVERVIEW

A. Plumbing systems design shall be performed by individual(s) certified in Plumbing Engineering /Design (C.I.P.E or C.P.D.) by the American Society of Plumbing Engineers or by a Texas licensed professional engineer having minimum five years experience designing the types of plumbing systems included within this Project.

B. Where it is considered by the A/E that proposed systems design cannot comply with the requirements stated and referenced herein, the A/E shall communicate such concerns to the Owner's Project Manager in writing and resolve non-compliance in sufficient time during the design phase of the Project to meet contract schedule obligations.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Where provisions for future equipment, fixtures or building expansion are required, systems equipment capacity, pipe sizing and arrangement shall accommodate proposed demand.

B. When developing floor plans, the A/E shall coordinate location of plumbing fixtures with the lower floor levels to avoid the need to route drainage, waste or sanitary vent piping within the ceilings of or exposed above sensitive equipment or areas where water leakage could cause contamination or major property loss. Refer to Element Z2050 for additional related requirements.

2.02 CODES AND REGULATIONS

A. The A/E is required to make themselves aware of all applicable codes and ordinances and assure compliance thereto.

B. Refer to Element Z2005 for referenced Codes and Applicable Regulatory Agencies.

C. NOTE: MD Anderson Cancer Center takes various exceptions to the International Plumbing Code and has adopted the more stringent requirements within the Uniform Plumbing Code. These exceptions are addressed within MD Anderson Cancer Center Master Construction Specifications and these Elements. The A/E shall include these exceptions within the Contract Drawings.

2.03 RENOVATION WORK

A. Where permanently disconnecting domestic water, medical vacuum, medical gas, natural gas, treated water, drainage, vent, or other piping serving demolished fixtures, inlets, outlets or equipment, remove all associated piping back to remaining active mains.

B. All existing floor drains that will not remain in service after Project completion shall be isolated from the remaining active building drainage and vent system. Floor drain bodies remaining within slabs shall be sealed watertight. Slab shall be finished to allow specified application of flooring or to match surface of the adjacent finished area. Completed patching of the slab shall prevent the passage of water and provide a structural integrity and fire rating equal to or greater than the existing slab. Remove all associated piping serving decommissioned floor drains located in suspended slabs back to remaining active mains.

C. All existing supports serving demolished piping and equipment shall be removed.

D. Portions of the existing medical vacuum and gas systems affected by work within this Project shall be re-certified in strict accordance with NFPA 99.

E. Design of new domestic hot water distribution piping system shall provide circulation within all portions of the system to within ten feet of each outlet. Rework existing system piping as required to facilitate this requirement.

2.04 WALL AND FLOOR PENETRATIONS

A. All new and existing penetrations through rated partitions and floor slabs within the project boundary shall be sealed to provide a fire/smoke rating equal to or greater than the rating of the floor slab.

B. All new and existing penetrations through floor slabs within the project boundary shall be sealed watertight.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Include provisions within Contract Documents addressing all applicable requirements within these Elements to insure they are included in the Project scope.

B. Room names and numbers, and column lines and designations shall appear on all plumbing underground, floor and partial floor plans as they appear on Architectural sheets.

C. Plumbing floor and partial plans shall include finished floor elevations, graphic scales, north arrows and key plan.

D. Floor plans shall show piping, valves, fixtures, equipment, etc. on the floor that they are to be installed. Where piping systems are to be installed below slab on grade, these shall be shown on a separate underground plan.

E. A separate plumbing roof plan shall be included for projects having components located on, in or penetrating through roofs, such as roof drains, sanitary vents, etc.

F. Be specific and precisely show all points of connection and flow rates for utilities. Inverts, when applicable, shall be determined and indicated.

G. Project specific characteristics (capacities, electrical requirements, model numbers, etc.) for equipment shall be shown in schedules on the drawings. Information indicated within drawing schedules shall not conflict with information included within specifications.

H. Information specified within the Project Manual (piping materials, support spacing, insulation thickness, etc.) shall be not be addressed on drawings.

I. Include legend on drawings identifying applicable symbols and abbreviations.

J. Plumbing plans shall clearly indicate location and ratings of all fire and smoke walls.

K. Coordinate with the Project Architect and identify all locations where plumbing components may jeopardize the integrity of partition and floor ratings. Indicate these locations on drawings and provide detailed directions to the Contractor for insuring that all required partition and floor ratings are maintained.

L. Refer to individual Element sections for additional document requirements applicable to the various systems.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-08-11	3.01 K. – Added requirement for coordinating with Architect and identifying components located within rated partitions and floors.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2000

D200002 Parking Garage Plumbing Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements all plumbing related Owner's Design Guideline Element Sections with additional specific criteria for projects involving design of Open Parking Garage Plumbing Systems within and to five feet beyond the building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Open parking garage plumbing systems shall include but not be limited to the following:

1. Domestic Cold Water, Trap Fill Water, Domestic Hot Water
2. Sanitary Waste and Vent
3. Storm Drainage
4. Sub Soil Drainage (As determined by site soils report and Structural Engineer’s recommendations)

B. The A/E shall verify and determine all plumbing services required by the various fixtures and equipment being installed and design systems accordingly. These determinations shall include but not be limited to water temperature, water pressure, water flow, drainage quality and drainage flow.

C. Where provisions for future equipment, fixtures or building expansion are required, systems equipment capacity, pipe sizing and arrangement shall accommodate proposed demand.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Refer to other D2000 series Elements applicable to the Project for information required to be included within the plumbing Contract Documents.

B. Column lines and designations shall appear on all plumbing underground, floor and partial floor plans as they appear on Architectural sheets.

C. Plumbing floor and partial plans shall include finished floor elevations, graphic scales, north arrows and key plan.

D. Floor plans shall show piping, valves, fixtures, equipment, etc. on the floor that they are to be installed. Where piping systems are to be installed below slab on grade, these shall be shown on a separate underground plan.

E. Be specific and precisely show all points of connection and flow rates for utilities. Inverts, when applicable, shall be determined and indicated.

F. Performance data schedules for all equipment shall be shown in schedules on the Drawings.

G. Include legend on Drawings identifying applicable symbols and abbreviations.

H. All equipment and material specifications shall be bound in the Specifications.

I. Plumbing plans shall clearly indicate location and ratings of all fire and smoke walls.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D200002

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses plumbing fixtures, trim and associated accessories. Refer to MD Anderson Cancer Center Master Construction Specification Sections for additional requirements.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Final selection of plumbing fixtures and trim shall be determined by close coordination with MD Anderson Cancer Center user groups and the Owner's Project Manager to determine functionality requirements for selection of appropriate fixture and trim types. Requirements may vary from facility to facility and even from department to department.

B. A/E shall modify MD Anderson Cancer Center Master Construction Specifications as required to ensure conformity between Drawing schedules and Specifications.

C. Quantities of plumbing fixtures shall be determined by compliance with the International Building Code requirements for minimum number of facilities. Consult with MDACC users to determine additional fixtures required for particular department needs. Provide fixtures as required by Title 25, Texas Administrative Code, Chapter 133, Hospital Licensing within all patient care areas.

D. Coordinate location of all plumbing fixtures with structural members, windows, lower-floor ceilings or other building components that may interfere with the installation of code compliant piping. This task shall be accomplished during the schematic design phase of the Project.

E. Coordinate location of plumbing fixtures on upper levels with spaces below to avoid areas where water leakage would cause major property loss or contamination, including but not limited to computer data centers, MRI rooms, food preparation, food storage, food serving, critical patient care areas, etc. This task shall be accomplished during the schematic design phase of the Project. Refer to Design Guideline Element Z2050 for additional related requirements.

F. Do not locate plumbing fixtures above electrical or telecommunications rooms.

G. Fixtures shall be mounted at heights recommended by the manufacturer, as required by accessibility standards, and as required by MD Anderson Cancer Center Users.

H. Coordinate sink/lavatory types and sizes with other toilet accessories and casework details to insure proper installation of fixtures.

I. When developing floor plans, the A/E shall coordinate location of plumbing fixtures with lower floor levels to avoid the need to route drainage, waste or sanitary vent piping within the ceilings of or exposed above sensitive equipment or areas where water leakage could cause contamination or major property loss. Refer to Element Z2050 for additional related requirements.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All plumbing fixtures and trim shall be scheduled on the Contract Drawings indicating manufacturer's model numbers and sufficient additional information to allow cross referencing to other acceptable manufacturer's products. Fixtures scheduled on Drawings shall not conflict with specification requirements.

B. Include a fixture rough in schedule on the Contract Drawings identifying minimum service pipe sizes required by code and as recommended by the manufacturer for all fixtures and trim to be installed within the Project.

C. Include schedules and/or detail elevations on Contract Drawings identifying required mounting heights for all fixtures and trim to be installed within the Project.

D. Detail shower floor liner installation on Contract Drawings.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Fixtures and trim specified for renovation of existing facilities shall match existing installation where possible.

C. Fixtures, trim and accessories shall be new institutional/commercial grade quality.

D. Fixtures, trim and accessories of any one type shall be by the same manufacturer.

E. Vitreous china plumbing fixtures shall be white in color with chrome-plated fixture trim and accessories.

F. Wall mounted fixtures shall be supported with commercial carriers, bolted to the floor. Fixture weight shall not be transmitted to walls or partitions.

G. Fixtures exposed to the public shall be provided with vandal resistant trim.

4.02 ELECTRONIC SENSOR ACTIVATED FIXTURE TRIM

A. Electronic faucet and flush valve sensors may be provided with AC or DC power. Selection of power type shall be determined for each project during the Schematic Design Phase and must be approved in writing by the Owner's Project Manager.

B. AC powered Electronic faucet and flush valve sensors located within Patient Care areas and critical Research areas shall be connected to the emergency electrical system.

C. All electronic flush valve sensors shall be provided with a manual override button except when located within specimen collecting toilet rooms.

4.03 LAVATORIES AND SINKS

A. Stainless steel sinks shall be 18 gauge Type 304 stainless steel with insulation undercoating. Fixture trim and accessories shall be heavily chrome-plated.

B. Provide faucets with laminar flow outlets. Aerators will not be acceptable.

C. All lavatories and sinks within patient care areas shall be provided with a spout having outlet a minimum of five inches above the flood level rim of the fixture. EXCEPTION: All lavatory faucets within public toilets shall have low-profile (non-gooseneck) spouts.

D. Lavatories shall be provided with grid strainer drain. Drain stoppers or mechanical (pop-up) waste fittings will not be acceptable.

E. All sinks primarily used for hand washing shall be provided with grid strainer drain. Drain stoppers or crumb-cup strainers will not be acceptable.

F. Lavatories located in public and staff washrooms shall be provide with electronic sensor activated faucets.

G. Lavatories faucets located in specimen collecting toilet rooms shall be provided with AC powered electronic sensors. The electrical power shall be controlled by a wall switch located outside of the toilet room to allow nursing staff to prevent use of faucet during collection of specimen. Coordinate with Owner's staff for exact location of wall switch.

H. Sinks and lavatories primarily used for hand washing in nurse stations, examination and treatment rooms shall be provided with electronic sensor activated faucets.

I. Sinks and lavatories used for procedural hand/arm scrubbing shall be trimmed with foot, knee or electronic sensor controls.

J. Each lab room shall be provided with at least one hand washing sink having electronic sensor activated faucet and hot and cold water.

K. Sinks located in BL-2 or higher tissue culture rooms shall be provided with foot pedal or electronic sensor activated faucets.

L. Faucets used by medical and nursing staff for cleanup or general use shall be trimmed with valves that can be manually operated without the use of hands. Wrist blade handles are acceptable for this purpose and shall be four inches in length, (including, nurse lounge, nourishment station, soiled utility, clean utility, film processing, etc.).

M. Lavatories located in patient room toilets shall be provided with manually operated four-inch wrist blade handles and gooseneck spouts.

N. Clinical sinks used for bedpan cleansing shall be provided with manually operated faucets having six-inch elbow blade handles and manually operated flush valves having integral bedpan washer.

O. Lab sinks used for general research shall be provided with manually operated faucets served with hot and cold water.

P. Housekeeping mop sink faucets shall not be provided with mixing faucets. . Three hose bibs supplied by a cold water service that is protected by a reduced pressure backflow preventer shall be provided as illustrated by MD Anderson Installation Detail PL-224000-01.

4.04 WATER CLOSETS

A. Toilets shall be wall mounted vitreous china with elongated bowl, siphon jet flushing action and one and one half inch top inlet spud.

B. Toilet bowls within patient rooms shall be provided with integral bedpan lugs.

C. Seats shall have open front and stainless steel self-sustaining check hinges.

D. Flush valves shall be chrome plated brass exposed type. Flush valves shall be manually or electronic sensor operated except in patient room toilets. Flush valves in patient room toilets shall be manually operated.

E. Flush valves in non-ambulatory patient toilet rooms shall be manually operated and have integral bedpan washer.

F. Coordinate flush valve height with grab bar locations to avoid interference.

G. Flush valves located in specimen collecting toilet rooms shall be provided with AC powered electronic sensors. The electrical power shall be controlled by a wall switch located outside of the toilet room to allow nursing staff to prevent use of faucet during collection of specimen. Coordinate with Owner's staff for exact location of wall switch.

4.05 URINALS

A. Urinals shall be wall mounted vitreous china with elongated bowl (14 inch minimum), washout flushing action and ¾ inch top inlet spud.

B. Urinal flush valves shall be electronic sensor operated, chrome plated brass exposed type.

4.06 BATHING SHOWERS AND BATHTUBS

A. Shower and bathtub mixing valves shall be combination thermostatic and pressure-balancing type with water temperature limit stops set at 110 degrees F. Mixing valves shall have integral check stops accessible for servicing.

B. Non-monolithic shower floors shall be provided with code compliant drain pan attached to floor drain in accordance with the latest edition of the Uniform Plumbing Code.

C. Shower finished floor and bathtub bottom shall be slip resistant.

D. Bathtubs shall be enameled cast iron or high strength composite material with porcelain finish. Enameled steel bathtubs are not acceptable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-18-07	Changed urinal flushing action from siphon jet to washout. (4.05, A.)	DOS
Rev. 2	07-31-08	Deleted reference to quiet action diaphragm and filtered bypass type flush valve (4.04, D. & 4.05, B.); Added word “non-ambulatory” (4.04, E.).	DOS
Rev. 3	07-08-10	4.03 P. ; Added requirement that housekeeping mop sinks shall be provided with RPZ backflow preventer protected hose bibs in lieu of the "standard" mixing faucet.	DOS
Rev. 4	06-05-14	Added requirement that hot and cold water be provided for laboratory sink faucets. Paragraph 4.03 O.	DOS
Rev. 5			

END OF ELEMENT D2010

D201001 Emergency Shower and Eye Wash Equipment

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses emergency shower and eye wash equipment and associated accessories. Refer to Owner's Master Construction Specification Sections for additional requirements.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Where the eyes or body of any person may be exposed to injurious corrosive or infectious materials, suitable fixed facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

B. Emergency shower and eyewash equipment design, installation and location shall meet current ANSI Z358.1, NFPA 99 -11.6 and OSHA 29 CFR 1910.151 standards and deliver clean water to users.

C. Emergency equipment location shall be based on the estimated time of travel for a person with compromised vision. Safety drenching equipment shall be located in accessible locations on the same level as the hazard and the path of travel shall be free of obstructions that may inhibit the immediate use of the equipment. A door is considered to be an obstruction. If the hazard is not a corrosive, one intervening door can be present between hazard and emergency equipment so long as:

1. The door opens in the same direction of travel as the person attempting to reach the emergency equipment.
2. The door is equipped with a closing mechanism that cannot be locked to impede access to the emergency equipment.

D. Emergency equipment shall be located within 10 seconds travel distance and not more than 75 feet of where toxic chemicals or infectious materials are used. For strong acids or caustics, the unit shall be located immediately adjacent to the hazard but far enough away from the hazard so that additional exposure to the hazard or exposure does not occur. The A/E shall utilize Material Safety Data Sheets in determining hazard of chemicals or materials.

E. Coordinate location of all safety drenching equipment with structural members, walls, doors, windows, ceilings or other building components that may interfere with the installation. This task shall be accomplished during the schematic design phase of the Project.

F. Coordinate location of safety drenching equipment on upper levels with spaces below to avoid areas where water leakage would cause major property loss or contamination, including but not limited to computer data centers, MRI rooms, electrical rooms, telecommunications rooms, food preparation, food storage, food serving, critical patient care areas, etc. This task shall be accomplished during the schematic design phase of the Project. The A/E shall insure that all holes in floor slabs are sealed to prevent water from flowing to lower floors due to discharge of emergency equipment.

G. Safety drenching equipment shall not be located within eighteen inches of electrical apparatus, telephones, thermostats, or power outlets.

H. Emergency shower heads shall be positioned 82 inches to 96 inches from the floor and shall have a spray pattern of a minimum diameter of 20 inches at 60 inches above the floor. The center of the spray pattern shall be located at least 16 inches from wall or nearest obstruction.

I. Emergency eyewash nozzles shall be positioned 33 inches to 45 inches from the floor and at least 6 inches from the wall or nearest obstruction.

J. The emergency equipment location must provide a level surface area for user.

K. A hand held drench hose or personal eyewash station may be installed in laboratory or shop areas as a supplement, not a substitute, for eyewash devices.

L. The water temperature in emergency eye wash and shower equipment shall be “tepid.” “Tepid water” is defined as water with a temperature between 60 degrees F and 100 degrees F. In circumstances where chemical reaction is accelerated by flushing fluid temperature, the A/E shall consult with the Owner’s EH&S Department to determine the optimum temperature for each application.

M. Safety drenching equipment shall be identified with a highly visible sign and area lighting shall be adequate to facilitate use.

N. Combination showers with eye and eye/face wash shall be connected to a potable water system capable of supplying adequate flushing fluid to meet the requirements of each component when all components are operated simultaneously. Combination units shall be positioned so they can be used simultaneously by the user under the shower.

O. Provide and accessible ball type shutoff valve in individual water supply line serving safety drenching equipment. Valves shall be labeled for identification and locked in the open position.

P. Provide Code compliant drainage to evacuate water during emergency equipment usage and testing.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All emergency shower and eyewash equipment and trim shall be scheduled on Contract Drawings indicating manufacturer’s model numbers and sufficient additional information to allow cross referencing to other acceptable manufacturer’s products.

B. Modify Owner's Master Construction Specifications as required to ensure conformity between drawing schedules and specifications.

C. Include a fixture rough in schedule on Contract Drawings identifying minimum service pipe sizes required by code and as recommended by the manufacturer for all fixtures and trim to be installed within the Project.

D. Include schedules and/or detail elevations on Contract Drawings identifying required mounting heights for all fixtures and trim to be installed within the Project.

E. Clearly designate on Contract Drawings that a four square feet area under emergency showers be identified with, “Keep area clear” for the use of the emergency shower. Identification shall utilize a distinctive pattern and color to facilitate promoting a clear path of access.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Final selection of emergency equipment and trim shall be determined by close coordination with Owner's EH&S representative and Project Manager to determine functionality and aesthetic requirements for selection of appropriate equipment types. Requirements may vary from facility to facility and even from department to department.

C. Emergency shower and eyewash equipment, trim and accessories of any one type shall be by the same manufacturer.

D. All emergency equipment shall meet American with Disabilities Act (ADA) accessibility requirements for activation of controls and height of eye/face outlets with the following exceptions:

1. Equipment within boiler rooms or central plants.

2. Eye/face outlets located in countertops that are not required to be accessible.

E. Emergency equipment activation devices shall be designed so that the flushing water remains on without requiring the use of the operator's hands. The valve shall be designed to remain activated until intentionally shut off.

F. Shower head flow rate shall be 20 gallons per minute at a minimum 30 pounds per square inch water pressure.

G. Eye Wash unit shall provide flushing fluid at 0.4 gallons per minute at a minimum 30 pounds per square inch water pressure.

H. Face Wash unit shall provide flushing fluid at 3 gallons per minute at a minimum 30 pounds per square inch water pressure.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	04-11-13	Added drainage requirement for emergency equipment. Paragraph 2.01 P.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D201001

D201002 Plumbing Fixtures for Open Parking Garages

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses plumbing fixtures, trim and associated accessories within open parking garages.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Final selection of plumbing fixtures and trim shall be determined by close coordination with Owner's user groups and Project Manager to determine functionality requirements for selection of appropriate fixture and trim types.

B. Modify Owner's Master Construction Specifications as required to ensure conformity between Drawing schedules and Specifications.

C. Quantities of plumbing fixtures shall be determined by compliance with the International Plumbing Code requirements for minimum number of facilities. Consult with Owner's users to determine additional fixtures required for particular department needs.

D. Coordinate location of all plumbing fixtures with structural members, vehicular and pedestrian traffic, and other garage building components that may interfere with the installation of code compliant piping. This task shall be accomplished during the schematic design phase of the Project.

E. Coordinate location of plumbing fixtures on above grade levels with spaces below to avoid areas where water leakage would cause a safety hazard or property loss, including but not limited to equipment, pedestrian walkways, vehicle parking, etc. This task shall be accomplished during the schematic design phase of the Project.

F. Do not locate plumbing fixtures above electrical or telecommunications rooms.

G. Fixtures shall be mounted at heights recommended by the manufacturer, as required by accessibility standards.

H. Coordinate sink/lavatory sizes and casework details to insure proper installation of fixtures.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All plumbing fixtures and trim shall be scheduled on Contract Drawings indicating manufacturer's model numbers and sufficient additional information to allow cross referencing to other acceptable manufacturer's products.

B. Include a fixture rough in schedule on Contract Drawings identifying minimum service pipe sizes required by code and as recommended by the manufacturer for all fixtures and trim to be installed within the Project.

C. Include schedules and/or detail elevations on Contract Drawings identifying required mounting heights for all fixtures and trim to be installed within the Project.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Fixtures, trim and accessories shall be new commercial grade quality.

C. Fixtures, trim and accessories of any one type shall be by the same manufacturer.

D. Vitreous china plumbing fixtures shall be white in color with chrome-plated fixture trim and accessories.

E. Wall mounted fixtures shall be supported with commercial carriers, bolted to the floor. Fixture weight shall not be transmitted to walls or partitions.

F. Fixtures shall be provided with vandal resistant trim.

G. Lavatories and Sinks:

1. Lavatories shall be provided with integral front overflow.

2. Provide faucets with laminar flow outlets. Aerators will not be acceptable.

3. Lavatories shall be provided with grid strainer drain. Drain stoppers or mechanical (pop-up) waste fittings will not be acceptable.

4. Lavatory faucets shall be provided with manually operated ADA compliant handles.

5. Janitor's sinks shall be floor mounted type and be monolithically constructed of terrazzo or stone. Coordinate with Owner for preferred size of sink. Mop sinks shall be provided

with integral stainless steel drain having 3 inch inside diameter pipe connection, stainless steel bumper guards, hose and hose hanger and mop hanger.

6. Janitor's sink faucets shall be provided with manually operated four-inch wrist blade handles, integral stops, vacuum breaker, wall brace and ¾ inch hose thread spout outlet.

H. Water Closets

1. Toilets shall be vitreous china floor mounted flush tank type with elongated bowl.

2. Seats shall have open front and stainless steel self-sustaining check hinges.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D201002

Element D Services

Plumbing — D2020 Domestic Water Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses domestic cold, hot and hot water return distribution systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Domestic water shall be provided for all plumbing fixtures, food service fixtures and equipment, and all other systems, equipment, and devices that require domestic water supply.

B. Building domestic water distribution systems shall be metered and isolated from the municipal water supply in accordance with the municipality's requirements.

C. The design of building supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand. Piping shall be sized at a velocity not exceeding six feet per second (fps) for cold and hot water and four fps for hot water return.

D. Main distribution piping risers shall utilize chases within the building footprint for vertical routing to multiple floor levels where possible. Accessible shut-off valves shall be provided at the base of each riser and at each branch connection to risers.

E. Do not locate water piping within stairways, electrical or telecommunications rooms.

F. Interior cold water piping shall be insulated to prevent condensation. Interior hot water piping shall be insulated as required by code and per latest ASHRAE Standard A90.1 Table 6.8.3.

G. Provide water softener systems to reduce hardness as required to supply food service equipment, water heating equipment, pure water production equipment, and other systems, fixtures and equipment which hard water may adversely affect operation or longevity. Water with a hardness of more than two grains per gallon shall not be delivered to equipment requiring softened water.

H. Provide freeze-proof wall hydrants on exterior walls a maximum of 150 feet apart, at loading docks, near building entrances, at mechanical yard and within 50 feet of exterior grease interceptors. Hydrants should be located at approximately 18 inches above finished grade. Coordinate the location of all wall hydrants with the architectural features of the building and obtain approval of locations from the Project Architect.

I. Provide freeze-proof wall hydrant on at least one exterior wall of each roof penthouse. Coordinate with Owner to verify location of additional hose bibs that may be required to provide a water source for each 10,000 square feet of roof area to accommodate maintenance efforts.

J. Provide a hose bibb with backflow preventer and a minimum of one floor drain in each mechanical room.

K. Provide manufactured water hammer arrestors in water supply lines in accordance with Standard PDI-WH201.

L. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

M. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the domestic water distribution system and connected components. Locations shall include but not be limited to the following; at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, at each battery of fixtures, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

N. Accessible capped valves shall be provided where required for future connections.

O. All valves shall be accessible for operation and servicing. Provide access panels for all concealed valves. Coordinate the location of access panels with the architectural features of the building and obtain approval of locations from the Project Architect.

P. Trap Priming devices that rely upon line pressure differential for activation are not allowed. Each electronic trap primer device shall be provided with a readily serviceable strainer immediately upstream of the device solenoid valve.

2.02 SYSTEM PRESSURES

A. Lower building levels may utilize municipal water system to a height allowed by verified available minimum pressure but shall not serve areas exceeding thirty feet above street grade elevation.

B. Static pressure at plumbing fixtures shall be limited to 55 psig (preferred), 80 psig (maximum), on each floor level by accessible pressure regulating valves. Provide additional pressure regulating valves as required for proper operation of individual equipment.

C. Pressure reducing valves shall be duplexed full-size where located within domestic water lines serving in-patient areas, critical research areas, and/or any area or equipment where un-interruptible (24 hour) water service is required.

D. Provide isolation valve, strainer and pressure gauge immediately upstream of each pressure regulating valve. Provide pressure gauge and isolation valve immediately downstream of each pressure regulating valve.

E. Design of pressure regulating assemblies shall incorporate prevention of over pressurization of downstream piping in the event of valve malfunction. Utilize pressure relief valves only where maximum flow discharge can be evacuated without causing water damage. Automatic solenoid shut-off valves may be provided in lieu of relief valves where approved by Owner.

Automatic shut-off valves shall be connected to the building automation system to annunciate activation.

2.03 PRESSURE BOOSTING SYSTEMS

A. Where municipal system pressure is inadequate, a packaged domestic water booster pump system shall elevate the incoming water pressure as required to serve fixtures and equipment. Selection of pumping system type shall be based upon flow and pressure demand, efficiency of operation, life expectancy and maintenance requirements of the equipment.

B. Specify variable frequency drives for booster pump systems requiring five horsepower and greater motors and when considered applicable by the A/E and approved by Owner.

C. Specify constant speed pressure regulated type booster systems when required pump motors are less than five horsepower and when considered applicable by the A/E and approved by Owner.

D. Booster pump systems shall be designed to deliver calculated peak flow at required pressure with one pump out of service.

E. Connect booster pump system to emergency power source.

   1. Exceptions: Office buildings or where the Owner does not consider this a requirement.

F. Booster pumps installed within the City of Houston shall draw water from a domestic break tank provided in accordance with City of Houston requirements.

   1. Domestic tank may be combined with fire pump water storage if deemed practical.

   2. The domestic surge tank coating shall be NSF approved for potable water and sized based upon available incoming water flow rate and pump demand. Domestic water storage shall not be less than twelve hundred gallons and divided into two compartments to prevent disruption of service during maintenance on fill valves, tank coatings, etc.

   3. Electrical power serving tank level control and monitoring shall be from emergency source.

   4. Provide block valves on domestic tank fill lines when tank overflows cannot discharge by gravity onto grade through an exterior wall. Block valves should be normally open and close when energized by tank high water level switch. Electrical power serving tank level control and monitoring shall be from emergency source.

   5. Provide two fill valves for each water storage compartment. Provide individual manual shutoff valves to isolate each fill valve for servicing.

   6. Provide full line size valved bypass around block and fill valves for each tank compartment to allow manual filling.

   7. Provide valves with blind flanges for future temporary bypass around break tank to accommodate tank servicing.

a. Provide one valve with blind flange on domestic tank fill line upstream of fill valve isolation valve. Valve shall be same size as the domestic water booster pump suction connection.

b. Provide one valve with blind flange on booster pump suction pipe. Valve shall be same size as the domestic water booster pump suction connection. Locate valve the proper distance from pump suction connection to allow proper operation of pump.

2.04 DOMESTIC HOT WATER SYSTEMS

A. Domestic hot water systems shall be designed to reasonably assure an expeditious flow of hot water at all outlets. Provide pumped circulating systems where required. Electric heat maintenance cable may be utilized only when considered applicable by the A/E and approved by Owner.

1. Size hot water return lines by the heat loss method as outlined in the ASHRAE Guide and Data Book, not to exceed 10 degrees F. heat loss. Developed length of branch piping from fixture outlet to circulated mains shall not exceed 20 feet (Refer to Exceptions in the following sub-paragraphs):

a. Hot water piping serving public lavatory faucets shall be circulated to within eighteen inches of the fixture hot water supply stop.

b. A single point-of-use instantaneous electric water heater shall serve no more than three lavatory faucets. The length of hot water piping from the heater to each faucet stop shall not exceed thirty-six inches (36”).

B. Water heaters installed and utilized for food service areas shall comply with National Sanitation Foundation (NSF) Standard Number 5 and be separate from water heating equipment and piping serving other areas of the building. Hot water serving food service commercial dishwasher and pot sink shall be 140 degrees F. All other hot water shall be 110 degrees F maximum at outlets.

C. Hot water heating equipment serving areas other than food service may be generated by centralized heaters or point-of-use heaters as determined by economics, space requirements and good engineering practices. All hot water shall be 110 degrees F. maximum at plumbing fixture outlets.

1. Separate water heating equipment should be considered to serve equipment and/or processes that require water temperatures that exceed 110 degrees F.

2. Separate water heating equipment and circulation pumps shall be provided for each pressure zone within a high-rise building. A/E may recommend and submit alternative designs for Owner approval provided that the design insures total circulation of the distribution system.

D. Where centralized heaters are provided, utilize semi-instantaneous type with steam to hot water or hot water to hot water double wall heat exchangers. Natural gas fired heaters may be provided where natural gas service is readily available and when considered applicable by the A/E and approved by Owner.

E. Water heating equipment shall meet latest ASHRAE standard A90.1 Table 7.8.

F. Water heating equipment shall not be subjected to system pressures beyond its ASME stamped working pressure.

G. Provide NSF and ASME compliant pre-pressurized steel thermal expansion tank with membrane on the cold water supply line of all water heating equipment where cold water service contains check valves, pressure reducing valves or backflow preventers. Thermal expansion tanks shall be sized in accordance with manufacturer's published recommendations.

2.05 CONTAMINATION PREVENTION

A. Design of domestic water systems shall avoid all cross connections and eliminate the possibility of water contamination. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide an approved vacuum breaker or backflow preventer. Location of vacuum breakers shall prevent any possible backflow through them.

B. Backflow preventers shall be duplexed where located within lines serving in-patient areas, critical research areas, and any area or equipment where un-interruptible (24 hour) water service is required. Coordinate with Owner to determine areas and equipment that require un-interruptible service.

C. Avoid providing individual backflow preventers for each piece of equipment where domestic water serves centralized multiple equipment such as sterilization equipment, fume hoods, etc. Cold and hot water shall be provided by dedicated services separated from the domestic water distribution system by duplexed reduced pressure backflow preventers. All piping downstream of the backflow preventers shall be identified as non-potable water.

D. Backflow preventer test ports shall not be located more than 72 inches above finished floor or permanent platform.

E. Pipe relief from backflow preventer indirectly to drain of sufficient size to evacuate maximum flow discharge.

F. Vacuum breakers for hose connections in health care or laboratory areas shall not be less than 72 inches above the floor with the following exceptions:

1. Vacuum breakers integral with faucets or equipment;

2. Vacuum breakers for bedpan washer hoses shall not be located less than 60 inches above the floor.

G. Do not install vacuum breakers above ceilings, above equipment, concealed within walls or any location where water leakage can cause damage.

H. Vacuum breakers (including vacuum breakers that are integral with faucets) shall not be installed under exhaust hoods or similar locations that may contain toxic fumes or vapors.

I. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be allowed within domestic water systems. Shock absorbers (water hammer arrestors) shall be located as close as possible to the piping served. Pipe extensions shall not be used to connect shock absorbers to piping.

J. Valves provided for future connections shall not extend more than 24 inches from an active main.

K. Where permanently disconnecting domestic water supplies serving fixtures or equipment, remove all associated piping back to active main to avoid stagnation.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All piping and valves shall be located and sized on Contract Drawings.

B. Indicate location and size of all valve access panels on floor plans.

C. Include a domestic water system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, booster pumps, water tanks, hot water heaters, hot water return pumps, piping mains, risers, pressure regulating stations, backflow prevention, main and riser shut-off valves. Calculated flow rates used for system design shall be noted at supply entrance, pumping system discharge, base of risers, hot water return circuit setters/balancing valves and sectional floor valves at risers. Branch piping to fixtures and equipment is not required to be shown on domestic water system distribution schematic provided that it is included within sanitary waste and vent system riser diagrams or individual equipment details.

D. Include details on the Contract Drawings to clearly identify installation requirements for all domestic water system components included within the Project, including but not limited to; water storage tanks, water heaters, pressure regulating stations, building water service riser, pumps, master thermostatic mixing valve assemblies, backflow preventers, trap primer units, roof penetrations, floor and wall penetrations.

E. Include schedules on the Contract Drawings to clearly identify location, capacity, size, model, options and other requirements for all domestic water system equipment included within the Project, including but not limited to; booster pumps, hot water return pumps, water heaters, thermal expansion tanks, pressure regulating valves, master thermostatic mixing valve assemblies, water hammer arrestors, backflow preventers, hot water return circuit setters/balancing valves.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-02-10	Changed City of Houston to municipality. Paragraph 2.01 B. ; Added requirement for electronic trap primers. Paragraph 2.01 P. ; Included additional requirements for pressure regulators. Paragraphs 2.02 C,D & E. ; Clarified system size parameters for use of VFD booster pump control. Paragraphs 2.03 B, C & D. ; Included additional requirements for backflow and backsiphonage devices. Paragraphs 2.05 C, D, E, F & G.	DOS
Rev. 2	07-08-10	2.02 B. ; Deleted statement concerning municipal systems. 2.03 F. 4. ; Added requirement to provide isolation valves for each water storage tank fill valve for servicing purposes. 2.03 F. 5. ; Added requirement to provide blind flanged valves for future break tank bypass for servicing purposes. 2.04 A. 1. a. & b. ; Added requirement to circulate hot water piping to within 18 inches of public lavatory faucets and clarified maximum length of piping from point-of-use instantaneous heaters. 2.04 C. 1. ; Added statement that separate water heaters and circulation pumps should be considered for serving processes and equipment that require water temperatures in excess of 110 degrees F. 2.04 C. 2. ; Added statement that separate water heaters and circulation pumps are required for each pressure zone within a building. 2.04 F. ; Added statement that Water heating equipment shall not be subjected to system pressures beyond its its ASME stamped working pressure. 2.05 C. ; Added requirement to serve multiple centralized equipment with one set of duplexed backflow preventers rather than individual backflow preventers at each piece of equipment. 2.05 I. ; Added statement to prevent dead-legs in piping due to installing shock absorbers with pipe extensions. 3.01 C. and E. ; Clarified requirements to provide hot water return circuit setters/balancing valve information on drawings.	DOS
Rev. 3	09-16-10	2.01 I. ; Included additional hose bib provisions for roof maintenance purposes. 2.03 F., 3., 5. And 6. ; Included additional requirements for domestic water surge tank fill valves.	DOS

Issue	Date	Revision Description	Reviser
Rev. 4	08-18-11	2.01 F. – Revised ASHRAE table reference number.	DOS

END OF ELEMENT D2020

D202001 Domestic Water Distribution for Open Parking Garages

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses domestic cold, hot and hot water return distribution systems within and to five feet beyond parking garage building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Domestic water shall be provided for all plumbing fixtures, hose bibbs, and all other systems, equipment, and devices that require domestic water supply.

B. Garage building domestic water distribution systems shall be metered and isolated from the municipal water supply in accordance with City of Houston requirements.

C. Design of domestic water systems shall avoid all cross connections and eliminate the possibility of water contamination. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide an approved vacuum breaker or backflow preventer. Installation of vacuum breakers shall prevent any possible backflow through them.

D. The design of garage building supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand. Piping shall be sized at a velocity not exceeding six feet per second (fps).

E. The domestic water system may utilize municipal water system to a height allowed by verified available minimum pressure.

F. Distribution piping shall be located to minimize space requirements and shall not interfere with the flow of pedestrian traffic, vehicular traffic or parking. All unburied piping shall be protected from damage by utilizing chases, steel bollards, be located adjacent to columns or by other means approved by the Owner.

G. Do not locate water piping within stairways, electrical or telecommunications rooms.

H. All domestic water piping that may be subjected to temperatures of 32 degrees F or below shall be protected from freezing with thermostatically controlled electric heat tracing and insulation. All exposed insulated piping shall be covered with aluminum or stainless steel jacket.

D202001 Domestic Water Distribution for Open Parking Garages

I. Provide freeze-proof wall hydrants on exterior walls a maximum of 150 feet apart at building grade level. Hydrants should be located at approximately 18 inches above finished grade. Coordinate the location of all wall hydrants with the architectural features of the building and obtain approval of locations from the Project Architect.

J. Provide at least one hose bibb with backflow preventer on each garage level up to a height allowed by verified available municipal water system pressure. Coordinate with Owner for preferred locations and quantity of hose bibbs.

K. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be allowed within domestic water systems.

L. Provide manufactured water hammer arrestors in water supply lines in accordance with Standard PDI-WH201.

M. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the domestic water distribution system and connected components. Locations shall include but not be limited to the following; at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, at each branch connection to risers, at each battery of fixtures, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

N. Accessible capped valves shall be provided where required for future connections. To prevent water stagnation within dead-legs, future valves shall not extend more than 24 inches from an active main.

O. All valves shall be accessible for operation and servicing. Provide access panels for all concealed valves. Coordinate the location of access panels with the architectural features of the building and obtain approval of locations from the Project Architect.

P. Domestic hot water systems shall be designed to reasonably assure an expeditious flow of hot water at all outlets within 10 seconds.

Q. Hot water shall be generated by electric point-of-use heaters. Lavatory faucet within unisex employee toilet shall be provided with an instantaneous type wall unit. Janitor’s sink faucet shall be provided with a 15 gallon storage type unit or an instantaneous type wall unit. Hot water temperature at hand wash lavatory shall be 105 degrees F. Hot water temperature at Janitor’s sink shall be 120 degrees F.

R. Cold water piping shall be insulated as required to prevent condensation. Hot water piping shall be insulated as required by code and per latest ASHRAE standard A90.1 Table 7.2.3.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All piping and valves shall be located and sized on the Drawings.

B. Indicate location and size of all valve access panels on floor plans.

C. Include a domestic water system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, hot water heaters, piping mains, risers, line and riser shut-off valves. Calculated flow rates used for system design shall be noted at supply entrance and base of risers. Branch piping to fixtures and equipment is not required to be shown on domestic water system distribution schematic provided that it is included within sanitary waste and vent system riser diagrams or individual equipment details.

D. Include details on the Contract Drawings to clearly identify installation requirements for all domestic water system components included within the Project, including but not limited to; water heaters, building water service riser, backflow preventers, trap primer units, roof penetrations, floor and wall penetrations.

E. Include schedules on the Contract Drawings to clearly identify capacity, size, model, options and other requirements for all domestic water system equipment included within the Project, including but not limited to; water heaters, and water hammer arrestors.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

D202001 Domestic Water Distribution for Open Parking Garages

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D201001

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses sanitary waste and vent systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Sanitary waste and vent systems shall be provided for all plumbing fixtures, floor drains, food service fixtures and equipment, and all other domestic waste producing equipment, systems and devices that are required by code to discharge into the sanitary sewer.

B. Waste and vent systems shall be designed using fixture drain loads established by code and provide proper operation during periods of peak demand.

C. Main waste and vent stacks shall utilize chases or be located adjacent to columns where possible for vertical routing to multiple floor levels.

D. Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 24 inches from an active line. Waste and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.

E. The building system is anticipated to flow by gravity to the exterior municipal sanitary sewer. Sanitary waste serving fixtures located below the 500 year flood plain or waste that cannot be discharged by gravity shall flow into a gas-tight, covered and vented sump from which the waste shall be lifted by automatic pumping equipment and discharged into a sanitary waste drain capable of gravity flow. Sewage ejector pumps shall be minimum duplex system sized to discharge peak calculated load with one pump out of service. Pumps shall be connected to emergency power source. Sumps and ejectors handling sewage shall not receive storm or subsoil/foundation drainage.

F. Above ground floor drains, P-traps and first 20 feet of connected drainage piping receiving condensate or ice machine waste shall be properly insulated to prevent condensation.

G. Provide cleanouts at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs. All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible. A floor cleanout shall be installed only where installation of a wall cleanout is not practical. Provide a wall cleanout for each water closet or battery of water closets. Locate wall cleanouts above the flood level rim of the highest water closet but no more than twenty four inches above the finished floor. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.

H. No buried waste line shall be smaller than 2 inches. No vent line shall be smaller than 1-1/2 inches. No roof vent terminal shall be smaller than 3 inches. Waste piping serving water closets shall not be smaller than 4 inches.

I. Locate all sanitary vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes, operable windows, doors and any other building openings.

J. Drain lines serving automatic blood-cell counters shall be of carefully selected material that will eliminate potential for undesirable chemical reactions (and/or explosions) between sodium azide wastes and copper, lead, brass, and solder, etc.

K. Avoid locating drains above sensitive equipment or areas where water leakage would cause major property loss or contamination. Refer to Design Guideline Element Z2050 for additional related requirements.

L. Do not locate drainage or vent piping within stairways, electrical or telecommunications rooms.

M. Provide floor drains in all toilet rooms designed to be occupied by more than one user at a time (i.e., containing two or more water closets or a combination of one water closet and one urinal).

N. Do not locate floor drains within pharmacy drug preparation areas, operating rooms or areas where hazardous materials are handled or stored.

O. All drain traps shall be properly vented in accordance with the Uniform Plumbing Code.

P. Provide water supplied trap primers for all floor drains, floor sinks and hub drains, that may be susceptible to trap seal evaporation.

1. Trap seal protection inserts may be provided in lieu of water supplied trap primers only where job conditions prevent the installation of water supplied primers.

2. Trap seal protection insert shall not be installed in drains receiving waste that may have a temperature greater than 140 degrees F.

3. Trap seal protection insert shall not be installed in drains receiving waste discharge flow of greater than 30 gallons per minute.

4. Trap seal protection insert shall not be installed in drains receiving corrosive or chemical waste.

Q. Provide submersible sump pump(s) in each elevator pit in accordance with the 2007 edition of ASME A17.1 and the State of Texas Elevator Safety and Licensing requirements. Pump effluent shall discharge indirectly into the sanitary waste system. The elevator pit pumping system shall be designed to prevent pump effluent, sewage, odors and gases from entering building spaces and the elevator pit. Provide a sanitary indirect waste receptor having a capacity greater than the maximum flow rate discharge of the pump(s). Pump electrical service shall be connected to emergency power source.

R. Design and size indirect waste receptors and associated piping receiving discharge from equipment and relief valves to evacuate the maximum possible flow. The design shall prevent flooding, splashing and ponding.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, isometric or flat riser diagrams and details indicating all information required to clearly illustrate the intent of system design. All piping shall be located and sized on the Contract Drawings.

B. Floor plans and riser diagrams shall include, but not be limited to identification of all sanitary waste piping from fixtures to connection to exterior sewer, all vent piping from fixtures and stacks to termination through roof, cleanouts, fixture and equipment identification, traps and trap primer lines.

C. Calculated fixture units used for system design shall be noted at house drains exiting the building, base of stacks, floor branch connections at stacks, ejector pump system discharge and interceptor inlets.

D. Invert elevations shall be noted at all drains exiting the building perimeter, connections to exterior sewers, uppermost point of each main and branch line located below ground level, and all other points where required to clearly establish proper slope and coordination with other piping systems and building components.

E. Bottom of pipe elevations shall be noted for unburied piping at locations where close coordination is required to prevent conflicts with other systems and/or building components.

F. Graphically identify each stack on plans and riser diagrams. Stack identification on riser diagrams shall correspond to stack identification on plans. Graphically indicate floor levels and floor elevations on riser diagrams.

G. Details shall be provided for, interceptors, cleanouts, roof penetrations, floor and wall penetrations, sewage ejector pump systems and all other components that require installation explanation beyond the information included within plans and riser diagrams.

H. Schedules shall clearly identify: Capacity, size, model, options and other requirements for all interceptors and sewage ejector pump equipment.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-10-09	Changed maximum distance between cleanouts in horizontal drainage piping to 75 feet (previously 90 feet) and added verbiage regarding cleanout locations to match master specifications. Paragraph 2.01 G. Revised elevator pit sump pumping requirements to comply with the 2007 edition of ASME A17.1. Paragraph 2.01 Q.	DOS
Rev. 2	03/02/10	Added requirement for proper design of evacuating equipment and relief valve discharge. Paragraph 2.01 R.	DOS
Rev. 3	04/05/12	Added requirements that restrict the use of trap seal protection inserts. Paragraph 2.01 P.	DOS
Rev. 4			
Rev. 5			

END OF ELEMENT D2030

D203001 Sanitary Waste and Vent for Open Parking Garages

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses sanitary waste and vent systems within and to five feet beyond parking garage building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Sanitary waste and vent systems shall be provided for all plumbing fixtures and all other domestic waste producing drains, equipment, systems and devices that are required by code to discharge into the sanitary sewer.

B. Waste and vent systems shall be designed using fixture drain loads established by code and provide proper operation during periods of peak demand.

C. Waste and vent stacks shall be located to minimize space requirements and shall not interfere with the flow of vehicular traffic or parking. All unburied piping shall be protected from vehicular damage by utilizing chases, steel bollards, be located adjacent to columns or by other means approved by the Owner.

D. Above ground floor drains, P-traps and first 50 feet of connected drainage piping receiving condensate, ice machine or chilled water waste shall be properly insulated with a vapor barrier to prevent condensation.

E. All floor drains susceptible to vehicular traffic shall have load bearing capacities capable of withstanding anticipated loads.

F. Provide cleanouts at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs. All cleanouts shall terminate flush with finished walls, flush with finished floors or at no higher than 24 inches above finished floor level in exposed vertical stacks. Obtain approval of all locations from the Owner.

G. No buried waste line shall be smaller than 2 inches inside diameter (I.D.). No vent line shall be smaller than 1-1/2 inches I.D. No vent terminal shall be smaller than 3 inches I.D. Waste piping serving water closets shall not be smaller than 4 inches I.D.

H. Locate all sanitary vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes and 7 feet above pedestrian traffic.

I. Avoid locating drains above sensitive equipment or areas where water leakage would cause a safety hazard or property loss, including but not limited to elevator equipment, pedestrian walkways, vehicle parking, etc.

J. Do not locate drainage or vent piping within stairways, electrical or telecommunications rooms.

K. All traps shall be properly vented in accordance with the 2000 Uniform Plumbing Code.

L. Provide automatic trap primers for all floor, floor sinks and hub drains that may be susceptible to trap seal evaporation. Trap seal guard inserts may be provided in lieu of automatic trap primers on condition that the inserts are applied in accordance with the manufacturer’s published product data.

M. The design of sanitary waste and vent systems shall prevent the entrance of storm water.

N. Provide submersible sump pump(s) in each elevator pit in accordance with the 2007 edition of ASME A17.1 and the State of Texas Elevator Safety and Licensing requirements. Pump effluent shall discharge indirectly into the sanitary waste system. The elevator pit pumping system shall be designed to prevent pump effluent, sewage, odors and gases from entering building spaces and the elevator pit. Provide a sanitary indirect waste receptor having a capacity greater than the maximum flow rate discharge of the pump(s). Pump electrical service shall be connected to emergency power source.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, isometric or flat riser diagrams and details indicating all information required to clearly illustrate the intent of system design. All piping shall be located and sized on the Contract Drawings.

B. Floor plans and riser diagrams shall include, but not be limited to identification of all sanitary waste piping from fixtures to connection to exterior sewer, all vent piping from fixtures and stacks to termination, cleanouts, fixture and equipment identification, traps and trap primer lines.

C. Calculated fixture units used for system design shall be noted at house drains exiting the garage building, base of stacks, floor branch connections at stacks, ejector pump system discharge and interceptor inlets.

D. Invert elevations shall be noted at all drains exiting the garage building perimeter, connections to exterior sewers, uppermost point of each main and branch line located below ground level, and all other points where required to clearly establish proper slope and coordination with other piping systems and garage building components.

E. Bottom of pipe elevations shall be noted for unburied piping at locations where close coordination is required to prevent conflicts with other systems, structural components, pedestrian traffic and/or vehicular traffic.

F. Clearly convey support requirements for all sanitary piping and vent stack terminals.

G. Graphically identify each stack on plans and riser diagrams. Stack identification on riser diagrams shall correspond to stack identification on the plans. Graphically indicate floor levels and floor elevations on riser diagrams.

H. Details shall be provided for; cleanouts, roof penetrations, floor and wall penetrations, sump pump systems and all other components that require installation explanation beyond the information included within plans and riser diagrams.

I. Schedules shall clearly identify: Capacity, size, model, options and other requirements for all floor drains and sump pump equipment.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Schedule 40 PVC DWV piping complying with the International Plumbing Code may be specified as an alternate to piping specified within Owner's Master Construction Specifications when determined appropriate by the Engineer of Record.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-10-09	Changed maximum distance between cleanouts in horizontal drainage piping to 75 feet (previously 90 feet). Paragraph 2.01 F. Revised elevator pit sump pumping requirements to comply with the 2007 edition of ASME A17.1. Paragraph 2.01 N.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D203001

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses laboratory waste and vent systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Laboratory waste and vent systems shall be provided for all fixtures, floor drains, and equipment that may discharge corrosive liquids, spent acids or other harmful chemicals that could potentially destroy or injure cast iron or copper drainage and vent piping.

B. The A/E shall obtain all necessary information from the Owner to determine system design, materials selection and waste treatment requirements. A proposed system design in either diagrammatic or narrative form shall be submitted to the Owner’s Project Manager during the schematic phase of the Project.

C. MD Anderson Cancer Center Department of Environmental Health and Safety maintains established policies that prohibits introduction of hazardous or corrosive waste into piping systems. However, as a precaution, chemically resistant waste and vent piping is required for all sinks, hub drains and floor drains within laboratory areas in the event that chemicals are inadvertently discharged into the piping system.

D. When effluent is expected to have a pH less than 6 or more than 10, waste treatment shall be provided to render the waste to a neutral pH before discharging into building sanitary or municipal sewer systems.

E. All piping shall be selected based upon the characteristics of the effluent expected to be introduced and be of such material and design as to adequately perform its intended function as required by code and to the satisfaction of the Owner’s Environmental Health and Safety Group and the Building Operation and Maintenance Director.

F. All materials located within spaces utilized as air plenums shall meet ASTM E84 25/50 for flame spread and smoke development and UL723 and UL910 for flame propagation and smoke density in environmental spaces.

G. Waste and vent systems shall be designed using fixture drain loads established by code and equipment manufacturers discharge flow rates. Waste and vent systems design shall provide proper operation during periods of peak demand.

H. Main waste and vent stacks shall utilize chases or be located adjacent to columns where possible for vertical routing to multiple floor levels.

I. Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 24 inches from an active line. Waste and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.

J. The building system is anticipated to flow by gravity to the exterior municipal sanitary sewer. Laboratory waste serving fixtures and/or equipment located below the 500 year flood plain or waste that cannot be discharged by gravity shall flow into a gas-tight, covered and vented sump from which the waste shall be lifted by automatic pumping equipment and discharged into a laboratory waste drain capable of gravity flow. Laboratory waste ejector pumps shall be minimum duplex system sized to discharge peak calculated load with one pump out of service. Pumps shall be connected to emergency power source. Sumps and ejectors handling laboratory waste shall not receive sanitary, storm or subsoil/foundation drainage. All components of basins and pumping systems shall be constructed of materials designed and approved for laboratory waste usage.

K. Above ground floor drains, P-traps and at least the first 20 feet of connected drainage piping receiving condensate or ice machine waste shall be properly insulated to prevent condensation from developing on exterior of piping.

L. Provide cleanouts at locations and with clearances as required by the International Plumbing code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs. All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible. A floor cleanout shall be installed only where installation of a wall cleanout is not practical. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.

M. No buried waste line shall be smaller than 2 inches. No vent line shall be smaller than 1-1/2 inches. No roof vent terminal shall be smaller than 3 inches.

N. Locate all vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes, operable windows, doors and any other building openings.

O. Avoid locating drains above sensitive equipment or areas where water leakage would cause major property loss or contamination. Refer to Design Guideline Element Z2050 for additional related requirements.

P. Do not locate drainage or vent piping within stairways, electrical or telecommunications rooms.

Q. Do not locate floor drains within pharmacy drug preparation areas, operating rooms or areas where hazardous materials are handled or stored.

R. All traps shall be properly vented in accordance with the Uniform Plumbing Code.

S. Provide automatic trap primer for all floor and hub drains that may susceptible to trap seal evaporation.

2.02 NEW BUILDINGS

A. Laboratory waste and vent piping shall be independent of all other waste and vent systems within the building.

B. Intersection of laboratory waste and sanitary waste shall occur at exterior of building within a sampling manhole. Invert of laboratory waste piping shall be a minimum of 8 inches above bottom of sampling manhole.

2.03 RENOVATION WORK

A. New laboratory waste and vent piping shall connect to existing chemically resistant piping within renovated laboratory areas.

B. Where existing chemically resistant piping is not located within Project boundaries, new laboratory waste and vent piping shall connect to existing sanitary waste and vent stacks occurring within Project boundaries.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, isometric or flat riser diagrams, schedules and details indicating all information required to clearly illustrate the intent of system design. All piping shall be located and sized on the Contract Drawings.

B. Floor plans and riser diagrams shall include, but not be limited to identification of all laboratory waste piping from fixtures and equipment to connection to exterior sewer or existing interior piping; all vent piping from fixtures and stacks to termination through roof or connection to existing piping; cleanouts; fixture and equipment identification; traps and trap primer lines.

C. Calculated fixture units used for system design shall be noted at house drains exiting the building, base of stacks, floor branch connections at stacks, ejector pump system discharge and waste treatment tank or sampling well inlet.

D. Invert elevations shall be noted at all drains exiting the building perimeter, connections to exterior sewers, uppermost point of each main and branch line located below ground level, and all other points where required to clearly establish proper slope and coordination with other piping systems and building components.

E. Bottom of pipe elevations shall be noted for unburied piping at locations where close coordination is required to prevent conflicts with other systems and/or building components.

F. Graphically identify each stack on plans and riser diagrams. Stack identification on riser diagrams shall correspond to stack identification on plans. Graphically indicate floor levels and floor elevations on riser diagrams.

G. Details shall be provided for, waste treatment systems, sampling wells, cleanouts, waste ejector pump systems, roof penetrations, floor and wall penetrations, and all other components that require installation explanation beyond the information included within plans and riser diagrams.

H. Schedules shall clearly identify: Capacity, size, model, options and other requirements for all waste treatment tanks, waste ejector pump equipment; Piping materials and piping support spacing.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-10-09	Changed maximum distance between cleanouts in horizontal drainage piping to 75 feet (previously 90 feet) and added verbiage regarding cleanout locations to match master specifications. Paragraph 2.01 L.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2035

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses storm water drainage systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Storm water drainage systems shall be provided to convey rainwater from roof and area drains to the site municipal storm sewer system. Secondary emergency overflow systems shall be installed to protect parapeted roof structures in the event of primary system blockage. The overflow system shall utilize parapet scuppers or secondary piping discharging through the exterior building wall. Aesthetics of scuppers and/or secondary piping termination shall be determined by the Project Architect.

B. Secondary emergency overflow piping shall discharge immediately below the roof level or at grade. Provide quantity of emergency overflow drains to limit the size of each discharge terminal to 8” inside pipe diameter.

C. Primary and secondary roof drain systems shall be designed using 8 inch per hour rainfall intensity in conjunction with code established areas-to-pipe sizes allowed.

D. Storm drains that cannot be discharged by gravity shall flow into a gas-tight, covered and vented sump from which the drainage shall be lifted by automatic pumping equipment and discharged into a storm drain capable of gravity flow. Storm water lift pumps shall be minimum duplex system sized to discharge maximum calculated load with one pump out of service. Pumps shall be connected to emergency power source. Sumps and lift pumps handling storm drainage shall not receive sanitary or subsoil/foundation drainage.

E. Roof drainage system shall not connect to subsoil/foundation drainage or any open storm drain piping located within the building.

F. Roof drain and emergency overflow drain sumps and horizontal piping to first vertical downspout shall be insulated to prevent condensation.

G. Provide cleanouts at the base of each vertical downspout and at intervals not exceeding 75 feet in horizontal building drain. Provide clearances as required by code. All interior cleanouts shall be accessible from walls or floors. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect. Horizontal roof drain piping located above building ground floor level will not require cleanouts.

H. No roof drain shall have an outlet connection smaller than 3 inches.

I. Avoid locating drain sumps or piping above sensitive equipment or areas where water leakage would cause major property loss or contamination. Refer to Design Guideline Element Z2050 for additional related requirements.

J. Do not locate drain sumps or piping within stairways, electrical or telecommunications rooms.

K. Appropriate subsoil and foundation drainage shall be provided as required by the geo-technical report. Due to elevations of foundations and city utilities, all subsoil drainage shall be discharged from the building through a lift station with duplex pumps. Each pump shall be sized for 100 percent of design capacity. Sumps and pumps handling sub-soil/foundation drainage shall not receive any sewage or roof drainage.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, isometric or flat riser diagrams and details indicating all information required to clearly illustrate the intent of system design. All piping shall be located and sized on the Contract Drawings.

B. Floor plans and riser diagrams shall include, but not be limited to identification of all roof drains, area drains and piping.

C. Area square footages used for system design shall be noted at each roof drain, area drain, house drains exiting the building, base of downspouts, branch connections at downspouts, and sump pump system.

D. Invert elevations shall be noted at all drains exiting the building perimeter, connections to exterior sewers, uppermost point of each main and branch line located below ground level, and all other points where required to clearly establish proper slope and coordination with other piping systems and building components.

E. Bottom of pipe elevations shall be noted for unburied piping at locations where close coordination is required to prevent conflicts with other systems and/or building components.

F. Graphically identify each roof drain, area drain and downspout on plans and riser diagrams. Identification on riser diagrams shall correspond to identification on plans. Graphically indicate floor levels and floor elevations on riser diagrams.

G. Details shall be provided for, cleanouts, roof drains, secondary emergency overflow piping terminals, area drains, sump pump systems, roof penetrations, floor and wall penetrations, and all other components that require installation explanation beyond the information included within plans and riser diagrams.

H. Schedules shall clearly identify: Capacity, size, model, options and other requirements for all sump pump equipment.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-10-09	Changed maximum distance between cleanouts in horizontal drainage piping to 75 feet (previously 90 feet). Paragraph 2.01 F.	DOS
Rev. 2	11-11-10	Included option to terminate emergency overflow piping immediately below the roof level or at grade and limited the size of overflow piping to 8" - Paragraph 2.01 B. Added requirement that emergency overflow piping terminals must be detailed on construction drawings – Paragraph 3.01 G.	DOS
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2040

D204001 Storm Water Drainage for Open Parking Garages

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses storm water drainage systems within and to five feet beyond parking garage building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Storm water drainage systems shall be provided to convey rainwater from garage structure to the site municipal storm sewer system. Secondary emergency overflow systems shall be installed to protect parapet roof structures in the event of primary system blockage. The overflow system shall utilize parapet scuppers.

B. Primary and secondary roof drain systems shall be designed using 8 inch per hour rainfall intensity in conjunction with code established area-to-pipe sizes allowed.

C. The design of storm drainage systems shall prevent the entrance of sanitary waste and/or sanitary vent gas.

D. Provide cleanouts at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs. All cleanouts shall terminate flush with finished walls, flush with finished floors or at no higher than 24 inches above finished floor level in exposed vertical stacks. Obtain approval of all locations from the Owner.

E. No roof or area drain shall have an outlet connection smaller than 3 inches.

F. Do not locate drain piping within stairways, elevator equipment rooms, electrical or telecommunications rooms.

G. Appropriate subsoil and foundation drainage shall be provided as required by the geo-technical report. Due to elevations of foundations and city utilities, all subsoil drainage shall be discharged from the building through a lift station with duplex pumps. Each pump shall be sized for 100 percent of design capacity. Sumps and pumps handling sub-soil/foundation drainage shall not receive any sewage or building storm drainage.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, isometric or flat riser diagrams and details indicating all information required to clearly illustrate the intent of system design. All piping shall be located and sized on the Contract Drawings.

B. Floor plans and riser diagrams shall include, but not be limited to identification of all roof drains, area drains and piping.

C. Area square footages used for system design shall be noted at each roof drain, area drain, house drains exiting the building, base of downspouts, branch connections at downspouts, and sump pump system.

D. Invert elevations shall be noted at all piping exiting the building perimeter, connections to exterior sewers, uppermost point of each main and branch line located below ground level, and all other points where required to clearly establish proper slope and coordination with other piping systems and building components.

E. Bottom of pipe elevations shall be noted for unburied piping at locations where close coordination is required to prevent conflicts with other systems, structural components, pedestrian traffic and/or vehicular traffic.

F. Graphically identify each roof drain, area drain and downspout on plans and riser diagrams. Identification on riser diagrams shall correspond to identification on plans. Graphically indicate floor levels and floor elevations on riser diagrams.

G. Details shall be provided for, cleanouts, roof drains, area drains, sump pump systems, roof penetrations, floor and wall penetrations, and all other components that require installation explanation beyond the information included within plans and riser diagrams.

H. Schedules shall clearly identify: Capacity, size, model, options and other requirements for all roof drains, area drains and sump pump equipment.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Schedule 40 PVC DWV piping complying with the International Plumbing Code may be specified as an alternate to piping specified within Owner's Master Construction Specifications when determined appropriate by the Engineer of Record.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-10-09	Changed maximum distance between cleanouts in horizontal drainage piping to 75 feet (previously 90 feet). Paragraph 2.01 D.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D204001

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses natural gas distribution systems within and to five feet beyond the building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. All natural gas piping on the customer side of the utility meter shall be designed, installed and tested in accordance with NFPA 54, Fuel Gas Code.

B. Natural gas shall be provided for all gas fired food service equipment, and all other gas fired equipment requiring natural gas supply.

C. Building natural gas distribution systems shall be metered and valved in accordance with the gas supplier's requirements.

D. The design of building supply and distribution systems shall provide a volume of gas at the required flows and pressures to ensure safe, efficient and code compliant operation during periods of peak demand. Piping shall be sized in accordance with referenced codes and standards.

E. Natural gas pressures shall not exceed five pounds per square inch gauge on customer side of the meter.

F. Provide readily accessible manual shut-off valve outside of building at service entrance.

G. Avoid locating gas piping within confined or unventilated spaces where leaking gas might collect.

H. Do not locate gas piping beneath building slab on grade.

I. Do not locate gas piping within stairways, electrical or telecommunications rooms.

J. Main distribution piping risers shall be located exposed within mechanical equipment rooms where possible for vertical routing to multiple floor levels. Where distribution mains cannot be located within mechanical equipment rooms, utilize chases within the building footprint. Natural gas piping installed above ceilings, within chases, within partitions, within spaces utilized as return air plenums, or any non-exposed location shall be encased within a sleeve vented to the exterior of the building.

K. Exposed and accessible shut-off valves shall be provided as required for proper operation, servicing and troubleshooting of the distribution system and connected components. Locations shall include but not be limited to the following; at the base of each riser, at each branch connection to risers, at each piece of equipment, where recommended by equipment manufacturer and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

L. Exposed and accessible capped valves shall be provided where required for future connections.

M. Valves, regulators, flanges, unions and similar appurtenances shall be accessible for operation and servicing and not be located above ceilings, within partitions or spaces utilized as return air plenums.

N. No natural gas line, including service drops shall be smaller than ¾ inches inside diameter. Local connections to individual equipment and outlets may be smaller than ¾ inches as required for the particular component.

2.02 LABORATORY NATURAL GAS DISTRIBUTION

A. All gas piping serving labs from main natural gas riser shall be routed exposed to view below ceiling.

B. Provide a manual shut-off valve in each line serving individual laboratory rooms for maintenance and isolation of natural gas serving each room. Room manual isolation valves shall be labeled indicating room being controlled and located accessible to maintenance staff.

C. Provide electric powered emergency shut-off valve in each line serving individual laboratory rooms. Locate valve shut-off control button at 54 inches above finished floor within laboratory area adjacent to each room exit. Operation of this control shall close a solenoid operated gas shut-off valve and interrupt the natural gas flow to the area. Activation of each emergency button shall send an alarm signal to the building monitoring system. Valve actuators shall be accessible to laboratory occupants for shutting off natural gas supply under emergency condition and comply with Texas Accessibility Standards Accessible Elements and Space requirements.

D. A manual emergency gas shut-off valve may be provided in lieu of an electric powered valve when approved in writing by the Owner’s Project Manager. Manual emergency shut-off valves shall be located exposed on wall at 54 inches above finished floor within each laboratory area adjacent to room exit.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All piping and valves shall be located and sized on the Contract Drawings.

B. Include a natural gas system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, piping mains, risers, pressure regulating valves, all shut-off valves, branch and individual connection piping to equipment and outlets. Calculated flow rates and developed piping lengths used for system design shall be noted at supply entrance, base of risers, sectional floor valves, branch piping to equipment and outlets, and at each connection to equipment and outlets.

C. Include details on the Contract Drawings to clearly identify installation requirements for all natural gas system components included within the Project, including but not limited to; service entrance, gas fired equipment connections, emergency shut-off valves, laboratory zone valves, pressure regulator venting, concealed pipe casing venting termination, roof penetrations, floor and wall penetrations.

D. Include schedules on the Contract Drawings to clearly identify natural gas system demand, pressures and equipment served.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2050

D2060 Medical Vacuum and Gas Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses medical vacuum, waste anesthetic gas disposal, compressed air, oxygen, nitrous oxide, nitrogen and carbon dioxide systems.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Medical vacuum and gas systems shall be designed in accordance with current editions of AIA Guidelines for Design and Construction of Hospitals and Healthcare Facilities, NFPA 55, NFPA 99 and Compressed Gas Association Standards.

B. Obtain all necessary information that is required from the Owner when determining system design and types of services.

C. A proposed system design in either diagrammatic or narrative form shall be submitted to the designated Owner's representative during the schematic phase of the Project.

D. Review the location, quantity and type of medical gas outlets, inlets and alarm panels with Owner's user groups during the design development phase of the Project.

E. Medical vacuum and gas systems serving patients shall be independent of all other vacuum and gas systems serving laboratory, research and/or animal areas.

F. Medical compressed air systems serving patients shall not be used to serve non-respiratory equipment, such as sterilizers, pneumatic doors, operating room service columns, etc.

G. Design medical gas and vacuum systems to deliver the following nominal pressures at the points of use: All pressure systems, except nitrogen shall be 50 to 55 psig at maximum flow; Nitrogen shall be 160 to 185 psig at maximum flow; Vacuum shall be 15 to 19 inches Hg at most distant inlets.

H. Coordinate the requirement for the use of ventilators with the Owner's user groups. Design the oxygen and medical air systems to accommodate required flow demands.

I. Include waste anesthetic gas disposal (WAGD) terminal inlets and piping in appropriate projects. The source for WAGD inlets shall connect to the medical vacuum system piping above the ceiling and downstream of the zone valve box serving the individual room where the inlets are to be located.

J. Provide at least one nitrogen control panel (NCP) within rooms containing nitrogen station outlets. Coordinate with Owner's users to determine quantity and location.

K. Locate station inlets and outlets at an appropriate height to prevent physical damage to attached equipment and accessories. Station inlets and outlets located above countertops shall be provided with sufficient space to allow usage and attachment of equipment without interferences by countertop, backsplash or overhead cabinets. All other station inlets and outlets having centerline located less than 60 inches above finished floor shall be protected by guardrails, recessing into walls or by other means approved by Owner.

L. Provide sufficient spacing between station inlets and outlets to allow simultaneous use with vacuum collection bottles, regulators, adaptors or any other equipment attached. Provide slide retainer bracket for collection bottle attachment adjacent to each vacuum station inlet.

M. Ensure that all medical vacuum and gas source equipment and alarm systems are provided with both normal and emergency electrical power supply.

2.02 CENTRAL SUPPLY SYSTEMS

A. Locate medical air compressors and vacuum pumps in a dedicated mechanical room in accordance with NFPA 99. Mechanical room shall provide a clean, relatively cool environment (i.e., not to exceed 100 degrees F ambient temperature). Equipment shall be located with adequate access space for regular monitoring and servicing. Provide floor drain adjacent to equipment pads. Floor drains serving vacuum pumps shall be provided with smooth, acid resistant interior coating. Provide a hose bib within mechanical room.

B. Locate the medical air compressor system intake outdoors above roof level, at least 25 feet (may require more depending upon prevailing wind direction and velocity) from all exhausts, vents, vacuum system discharges or any anticipated source of odor or particulate matter. Air that is filtered for breathable ventilation system use may be considered an acceptable source of intake air when approved by Owner's. Combined air intakes must be sized for no restriction while flowing the maximum intake possible, and shall be provided with an isolation valve at the header for each compressor served. Intake piping for air compressors shall be sized using the total SCFM for the system (both lead and lag pumps) and the total developed length of run. Coordinate with air compressor system technical representative and verify that proposed sizing of intake piping complies with manufacturer's recommendations.

C. Terminate medical vacuum exhaust discharge outdoors above roof level, at least 25 feet horizontally (may be more depending upon prevailing wind direction and velocity) from all air intakes, doors, windows, louvers or any other building openings. Combine exhaust from each medical vacuum pump into one discharge pipe, sized for no restriction while flowing maximum discharge possible, and shall be provide with an isolation valve at the header for each pump served. Exhaust piping for vacuum pumps shall be sized using the total SCFM for the system (both lead and lag pumps) and the total developed length of run. Exhaust piping shall be sized and arranged to prevent moisture and back-pressure from entering pump. Provide valved drip-leg at base of exhaust stacks. Coordinate with vacuum pump system technical representative and verify that proposed sizing of exhaust piping complies with manufacturer's recommendations.

D. Medical air compressors and vacuum pumps shall be multiplexed with receiver tanks and sized such that 100 percent of the design load is carried with the largest single unit out of service. Increase the calculated (SCFM) load by 25 percent to accommodate future system expansion.

E. In designing a medical air system where ventilators are expected to be utilized, add the ventilator requirement of 200 L/min (7 SCFM) for each ventilator in use to the compressor sizing.

F. Design air dryers, filters and pressure regulators for the medical air system in duplex, each sized for 100 percent of the load using duplex twin tower desiccant dryers. Include continuous line dewpoint and carbon monoxide monitoring with sample connections on the discharge piping downstream of the filters and regulators. Locate monitors at, or integral with, the control panel.

G. Provide sufficiently sized, properly ventilated and constructed room for medical gas cylinder storage and manifold systems in accordance with NFPA 99. Coordinate with the designated Owner's representative to determine space required for storage of additional non-manifolded cylinders. Gas cylinder storage rooms shall be located at ground level with at least one exterior wall and be provided with a minimum 42 inch door opening to the outside.

H. Bulk liquid oxygen supply systems shall be designed and located in accordance with NFPA 55 and closely coordinated with the Owner and designated oxygen supplier. Provide emergency oxygen inlet on exterior wall of building served. Insure that location of inlet allows truck access and that concrete pavement is provided where truck will park during transfer of oxygen.

2.03 ALARM SYSTEMS

A. To ensure continuous responsible observation, provide two master system alarms, in separate warning locations, for all medical vacuum and gas source equipment systems. Coordinate both master alarm panel locations with the user facility and the other design services. When deciding upon alarm locations, consider emergency power circuits, engineering control center data relay interface locations, and the facility's established procedures for monitoring alarm signals.

B. The primary warning location shall be supervised by engineering personnel, and is required to be located at one of the following (in order of priority): Boiler plant control office, engineering control center, or in the office or principal working area of the individual responsible for the maintenance of the medical vacuum and gas systems. The secondary warning location shall be located to assure 24-hour constant surveillance. Suitable secondary warning locations may include monitoring services, fire command station, telephone switchboard (PBX), security office or other continuously staffed location.

C. Building management systems must not be exclusively relied upon to monitor medical vacuum and gas alarms.

D. Provide local area alarms for all branches serving medical vacuum and gas station outlets and inlets. Locate area alarms at nurse stations visible and accessible to staff for monitoring. All alarm sensor locations shall be in conformance with NFPA 99.

2.04 PIPING SYSTEMS

A. Design pressure piping systems, except nitrogen, not to exceed 35 kPa (5 psi) loss from source to point of use. Design nitrogen piping systems not to exceed 138 kPa (20 psi) loss from source to point of use. Design vacuum piping systems not to exceed 10 kPa (3 inches Hg) from source to point of use.

B. Include ventilator demand in sizing calculations for oxygen and compressed air piping. Ventilator usage shall be based upon 200 L/min (7 SCFM) for each ventilator from the outlet back to the source.

C. Design medical gas and vacuum piping systems based upon the following minimum flow rates for any pipe section: Oxygen – 200 L/min (7 SCFM); Medical Air – 200 L/min (7 SCFM); Vacuum – 85 L/min (3 SCFM); Nitrous Oxide – 28 L/min (1 SCFM); Carbon Dioxide – 28 L/min (1 SCFM); Nitrogen – 425 L/min (15 SCFM).

D. Include a 25 percent calculated (SCFM) load for sizing distribution mains to accommodate future system expansion.

E. Distribution piping shall be designed in accordance with the following minimum size parameters to allow for future expansion and minimize service interruptions during renovations:

1. Pressure Gases

   a. Branch lines and drops to individual outlets for the pressure gases shall be a minimum of ½ inch.

   b. Branch lines serving more than one room or zone valve shall be a minimum of ¾ inch.

   c. Main lines and risers shall be no less than 1 inch.

2. Vacuum

   a. Branch lines and drops to individual vacuum inlets shall be a minimum of ¾ inch.

   b. Branch lines serving more than one room or zone valve shall be a minimum of 1 inch.

   c. Main lines and risers shall be no less than 1½ inches.

3. Zone valves and associated piping within walls shall not be smaller than ¾ inch, except for zones valves and piping serving an individual room.

F. Place a source shut-off valve for each medical vacuum and gas system at the immediate outlet (or inlet, in the case of vacuum) of the source of supply, so that the entire supply source, including all accessory equipment, can be isolated from the entire pipeline system. Provide each main line supply line with a shut-off valve. Locate valve accessible by authorized personnel only and locate downstream of the source valve and outside of the source room, enclosure, or where the main valve enters the building. Provide medical vacuum and gas services with line pressure and vacuum gauges at the source (and immediately inside the building, where source is remote from building).

G. Provide each riser supplied from the main line with an in-line shut-off valve located at the base of the riser. Provide each branch supplied from a riser with an in-line shut-off valve adjacent to the riser. Provide additional service valves in each branch line at point of connections to mains, in branch lines serving more than one zone valve box, and at other locations to strategically subdivide areas for maintenance. Conceal in-line service and shut-off valves at secure locations (e.g. above ceiling with ceiling tag, or in a locked equipment room), and specify that these valves be locked open and identified in accordance with NFPA 99.

H. Provide zone valves within recessed wall cabinets for all branch piping serving station outlets and inlets. Locate zone valves in corridor, visible and accessible to staff for operation of valves. All zone valve locations shall be in conformance with NFPA 99.

I. Strategically locate minimum ¾ inch valved and capped connections for future system expansion of medical vacuum and gas piping distribution systems. Extend capped connections minimum 18 inches from valves. Coordinate size and locations of future connections with Owner’s Patient Care Facilities and Building Operations Management during the Design Development phase of the Project.

2.05 RENOVATION PROJECTS

A. Survey current installation and coordinate with Owner’s Patient Care Facilities and Building Operations Management to verify type, location, size and capacities of existing piping and source equipment for determining adequate tie-in points.

B. Survey current installation to ascertain the type of existing alarms, medical gas station outlets and medical vacuum terminal inlets. All new alarms shall match and be compatible with the existing installation. All new outlets and inlets shall match the existing terminal connections and not require the use of secondary adapters. In cases where existing alarms, station outlets or terminal inlets are no longer available, not U.L. approved, or are not NFPA 99 compliant, the A/E shall coordinate with Owner to determine types to be specified within Contract Documents.

C. Review the proposed alarm, outlet and inlet types, and connection locations to existing piping and alarms with Owner’s Patient Care Facilities and Building Operations Management during the design development phase of the Project.

D. Provide a shut-off valve at the connection of new line to existing line.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schematic diagrams, schedules and details indicating all information required to clearly illustrate the intent of system design.

B. Floor plans shall include, but not be limited to location, sizes and identification of all: Piping from source equipment or existing piping connections to terminals; intake and exhaust piping from source equipment to termination through roof or connection to existing piping; master and local alarm panels; alarm sensors; pressure gauges; relief valves; relief valve discharge terminals; zone valve wall cabinets; nitrogen control cabinets; in-line shut-off and service valves; future valved connections; source equipment; inlets, outlets and slides.

C. Schematic diagrams shall include, but not be limited to identification and sizes of all: piping from source equipment or existing piping connections to zone valve cabinets; all intake and exhaust piping from source equipment to termination through roof or connection to existing piping; local alarm panels; alarm sensors; pressure gauges; zone valve wall cabinets; nitrogen control cabinets; in-line shut-off and service valves; future valved connections; source equipment.

D. Actual calculated usage flows (not including percentages added for future expansion) shall be noted on schematic diagrams at source valves, where service enters the building (when source is remote from building), base of risers, floor branch connections to risers, branch connections to mains and at zone valve cabinets. Indicate maximum flows allowed at each future valved connection.

E. Identify location of each zone valve cabinet, area alarm panel, and source equipment on schematic diagrams with room name and number.

F. Bottom of pipe elevations shall be noted for piping at locations where close coordination is required to prevent conflicts with other systems and/or building components.

G. Graphically identify each riser on plans and schematic diagrams. Riser identification on schematic diagrams shall correspond to riser identification on plans. Graphically indicate floor levels and floor elevations on schematic diagrams.

H. Details shall be provided for roof penetrations, floor and wall penetrations, and all other components that require installation explanation beyond the information included within plans and schematic diagrams.

I. Include schedules clearly identifying: Location, capacity, size, manufacturer, model, electrical characteristics, options and other pertinent information for all vacuum pump systems, air compressor systems and cylinder manifolds; Locations, services monitored and annunciation descriptions for master alarm panels; Outlet and inlet combinations and mounting heights above finished floor; Zone valve cabinet combinations and mounting heights above finished floor.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03/02/10	Changed NFPA standard reference for bulk oxygen storage from 50 to 55. Paragraphs 2.01 A. and 2.02 H. Clarified minimum size requirements for pressure gases and vacuum piping. Paragraph 2.04 E.	DOS
Rev. 2	11-15-12	2.04 G & I – Deleted requirement for purge connections downstream of line shut-off valves.	DOS
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2060

D2065 Laboratory Vacuum and Gas Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses laboratory vacuum, compressed air, gaseous nitrogen, and carbon dioxide systems within and to five feet beyond building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Laboratory vacuum and gas systems shall be designed in accordance with requirements stated herein and the current editions of NFPA 99, NFPA 45 and Compressed Gas Association Standards.

B. Obtain all necessary information that is required from the Owner when determining system design and types of services.

C. A proposed system design in either diagrammatic or narrative form shall be submitted to the designated Owner's representative during the schematic phase of the Project.

D. Review the location, quantity and type of laboratory gas outlets, inlets and alarm panels with Owner's user groups during the design development phase of the Project.

E. Vacuum and gas systems serving laboratory, research and/or animal areas shall be independent of vacuum and gas systems serving patients.

F. Laboratory compressed air systems shall not be used to serve utility equipment, such as pneumatic doors, HVAC controls, etc.

G. Design lab gas and vacuum systems to deliver the following nominal pressures at the points of use: All pressure systems shall be 45 to 50 psig at maximum flow; Vacuum shall be 19 inches Hg at most distant inlets.

H. Locate station inlets and outlets at an appropriate height to prevent physical damage to attached equipment and accessories. Station inlets and outlets located above countertops shall be provided with sufficient space to allow usage and attachment of equipment without interferences by countertop, backsplash or overhead cabinets. All other station inlets and outlets having centerline located less than 60 inches above finished floor shall be protected by guardrails, recessing into walls or by other means approved by Owner.

I. Provide sufficient spacing between station inlets and outlets to allow simultaneous use with vacuum collection bottles, regulators, adaptors or any other equipment attached. Provide slide retainer bracket for collection bottle attachment adjacent to each recessed wall type vacuum station inlet.

J. Ensure that all laboratory vacuum and gas source equipment and alarm systems are provided with both normal and emergency electrical power supply.

2.02 CENTRAL SUPPLY SYSTEMS

A. Locate laboratory air compressors and vacuum pumps in a dedicated mechanical room in accordance with NFPA 99. Mechanical room shall provide a clean, relatively cool environment (i.e., not to exceed 100 degrees F ambient temperature). Equipment shall be located with adequate access space for regular monitoring and servicing. Provide floor drain adjacent to equipment pads. Floor drains serving vacuum pumps shall be provided with smooth, acid resistant interior coating. Provide a hose bib within mechanical room.

B. Locate the laboratory air compressor system intake outdoors above roof level. Air intake may extend through exterior wall and terminate below roof level when approved by Owner’s. Air compressor system intake terminals shall be located at least 25 feet (may require more depending upon prevailing wind direction and velocity) from all exhausts, vents, vacuum system discharges or any anticipated source of odor or particulate matter. Air that is filtered for breathable ventilation system use may be considered an acceptable source of intake air when approved by Owner’s. Combined air intakes must be sized for no restriction while flowing maximum intake possible, and shall be provided with an isolation valve at the header for each compressor served. Intake piping for air compressors shall be sized using the total SCFM for the system (both lead and lag pumps) and the total developed length of run. Coordinate with air compressor system technical representative and verify that proposed sizing of intake piping complies with manufacturer’s recommendations.

C. Terminate laboratory vacuum exhaust discharge outdoors above roof level. Exhaust may extend through exterior wall and terminate below roof level when approved by Owner’s. Laboratory vacuum exhaust shall terminate at least 25 feet horizontally (may be more depending upon prevailing wind direction and velocity) from all air intakes, doors, windows, louvers or any other building openings. Combine exhaust from each laboratory vacuum pump into one discharge pipe, sized for no restriction while flowing maximum discharge possible, and shall be provide with an isolation valve at the header for each pump served. Exhaust piping for vacuum pumps shall be sized using the total SCFM for the system (both lead and lag pumps) and the total developed length of run. Exhaust piping shall be sized and arranged to prevent moisture and back-pressure from entering pump. Provide valved drip-leg at base of exhaust stacks. Coordinate with vacuum pump system technical representative and verify that proposed sizing of exhaust piping complies with manufacturer’s recommendations.

D. Laboratory air compressors and vacuum pumps shall be multiplexed with receiver tanks and sized such that 100 percent of the design load is carried with the largest single unit out of service. Increase the calculated (SCFM) load by 25 percent to accommodate future system expansion.

E. Design air dryers, filters and pressure regulators for the laboratory air system in duplex, each sized for 100 percent of the load using duplex twin tower desiccant dryers. Include continuous line dewpoint and carbon monoxide monitoring with sample connections on the discharge piping downstream of the filters and regulators. Locate monitors at, or integral with, the control panel.

F. Provide sufficiently sized, properly ventilated and constructed room for laboratory gas cylinder storage and manifold systems in accordance with NFPA 99. Coordinate with the designated Owner's representative to determine space required for storage of additional non-manifolded cylinders. Gas cylinder storage rooms shall be located at ground level with at least one exterior wall and be provided with a minimum 42 inch door opening to the outside. Localized gas cylinder storage rooms may be provided at other locations within the building when approved by Owner.

2.03 ALARM SYSTEMS

A. To ensure continuous responsible observation, provide two master system alarms, in separate warning locations, for all laboratory vacuum and gas source equipment systems. Coordinate both master system alarm annunciator locations with the user facility and the other design deciplines. When deciding upon alarm locations, consider emergency power circuits, engineering control center data relay interface locations, and the facility's established procedures for monitoring alarm signals.

B. The primary warning location shall be supervised by engineering personnel, and is required to be located at one of the following (in order of priority): Main equipment plant control office, engineering control center, or in the office or principal working area of the individual responsible for the maintenance of the laboratory vacuum and gas systems. The secondary warning location shall be located to assure 24-hour constant surveillance. Suitable secondary warning locations may include building automation system (BAS) station, telephone switchboard (PBX), security office or other continuously staffed location.

C. Building management systems must not be exclusively relied upon to monitor laboratory vacuum and gas alarms.

D. Provide high/low line pressure/vacuum sensors at most remote points from source equipment in each system. Status of remote monitoring points shall be annunciated at both master system alarm locations.

2.04 PIPING SYSTEMS

A. Design pressure piping systems not to exceed 35 kPa (5 psi) loss from source to point of use. Design vacuum piping systems not to exceed 10 kPa (3 inches Hg) loss from source to point of use.

B. Design laboratory gas and vacuum piping systems based upon the following simultaneous usage tables: Note: Minimum flow rates for any pipe section shall be: Laboratory Air – 57 L/min (2 SCFM); Vacuum – 85 L/min (3 SCFM); Carbon Dioxide – 57 L/min (2 SCFM); Nitrogen – 142 L/min (5 SCFM).

Laboratory Compressed Air Outlet Simultaneous Use Factors
(1 SCFM per inlet)

Quantity of Inlets	Use Factor %	Minimum SCFM
1 - 2	100	2

3 - 12	80	5
13 - 38	60	10
39 - 115	40	25
116 - 316	30	50
317 - 700	20	95

Laboratory Vacuum Inlet Simultaneous Use Factors (1 SCFM per inlet)

Quantity of Inlets	Use Factor %	Minimum SCFM
1 - 4	100	3
6 - 12	80	5
13 - 33	60	10
34 - 80	50	21
81 - 150	40	40
151 - 315	35	61
316 - 565	30	111
566 – 1,000	25	171
1001 – 2,175	20	251
2,176 – 4,670	15	436
4,671 and Above	10	701

Laboratory Carbon Dioxide Outlet Simultaneous Use Factors
(1 SCFM per inlet)

Quantity of Inlets	Use Factor %	Minimum SCFM
1 - 2	100	2
3 - 12	80	5
13 - 38	60	10
39 - 115	40	25
116 - 316	30	50
317 - 700	20	95

Laboratory Gaseous Nitrogen Outlet Simultaneous Use Factors
(1 SCFM per inlet)

Quantity of Inlets	Use Factor %	Minimum SCFM
1 - 5	100	5
6 - 12	80	7
13 - 38	60	10
39 - 115	40	25
116 - 316	30	50
317 - 700	20	95

C. Include a 25 percent calculated (SCFM) load for sizing distribution mains to accommodate future system expansion.

D. To allow for future expansion and renovations without replacing piping; branches and drops to individual outlets for the pressure gases shall be a minimum of ½ inch, sub-mains shall be a minimum of ¾ inches in size and main lines shall be no less than 1 inch. Branches and drops to individual vacuum inlets shall be a minimum of ¾ inches, sub-mains shall be a minimum of 1 inch in size and main lines shall be no less than 1½ inches. Zone valves and associated piping within walls shall not be smaller than ¾ inch except for zones valves and piping serving individual rooms.

E. Place a source shut-off valve for each laboratory vacuum and gas system at the immediate outlet (or inlet, in the case of vacuum) of the source of supply, so that the entire supply source, including all accessory equipment, can be isolated from the entire pipeline system. Provide each main line supply line with a shut-off valve. Locate valve accessible by authorized personnel only and locate downstream of the source valve and outside of the source room, enclosure, or where the main valve enters the building. Provide laboratory vacuum and gas services with line pressure and vacuum gauges at the source (and immediately inside the building, where source is remote from building).

F. Provide each riser supplied from the main line with an in-line shut-off valve located at the base of the riser. Provide each branch supplied from a riser with an in-line shut-off valve adjacent to the riser. Provide additional service valves in each branch line at point of connections to mains, in branch lines serving more than one zone valve, and at other locations to strategically subdivide areas for maintenance. Conceal in-line service and shut-off valves at secure locations (e.g. above ceiling with ceiling tag, or in a locked equipment room), and specify that these valves be locked open and identified in accordance with NFPA 99.

G. Provide zone valves for all branch piping serving individual laboratory rooms. Locate zone valves above ceiling in corridor immediately outside of room and accessible to staff for servicing and operation.

H. Strategically locate minimum ¾ inch valved and capped connections for future system expansion of laboratory vacuum and gas piping distribution systems. Extend capped connections minimum 18 inches from valves. Coordinate size and locations of future connections with Owner's Research and Education Facilities and Building Operations Management during the Design Development phase of the Project.

I. Design carbon dioxide distribution piping to allow metering of usage by various departments. Coordinate with Owner for quantity and location of meters.

2.05 RENOVATION PROJECTS

A. Survey current installation and coordinate with Owner's Research and Education Facilities and Building Operations Management to verify type, location, size and capacities of existing piping and source equipment for determining adequate tie-in points.

B. Survey current installation to ascertain the type of existing alarms, laboratory gas station outlets and laboratory vacuum terminal inlets. All new alarms shall match and be compatible with the existing installation. All new outlets and inlets shall match the existing terminal connections and not require the use of secondary adapters. In cases where existing alarms, station outlets or terminal inlets are no longer available, not U.L. approved, or not NFPA 99 compliant Coordinate with Owner to determine types to be specified within Contract Documents.

C. Review the proposed alarm, outlet and inlet types, and connection locations to existing piping and alarms with Owner's Research and Education engineering and building operations staff during the Design Development phase of the Project.

D. Install shut-off valve at the connection of new line to existing line.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schematic diagrams, schedules and details indicating all information required to clearly illustrate the intent of system design.

B. Floor plans shall include, but not be limited to location, sizes and identification of all: Piping from source equipment or existing piping connections to terminals; intake and exhaust piping from source equipment to terminal or connection to existing piping; alarm panels; alarm sensors; pressure gauges; relief valves; relief valve discharge terminals; zone valves; in-line shut-off and service valves; future valved connections; source equipment; inlets and outlets.

C. Schematic diagrams shall include, but not be limited to identification and sizes of all: piping from source equipment or existing piping connections to zone valves; all intake and exhaust piping from source equipment to terminals or connections to existing piping; alarm annunciators; alarm sensors; pressure gauges; zone valves; in-line shut-off and service valves; future valved connections; source equipment.

D. Actual calculated usage flows (not including percentages added for future expansion) shall be noted on schematic diagrams at source valves, where service enters the building (when source is remote from building), base of risers, floor branch connections to risers, branch connections to mains and at zone valves. Indicate maximum flows allowed at each future valved connection.

E. Identify location of each zone valve, area alarm annunciator and source equipment on schematic diagrams with room name and number.

F. Bottom of pipe elevations shall be noted for piping at locations where close coordination is required to prevent conflicts with other systems and/or building components.

G. Graphically identify each riser on plans and schematic diagrams. Riser identification on schematic diagrams shall correspond to riser identification on plans. Graphically indicate floor levels and floor elevations on schematic diagrams.

H. Details shall be provided for roof penetrations, floor and wall penetrations, and all other components that require installation explanation beyond the information included within plans and schematic diagrams.

I. Include schedules clearly identifying: Location, capacity, size, manufacturer, model, electrical characteristics, options and other pertinent information for all vacuum pump systems, air compressor systems and cylinder manifolds; Locations, services monitored and annunciation descriptions for master alarm annunciators; Outlet and inlet combinations and mounting heights above finished floor.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	07-08-10	2.01 G. ; Changed vacuum level from 25 to 19 inches of mercury (Hg). 2.04 I. ; Added requirement for metering carbon dioxide usage.	DOS
Rev. 2	11-15-2012	2.04 F & H – Deleted requirement for purge connections downstream of line shut-off valves.	DOS
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D2065

D3000 General Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. HVAC systems design shall be performed by a Texas licensed professional engineer.

B. Where it is considered by the A/E that the proposed systems design cannot comply with the requirements stated and referenced herein, the A/E shall communicate such concerns to the Owner's Project Manager in writing and resolve non-compliance in sufficient time during the design phase of the Project to meet Contract schedule obligations.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies. Where direction described in applicable codes are in conflict, the A/E shall comply with the more stringent requirement. The A/E is required to make themselves aware of all applicable codes and ordinances and assure compliance thereto.

B. Where provisions for future equipment, fixtures or building expansion are required, systems equipment capacity, pipe sizing and arrangement shall accommodate proposed demand. Coordinate with the Owner during Programming to identify and document specific project requirements.

C. Coordinate all room equipment information with the Project Architect for mechanical requirements.

D. HVAC design must be coordinated with all other disciplines such as, Architectural, Structural, Electrical, Plumbing and Civil/Site. The following HVAC related work is usually shown by other disciplines:

1. Architectural drawings and specifications show all louvers and attached screens in exterior walls, all flashing for ducts and pipes penetrating roofs and exterior walls, finish and identification, painting of walls and ceilings, access panels, chases, furred spaces, mechanical equipment rooms, and penthouses.

2. On new construction projects coordinate with Architectural consultant to consider fixed external shading devices, reduced glazing areas, and increased thermal envelope insulation values. Reduced thermal loads will reduce physical installation requirements of mechanical equipment, reduce above ceiling congestion, and reduce HVAC construction cost. Reduced thermal loads are required to be considered in load calculations by HVAC Engineer. Intent is to reduce the installed heating/cooling capacity while reducing energy consumption over the life of the facility.

3. On new construction projects coordinate with Architectural consultant to provide appropriate building enclosure, including exterior wall/roof insulation values, air barriers,

and vapor retarder systems. Coordinate that all exterior penetrations are to be fully sealed to prevent infiltration per ASHRAE 90.1, limiting the effect on the HVAC system. Common areas of special attention required to be reviewed include window/door framing, intersection of differing building materials, intersection of material segments, and intersection of building planes.

4. Structural drawings and specifications show all concrete and structural steel work, including catwalks, concrete housekeeping pads, lintel supports around openings, and platforms for access to HVAC equipment and supports for cooling towers and other large mechanical equipment. Structural drawings indicate pipe support design details for floor and wall-mounted supports.

5. Electrical drawings and specifications show motor starters and disconnects not furnished as part of HVAC equipment, smoke detectors (duct and/or space mounted), all power wiring to HVAC smoke dampers and motors.

6. Plumbing provides all domestic water make-up supply and drain outlets, underground oil storage tank(s) and piping for emergency generators.

E. Coordinate and make provisions for all necessary stairs, catwalks, platforms, steps over roof mounted piping and ducts, etc., that will be required for access, operation and maintenance. Access to roofs by portable ladder is not acceptable.

F. Equipment shall be located to be accessible for installation, operation and repair. Mechanical spaces shall be of suitable size to permit inspection and access for maintenance, and to provide space for future equipment when required. The effect that equipment noise or vibration might have on areas adjacent to, above, and below equipment shall be considered. Location of equipment remote from sound sensitive areas should be emphasized. Design shall comply with specified room sound ratings.

G. Equipment on emergency power and their associated controls must be located above the FEMA 500-year flood elevation. Emergency power is required for various systems and is specifically identified throughout the Design Guidelines. A/E is to consider emergency power needs in systems configurations and groupings. Project emergency power needs are to be identified and documented during Programming.

H. Floor areas that are purposely designed as shell or build out space in a building shall be properly ventilated and dehumidified/conditioned to alleviate the creation of a detrimental environment that would support mold growth. Provide adequate space conditioning such that relative humidity levels do not exceed 60% RH.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Room names and numbers, and column lines and their designations shall appear on all floor and partial floor plans as they appear on architectural drawings.

B. HVAC floor and partial plans shall include graphic scales, north arrows and key plan.

C. Floor plans shall show ductwork piping, valves, equipment, etc.

D. Performance data schedules for all equipment shall be shown in schedules on the Drawings.

E. Include legend on Drawings identifying applicable symbols and abbreviations.

F. The A/E shall include in the General Notes section of the Drawings a note stating "No mechanical piping or HVAC duct (except where used for stairwell pressurization purposes) shall penetrate through fire resistance rated exit enclosures (stairwells and exit passageways)".

G. All equipment and material specifications shall be bound in the Project Manual.

H. HVAC Drawings shall clearly indicate location and ratings of all fire and smoke partitions and shall also include the table of legends used to describe the firewall and/or smoke ratings.

1. Do not employ "smoke control" unless it is specifically required by NFPA (e.g. still need to utilize stairwell pressurization and HVAC shut down).

2. Utilize duct detector arrangements to affect HVAC shutdown as required by NFPA - do not employ HVAC shutdown upon general alarm. HVAC shutdown shall be affected by a two-detector, "cross-zoned" arrangement where both detectors must alarm before shutdown occurs. This is an arrangement similar to that employed in clean agent installations.

I. Refer to individual Design Guideline Element sections for additional document requirements applicable to the various systems.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 B; 2.01 D 2; 2.01 D 3; 2.01 D G & 2.01 D H)	JCD
Rev. 2	01-19-12	Insert statement which is now 3.01 F., statement G. was previously F. and so on. The purpose of this revision is to close action item from lessons learned from CTT with respect to code requirements limiting penetrations in stairwells to be only for life safety purposes.	PDN
Rev. 3			

END OF ELEMENT D3000

D300001 Renovation General Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3000, with specific criteria for projects involving construction of alterations to existing buildings.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The A/E is responsible for surveying existing buildings to confirm location, type, and condition of existing utilities, equipment, and associated components, including but not limited to: air handling equipment, exhaust fans, ductwork, air devices, dampers, and temperature sensors. In addition, the A/E must determine if adequate space is available for proposed ductwork, piping, and equipment. The A/E must not rely upon Owner furnished as-built drawings alone.

B. Early in the design phase, the A/E shall make arrangements in advance with the Owner's Project Manager for access above ceilings to determine the above noted field conditions and to locate existing HVAC components and utility services.

C. Contact and coordinate with Owner's Environmental Health and Safety (EH&S) Department to identify existing fire, smoke and fire/smoke dampers within the Project Boundary and to determine acceptable actions to be taken. Clearly communicate this scope of Work within the Construction Documents.

1. The following table represents typical conditions and actions regarding existing dampers. Verify actual scope of Work required with (EH&S) prior to finalizing Construction Documents:

Criteria	Action
Compliant and Needed	Maintain
Compliant and Not Needed	Remove Completely
Deficient and Needed	Replace with New or Repair
Deficient and Not Needed	Remove Completely
Access Issue and Needed	Repair
Access Issue and Not Needed	"Abandon in Place" and Document

D. When zoning and selecting air handling systems, consideration must be given to the following:

1. Space availability for equipment, piping, equipment floor drains, and ductwork.

2. Construction phasing requirements.

3. Present capacity and condition of the existing HVAC systems, and components if any, serving areas to be renovated.

4. Determine current HVAC load requirements prior to calculating the revised HVAC loads for the renovated Project area.

5. Impact of renovation activities on adjoining areas not included in the Project.

E. The A/E shall examine the existing building envelope and recommend improvements to enhance thermal efficiency if proven economically and technically feasible.

F. Investigate the feasibility; both capacity and physical location, of connecting to existing steam, hot water, chilled water, and condensate return piping that serve the Project area. Notify the Owner's Project Manager if existing utilities do not support loads within the new Project area.

G. Indicate on the Drawings for new work, new isolation valves for utilities, if such valves are not currently installed.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Required demolition of existing HVAC systems must be indicated on the Drawings. For clarity in work scope, demolition work should be indicated on a separate drawing from new work.

B. Specific detailing of interfaces between alterations and existing to remain shall be clearly indicated on the Drawings.

C. Where existing equipment must be modified to be physically used on a project, evaluate if initial and operational cost savings will be realized by modifying the existing equipment rather than installing new. Provide recommendations.

D. Provide drawing section(s) to resolve conflicts. Location of new equipment and services must be coordinated with all involved construction disciplines. Phasing of construction work must be coordinated with all involved parties. Phasing of construction work must be coordinated with operation of the facility and Owner's staff and be accounted for in the design.

E. If Owner wishes to retain existing HVAC equipment considered obsolete as a result of modification, the A/E should note this on the demolition drawings; otherwise, the contractor in accordance with General Conditions of the Contract will dispose of the equipment.

F. Note on the Drawings if applicable to the Project, that other services passing through areas of renovation shall be maintained throughout the construction period.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. New equipment shall be compatible with existing components and systems to which they interface.

C. If the A/E has determined that existing equipment will be reused, the A/E shall verify the availability of spare parts.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-05-13	Added requirements for fire, smoke, fire/smoke damper removal/abandonment. Paragraph 2.01 C.	DOS/BG
Rev. 2	06-11-13	Added the word “Completely” in table for compliant and not needed fire, smoke, fire/smoke damper removal. Paragraph 2.01 C. 1.	DOS/BG
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D300001

D300101 Patient Treatment Load Calculation Criteria

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3001 with specific requirements for patient treatment occupancies that the A/E must incorporate when calculating HVAC cooling and heating loads.

B. Load calculations must be performed in accordance with the latest ASHRAE Handbook of Fundamentals.

C. Refer to Design Guideline Element D3001 for general design criteria related to outdoor design conditions, internal loads, occupant density, occupant heat rejection, building envelope, and system zoning.

PART 2 - DESIGN CRITERIA

2.01 INDOOR DESIGN CONDITIONS

A. Use ASHRAE / ASHE Standard 170 Ventilation of Health Care Facilities (latest revision).

B. Humidification for control shall be provided for applications where indicated.

C. Coordinate environmental requirements for special equipment in accordance with manufacturer’s recommendations.

D. Design conditions for spaces that house special equipment such as diagnostic imaging and X-ray equipment etc, shall be dictated by the respective equipment manufacturer.

2.02 BUILDING VENTILATION / PRESSURE RELATIONSHIPS

A. The A/E shall ensure that make-up air required to maintain negative pressure and excess air to maintain positive pressure are available and taken into account in the air balance calculations.

B. Supply air to occupied spaces will use a mixture of return air and pretreated outside air, unless noted otherwise herein.

C. Where ASHRAE requires a particular static pressure differential be maintained between the room adjacent spaces, the A/E shall calculate the offset between supply air and exhaust as needed to maintain that pressure. A control strategy shall be designed to track that offset.

D. Room ventilation and pressure relationships shall be based on ASHRAE /ASHE Standard 170 Ventilation of Health Care Facilities.

E. Pharmacy Compounding Rooms the air change rates and pressurization requirements shall comply with USP 797.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Unless stated otherwise in these Owner's Design Guidelines, the A/E need not submit calculations or economic analysis for review. Copies must be retained and presented however, to Owner for review upon request.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-04-10	2.01 Replaced Indoor Design Conditions table with reference to ASHRAE Standard - 170 2.02 E added clarification statement to separate pharmaceutical compounding from ASHRAE 170 which provide requirements for standard hospital pharmacy. Deleted E. reference to Indoor Design Conditions Table in 2.01. Deleted F.	PDN
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D300101

D300102 Laboratory Load Calculation Criteria

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3001 with additional requirements for laboratory occupancies that the A/E must incorporate when calculating HVAC cooling and heating loads.

B. Load calculations must be performed in accordance with the latest ASHRAE Handbook of Fundamentals.

C. Refer to Design Guideline Element D3001 for general design criteria related to outdoor design conditions, internal loads, occupant density, occupant heat rejection, building envelope, and system zoning.

PART 2 - DESIGN CRITERIA

2.01 INDOOR DESIGN CONDITIONS

A. The following table applies to Laboratory spaces that are in addition to office spaces, which are listed in Design Guideline Element D3001.

Application	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Tissue Culture Room	74°F ± 2°F	72°F ± 2°F	30-50
Cold Room	19°F ± 0.1°F	19°F ± 0.1°F	30-50
Flex (Interim Space) Room	74°F ± 2°F	68°F ± 2°F	30-50
Chemical Fume Hood Room	74°F ± 2°F	68°F ± 2°F	30-50
Dark Room	70°F ± 2°F	68°F ± 2°F	30-50
LN 2 Freezer Room	74°F ± 2°F	68°F ± 2°F	30-50
Glass Wash Room	74°F ± 2°F	68°F ± 2°F	30-50
Storage Room	74°F ± 2°F	72°F ± 2°F	30-50
Equipment Room	80°F ± 5°F	55°F ± 5°F	25-50

B. Humidification for control shall be provided for applications where indicated.

1. Size the steam delivering capacity of the humidifier to maintain the room at mean 45 percent relative humidity and at minimum design air temperature of 72 degrees F during winter minimum outside air temperature conditions.

2. Size the capacity to maintain relative humidity in the space at mean 45 percent at a maximum condition of 74 degrees F.

C. Coordinate environmental temperature limits and humidity requirements for special equipment in accordance with manufacturer's recommendations.

D300102 Laboratory Load Calculation Criteria

2.02 INTERNAL LOADS

A. When calculating HVAC system loads for selecting equipment, incorporate the following safety margins, unless directed otherwise by Owner during the Schematic Design phase:

1. 8 watts per square foot for internal sensible power loads at receptacles.

2. Apply a 10 percent safety factor to sensible Btuh loads for system design capacity to the HVAC system.

2.03 VENTILATION LOADS

A. Refer to Design Guideline Element D304202 Laboratory Exhaust Ventilation for minimum air change rates applicable to different types of laboratory spaces and support rooms.

B. Different types of Biological Safety Cabinets with their design exhaust rates that affect room ventilation rates are listed within Design Guideline Element D304202.

2.04 SYSTEM ZONING

A. In determining zones for air handling unit service, consider the following:

1. Tissue culture rooms and chemical fume hood rooms will require separation of air handling systems to prevent the possibility of cross contamination from one controlled space to another.

2. Zone office areas and laboratory areas separately with service from different air handling systems.

3. Each tissue culture room and support room must have individual temperature control.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Unless stated otherwise in these Owner's Design Guidelines, the A/E need not submit calculations or economic analysis for review. Copies must be retained and presented however, to Owner for review upon request.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Revised cold room temperature and humidity per JGC comment	PDN
Rev. 2	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01; 2.01 B; 2.01 E & 2.04 A;)	JCD
Rev. 3	02-11-10	Added load value of 8 watts per square foot for internal sensible plug power loads. Paragraph 2.02 A. 1.	PDN
Rev. 4	07-08-10	Revised 2.02 A. 2., to be in agreement with ODG 3001 requirement. Deleted 2.02. A.3. Revised Section 2.03 from 2.05 Ventilation Loads. Revised 2.04 to be System Zoning from Section 2.06., and added 2.04 .2 and3. zone requirements for tissue rooms and support areas.	SAK / DAB
Rev. 5			

END OF ELEMENT D300102

D3001 Load Calculation Criteria

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes requirements for calculating HVAC cooling and heating loads.

B. Load calculations must be performed in accordance with the latest ASHRAE Handbook of Fundamentals.

C. The HVAC system shall include all energy, distribution and control systems required to provide a completely functional heating, ventilating and air conditioning system for the Project. The systems described within this document are provided to aid the A/E in the design of the Project and are not intended to address every HVAC component required.

PART 2 - DESIGN CRITERIA

2.01 OUTDOOR DESIGN CONDITIONS

A. Design conditions for HVAC load calculations at facilities located in Houston and at Smithville and Bastrop shall be based on the following Design Criteria.

	Houston	Smithville / Bastrop
Cooling Dry Bulb	96°F	100°F
Cooling Wet Bulb	80°F	77°F
Heating Dry Bulb	20°F	20°F

2.02 INDOOR DESIGN CONDITIONS FOR OFFICE AND ADMINISTRATIVE AREAS

A. As a guide, indoor design conditions shall be based on the following Design Criteria:

Application	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Office, Conference, Administrative Support, Corridors, Public Areas, Elevator Machine Rooms	74°F ± 2°F	69°F ± 2°F	<60
Toilet Rooms	74°F ± 4°F	69°F ± 4°F	<60
Telephone /Communications Intermediate Distribution Rooms (IDR) and Main Distribution Rooms (MDR), Audio/Video Rack Rooms	72 ± 3°F	67± 3°F	40-70

D3001 Load Calculation Criteria

Application	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Equipment Rooms	55°F - 80°F	55°F - 80°F	<60

1. Confirm indoor design conditions of telecommunications rooms with Design Guideline Element D5030, Telecommunications. Refer to Element D3041 Air Handling Distribution for HVAC equipment requirements.

2. Occasional deviations beyond stated design conditions may occur; however, such deviations should not affect the intended function of the space.

3. Humidification for control shall be provided only for applications where indicated.

4. Coordinate environmental requirements for special equipment in accordance with manufacturer's recommendations.

2.03 INTERNAL LOADS

A. As a guide, base preliminary HVAC system loads to size equipment on the following lighting and equipment loading for the various spaces, unless actual lighting and equipment loads are known.

Application	Lighting (Watts/Square Foot)	Equipment (Watts/Square Foot)
Corridors, Public Areas	Note "a"	0.5
Office Areas	Note "a"	2.5
Conference Rooms	Note "a"	1.0
Food Service	Note "a"	20.0 (Base on Actual)
Equipment Rooms	Note "a"	Base on Actual
Storage Rooms	Note "a"	0.0
Toilet Rooms	Note "a"	0.0
Patient Care Support	Note "a"	1.0

a. Refer to Table "Lighting Power Densities Using the Space-by-Space Method", ANSI/ASHRAE/IESNA Standard 90.1 for lighting watts/square foot.

b. Confirm with Owner on lighting power densities for certain applications that may exceed ANSI/ASHRAE/IESNA Standard 90.1 requirements.

B. When calculating HVAC system loads for selecting airside equipment, incorporate the following safety margins, unless directed otherwise by Owner during the Schematic Design phase:

1. Apply a 10 percent safety factor to sensible and latent BTUH design loads for patient, conference, auditorium and waiting rooms.

2. For selected outside air handling equipment apply a 10 percent sensible safety factor for cooling coil and fan capacity.

3. Confirm with Owner if adjustments to safety margins need to be considered for future expansion or flexibility in space programming. Coordinate with Owner during Programming to identify and document specific project requirements.

C. When calculating HVAC system loads for selecting cooling and heating generating systems such as heat exchangers and pumps, base equipment selection on peak cooling and heating generating loads with no safety factor, since the additional 10 percent safety factor should already exist in the system load requirements.

2.04 OCCUPANT DENSITY

A. Base occupant density in accordance with ASHRAE Standard 62. Confirm this number of occupants with the Facility Program or Pre-Design Report as space programming is finalized.

2.05 OCCUPANT HEAT REJECTION

A. In general, use heat gain rates for occupants listed in ASHRAE Handbook of Fundamentals.

2.06 BUILDING ENVELOPE

A. Refer to the Design Guideline Element B for wall, roof, and glass construction criteria, where applicable.

B. Roof and glass U values must meet or exceed the values noted in ANSI/ASHRAE/IESNA Standard 90.1.

2.07 BUILDING OCCUPANCY

A. Mechanical systems for general office/administration areas will operate during normal business hours with unoccupied setback capability. Confirm areas that require 24-hour/7 day air conditioning with the Owner’s Project Manager, including but not limited to, telecommunications and elevator machine rooms.

B. General operating hours will be 7am – 6pm Monday through Friday, however, confirm intended operating hours with the Owner’s Project Manager.

2.08 BUILDING VENTILATION

A. Supply air to occupied spaces will use a mixture of return air and pretreated outside air, unless noted otherwise herein.

B. Outside air requirements shall be based on ASHRAE Standard 62 and where applicable, Department of State Health Services (DSHS) guidelines. Outside air quantities must also be based on maintaining a minimum overall building net pressurization.

C. Utilize a combination of directly supplied conditioned air and transferred make-up air to toilet rooms and janitor’s closets via air devices and transfer jumper ducts (as needed) to maintain design temperature and to provide make-up air for exhaust requirements. Where toilet rooms include two or more fixtures (toilets or urinals), provide ventilation occupancy controls to reduce exhaust flow during unoccupied periods (for example: via 2-position control damper in exhaust ductwork tied to light switch with time delay feature).

D. Do not air-condition stairwells.

2.09 SYSTEM ZONING

A. In determining zones for air handling unit service, consider the following:

1. Structural and architectural building constraints and layout.

2. Functional use of the space; similar occupancies may be served from a single air handling unit, while other functions such as food service/dining or conference centers should be provide with dedicated units.

3. Discuss proposed air handling unit zoning with Owner during the Schematic Design Phase.

B. In general, terminal unit zoning will be as follows:

1. Maximum four (4) offices per perimeter zone temperature control. Do not exceed 1500 CFM per terminal unit.

2. Maximum six (6) offices per interior zone temperature control; maximum 1200 square feet per zone. Do not exceed 1500 CFM per terminal unit.

3. Zone areas in accordance with functional use of the space and similar occupancies.

4. Zone open office areas separate from individual, enclosed offices.

5. Exterior corner zones shall be served by dedicated terminal units.

6. Zone waiting rooms and lobby area separate from other rooms.

7. Each conference room, including sub-dividable rooms, must have individual terminal unit and temperature controls.

8. Telecommunications rooms and audio/video rack rooms shall each be served by dedicated terminal units. Refer to actual equipment loads and associated environmental characteristics to determine if a fan-coil unit or computer room air handling unit will be required for conditioned air supply.

9. Zone areas with high concentration of equipment loads separate from general office areas.

2.10 BUILDING PRESSURE RELATIONSHIPS

A. Toilet rooms, locker rooms, food service, and janitor’s closets will be at a negative pressure with respect to adjacent spaces.

B. Design overall building pressurization to be slightly positive on every floor to reduce infiltration. Net positive pressurization (outside air less exhaust air) should be equal to between 5 and 15 percent of total supply air flow, depending on envelope design and construction. Note that tighter buildings are eligible for less net pressurization.

C. The A/E shall ensure that make-up air required to maintain negative pressure and excess air to maintain positive pressure are available and taken into account in the air balance calculations.

D. Where ASHRAE requires a particular static pressure differential be maintained between the room adjacent spaces, the A/E shall calculate the offset between supply air and exhaust air as needed to maintain that pressure. A control strategy shall be designed to track that offset.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall submit calculations and economic analysis for Owner review.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Specify air curtains at loading dock doors that open to air-conditioned spaces.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.02; 2.02 B; 2.02 E; 2.03 C 3; 2.05 A;2.08 B; 2.08 C & 2.10 B))	JCD
Rev. 2	03-02-10	Revised temperature and humidity requirements telecommunication rooms from ODG prepared by Tele-communications.	PDN
Rev. 3	07-08-10	Added 2.02 A. Clarification of guide table for design. Revised Sections 2.02 A. 1, and 2, editorial clarifications, Revised 2.03 1. and 2. editorial clarifications. 2.04. A. added ASHRAE 62. Standard. Deleted statement 2.07 C. Revised 2.09 to require discussion from A/E on zoning prior to implementing calculations and design drawings.	PDN
Rev. 4	09-16-10	2.02 A: added Elevator Machine Rooms to Design Temperature and Humidity Table. Revised 2.03 “recommendation” to read “requirements”; 2.09 B.7 added terminal units for individual control; revised 3.01 A.	KTB / PDN
Rev. 5	03-21-13	Revised 2.02A and 2.09B 8 for audio/video rack rooms	SAK

END OF ELEMENT D3001

D3002 Sound Criteria

PART 1 - GENERAL

1.01 OVERVIEW

A. Acoustical design practices to minimize noise transmission from HVAC systems, is addressed in this section. Refer to Chapter 47 “Sound and Vibration Control” of the ASHRAE Applications Handbook and Chapter 7 “Sound and Vibration” of the ASHRAE Fundamentals Handbook.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The design will not exceed the following HVAC system noise levels using the RC Mark II Room Criteria Method in the 500, 1000, and 2000 – Hz octave bands for respective application or occupancy type. Note that noise RC(N) levels are independent of and prior to the installation of equipment and furnishings within each space.

B. A/E shall confirm specific requirements for applications not included in the following Table.

Application	Room Criteria (N)
Private Offices	25-35
Open-Plan Offices	30-40
Office Corridors and Lobbies	40-45
Conference Rooms	25-35
Teleconferencing Rooms	25
Training Rooms	25-35
Large Meeting/Banquet Rooms with Amplified Speech	30-40
Libraries	30-40
Dining Rooms and Serveries	35-45
Inpatient Rooms	25-35
Shared Patient Rooms	30-40
Exam Rooms	35-40
Procedure/Treatment Rooms	35-40
Operating Rooms	25-35
Patient Corridors and Public Spaces	30-40
Shared Work Rooms	30-40
Normally Unoccupied Support Rooms	40-45
Laboratories	45-55
Laboratories with Extensive Speech and Telephone Conversation	40-50
Animal Holding Rooms	35-45

D3002 Sound Criteria

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E must engage services of an acoustics consultant during the Design Development Phase to ensure the room sound criteria are met prior to final selection of equipment.

B. The acoustics consultant shall be provided with manufacturer's data for air handling units representative of the Project and a ductwork drawing with sheetmetal sizes. The acoustics consultant will be responsible for determining the necessary means for achieving design RC(N) levels per the Room Criteria Method prior to the issuance of 95 percent complete Construction Documents.

C. If sound attenuation is necessary based on the acoustics consultant's recommendation or the project/design conditions, apply attenuation measures with consideration of effectiveness, installation, maintenance, and economy. Include such measures as: selection of components for low noise performance (e.g. fans, terminal boxes, air valves, steam pressure reducing valves); attenuation at the sound generated source (e.g., the air handling unit fan, prior to unit final filter); and low air pressure drop sound reduction measures (e.g. acoustical double wall ductwork, acoustical flexible ductwork, sheet metal duct elbows with acoustical turning vanes, and efficient fan discharge condition).

D. Reliance on sound path attenuation such as duct silencers or acoustically lined duct in the supply duct air stream is not acceptable unless specifically accepted by the Owner.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specification sections for specific product sound power level requirements appropriate to the Project. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 3.01 C & 3.01 D)	JCD
Rev. 2			

END OF ELEMENT D3002

D3010 TECO Energy Supply

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses criteria for buildings with thermal chilled water and steam energy provided by the Texas Medical Center Central Heating and Cooling Services Corporation (TECO).

B. For specific design requirements, refer to the latest revision of TECO's New Service Connection Manual.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. TECO chilled water and steam services shall enter the building's first floor mechanical room from below the slab. The building thermal energy services shall tie into TECO chilled water supply and return mains and high pressure steam and low pressure pumped condensate return mains located below grade.

1. TECO will install chilled water and steam service lateral lines to a point five (5) feet from the exterior wall.

2. Chilled water and steam service lines shall be returned immediately adjacent to the point of delivery unless TECO agrees in writing to a different point of delivery.

B. Energy supply to the building will be metered through a chilled water meter, steam meter and a condensate meter provided by TECO and installed by the Division 23 contractor. The A/E shall coordinate TECO meter locations and space requirements within the mechanical equipment room per TECO criteria.

C. The A/E shall confirm all criteria noted above and coordinate exact thermal energy service entrance locations to the building.

2.02 CHILLED WATER SERVICE

A. The (TECO) design chilled water supply temperature to the building for cooling will be 43 degrees F. The building HVAC piping design shall be based on peak flow. The building air conditioning system shall be designed to accommodate the TECO criteria noted below:

1. Plate and frame heat exchangers must be used to transfer heat from the building chilled water secondary side to the primary (TECO) chilled water side of the heat exchanger.

2. The heat exchanger shall be selected for a 2 degree approach where the leaving chilled water on the secondary side will not exceed 45 degrees F and the (TECO) chilled water entering on the primary side is 43 degrees F. Refer to Design Guidelines Element D3030.

3. Provide temperature and pressure gauges on the primary chilled water header.

2.03 STEAM AND STEAM CONDENSATE RETURN SERVICE

A. TECO has indicated that the steam pressure at the inlet pressure would be within a normal operating range of 125 psig to 300 psig with a maximum pressure of 425 psig and a minimum pressure of 100 psig at a maximum temperature of 625 degrees F.

B. The steam system will be designed for a steam supply pressure of 225 to 275 psig. Provide a two-stage steam pressure reducing station to reduce TECO steam pressure to 70 psig and 15 psig for use within the facility. Provide a 1/3 - 2/3 piping arrangement with the appropriate steam pressure indicating gauges for all steam pressure reducing valve stations.

C. All steam condensate shall be returned to TECO, and the pumped condensate pressure shall not exceed the maximum allowable pressures required by TECO. Pressure regulating devices shall be provided where required.

D. When a new building is planned to be connected to TECO chilled water service, a separate (make-up) water meter must be installed on the building secondary side of the chilled water system. The meter shall be a positive displacement type with a magnetic driven register that cannot be reset.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specify temperatures and pressures of TECO energy service to be delivered to the building on the Contract Documents.

B. Indicate chilled water pressure gauges at the TECO supply and return piping on the piping riser diagrams.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. The A/E shall specify a meter isolator/splitter so that the meter signal can be shared by building automation system. A/E shall coordinate the location of this device with TECO.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-23-07	Revised 2.02 C. and 2.03 C.	PDN
Rev. 2	07-08-10	Updated 2.01 A, B; 2.02 A, B: clarified temperature differentials; 2.03D: deleted requirement for backflow preventer.	DAB/PDN
Rev. 3	09-16-10	Revised 2.02 Chilled Water Service criteria; revised 2.03 B, steam pressure reducing station.	KTB
Rev. 4			
Rev. 5			

END OF ELEMENT D3010

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses criteria for buildings using chilled water provided by the University of Texas Research Park (UTRP) Central Plants (UTRP Plant), which includes all isolation valves, hydronic piping and fittings, hydronic specialties, control valves and pumps required to distribute chilled water through the UTRP piping network.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The UTRP Plant provides 40 degree F chilled water supply temperature with a return water temperature at 54 degree F.

B. Chilled water velocities are kept in normal range between 4 to 8 feet per second (fps) with maximum up to 10 fps for abnormal short term operating situations.

C. The A/E shall allow for a minimum of two (2) centrifugal split case or split-coupled vertical in-line chilled water and condenser water pumps using N+1 redundancy. Pump configuration will depend on scheduled system capacity requirements. Pumps shall be selected at 1750 RPM.

D. The chilled water pumps and condenser water pumps shall be equipped with variable frequency drives (VFD), unless it is determined by the A/E the use of a VFD is not required for a certain application.

E. Minimum ¾ inch pipe size for run-outs fan coil units or air handling units within the UTRP Central Plant.

F. Provide pre-insulated piping tee connections with isolation valves at the building’s chilled water supply and return piping that connects to existing underground UTRP Plant chilled water supply and return piping. The main tee fitting connections need to be the same size as the underground supply and return chilled water distribution piping from the UTRP Plant.

1. Minimum of 5 feet of cover over chilled water pipes

2. Parallel pipes may run side-by-side or stacked.

3. Except for valves, underground flange fitting connections should be avoided when ever possible.

4. The system design pressure is 150 psig.

5. Hydrostatic test pressure at 225 psig with no leakage over a four-hour period.

6. Isolation valves and blank off flanges are to be placed at the outlet end of the main tee connections.

7. Isolation valves are to be placed at the tee branch connections used to connect piping to the buildings.

8. Valve boxes must be used at all underground valve locations.

9. Supply and return piping dead legs are to have appropriate drain and vent valves.

G. The chilled water supply to the building shall be metered through a BTU water flow meter capable of connecting to the building automation system (BAS) to record usage. The A/E shall coordinate meter locations and space for required piping lengths within the mechanical equipment room per the manufacturer's instructions.

H. The A/E shall confirm all criteria noted above and coordinate the exact location of the chilled water service entrance location to the building.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specify chilled water supply and return water temperatures and pressures from the UTRP Plant to be delivered to the building on the Contract Documents.

B. The A/E shall include a schematic of the chilled water distribution system in the contract documents.

C. Indicate the location all pumps, air separators, expansion tanks, etc. on floor plans.

D. The A/E shall include a chilled water system distribution schematic drawing that indicates information required to clearly illustrate the intent of system design including, but not limited to, supply source, primary pumps, expansion tanks, strainers, supply and return piping, piping risers, pressure, and temperature sensors, including branch piping and shut-off valves to equipment.

E. The A/E shall include either a flanged butterfly or a gate valve of to permit proper water velocities or achieve pipe flushing criteria.

F. The A/E shall include either a flanged 2 inch or greater bypass butterfly or a gate valve of the appropriate size to permit proper water flow at underground supply and return piping dead legs.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. The A/E shall use a hydraulics model to determine the size of the chilled water supply pumps. A system hydraulics model shall be developed to determine the remaining chilled water network pipe sizes to support a totally built-out system along with incremental models for various in-process or future phases of system development.

C. Seamless piping 18 inch diameter and smaller shall be insulated with a minimum of 2 inch polyurethane insulation with a protective jacket.

D. Twenty-four (24) inch diameter supply pipe shall also be insulated unless it has more than 20 feet of cover.

E. All piping will be protected from corrosion with exterior coating/jacketing and due to certain instances of installation the piping and valves are to have cathodic protection

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-17-07	Re-Numbered Element From D301001 to D3015	PDN
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D3015

D3020 TECO Heat Generating Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. For projects requiring new or modified heat generating systems via the Texas Medical Center Central Heating and Cooling Services Corporation (TECO), this section includes criteria for the design of building heat generating systems including all isolation valves and steam piping and fittings, steam specialties, control valves, steam pressure pumps and shell and tube heat exchangers.

B. Refer to Design Guideline Element 3010, Energy Supply, for TECO requirements. Refer to Design Guideline Element D3044, for waterside distribution requirements.

PART 2 - DESIGN CRITERIA

2.01 TECO STEAM SERVICE

A. TECO 225-275 psig steam service shall enter the building's main mechanical room, below the slab. The A/E shall indicate isolation valves at the building entrance for the steam and condensate piping.

B. TECO 225-275 psig steam service shall be reduced to 15 to 20 psig at the individual heat exchangers, prior to the control valve. Provide minimum two-stage pressure reducing valve station.

C. TECO steam will be used as a heating medium for the following applications:

1. Heating Hot Water

2. Food Service (non-contract, as applicable)

D. Steam condensate will be collected and pumped back to the TECO plant.

E. Design shall incorporate flash steam recovery where multiple steam pressures are used.

2.02 AUXILIARY EQUIPMENT

A. Pressure reducing valves associated with the station reducing to 70 psig will be sized to provide the required capacity with inlet pressure varying between 125 psig and 300 psig. Pressure reducing valves associated with the station reducing to 15 psig will be sized to provide the required capacity with inlet pressure of 70 psig.

B. Each steam pressure reducing station will have a minimum of two air loaded steam pressure-reducing valves. One steam pressure-reducing valve will be sized to provide 1/3 of the required steam capacity and the second steam pressure-reducing valve will be sized to provide 2/3 of the required steam system capacity.

C. The number of condensate pumping systems provided will be determined based on condensate loads. Condensate receiver tanks shall be sized to accommodate the full condensate load when the steam system is isolated shut.

D. Heating hot water shall be produced by steam to hot water heat exchangers. The A/E shall allow for a minimum of two steam to hot water shell and tube heat exchangers to handle the heating hot water load. Each exchanger shall be capable of heating the hot water from 120 degrees F to 150 degrees F, at the required flow rate (gpm) to heat the building.

   1. Select equipment such that one heat exchanger provides N+1 redundant capacity based on peak design load.

E. Each steam heat exchanger shall have two steam control valves. One valve will be sized to provide 1/3 of the steam capacity and the second to be sized to provide 2/3 of the steam capacity.

F. Steam pipe shall be sized such that the steam velocity for low pressure steam shall not exceed 80 feet per second at peak load conditions and for medium pressure and high pressure steam the steam velocity shall not exceed 100 feet per second.

G. Steam relief vents shall be extended to the highest building roof.

H. Design steam distribution system for minimum ¾ inch pipe size. Design steam and condensate piping with loops, bends, and offsets to allow for thermal expansion and keep stresses within allowable limits of the piping material.

I. Avoid using expansion joints or ball joints if possible.

J. All steam-to-hot water converters shall be installed with a minimum of two (2) steam traps.

K. Steam traps shall be readily available for ease of maintenance.

L. All medium or high pressure condensate (31-300psi) shall be gravity drained to a flash tank and then to a condensate receiver before being lifted by a condensate pump.

M. All low pressure condensate (5-30psi) shall be gravity drained to a condensate receiver before being lifted by a condensate pump.

N. Steam pressure powered condensate pumps must be powered by a minimum of 45 psi medium pressure steam. Do not specify air powered pressure pumps to lift condensate.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the steam and hot water heat generating systems in the Contract Documents.

B. Provide a separate room to house the steam TECO service entrance and pressure reducing station.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.01 E)	JCD
Rev. 2	07-08-10	2.02D: changed temperatures; 2.02J: added requirement for 2 steam traps.	DAB
Rev. 3	09-16-10	Revised 2.02 C; added 2.02 F on steam control valves; added 2.02 M, N on condensate receivers. Clarification on 3.01 A.	KTB
Rev. 4			
Rev. 5			

END OF ELEMENT D3020

D3025 Steam Boilers and Associated Equipment

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes criteria for the design of building heat generating systems including all isolation valves and steam piping and fittings, steam specialties, control valves, steam pressure pumps and shell and tube heat exchangers.

B. Refer to Design Guideline Element D3044 for waterside distribution requirements.

C. Where applicable for satellite locations, HVAC heating water and domestic hot water shall be produced using high efficiency (condensing style, long life, cast iron, etc.) natural gas fired heaters/boilers.

D. Where steam generation is required/chosen due to existing systems, process needs, or district distribution, pursue high efficiency heat recovery systems (i.e., 2-stage flue gas recovery) for steam generating equipment to achieve high efficiency condensing operation. Intent is to limit inefficient steam generation where possible by using highly efficient steam generating systems.

E. Consideration of facility operations with respect to dual-fuel and emergency operation is required when using condensing style boilers/heaters. Refer to Design Guideline Element D3026 for water heating and distribution requirements.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Boiler fuel selection and system design will be in accordance with the ASHRAE Handbooks and NFPA Standards.

B. Boiler steam will be used as a heating medium for the following applications:

1. Heating Hot Water
2. Food Service (non-contract, as applicable)
3. Domestic Hot Water
4. Humidification (Clean) Steam (using an unfired boiler)
5. Autoclaves and sterilizers (verify quality of steam and whether plant or clean steam is required).

C. Provide gas and oil meters for the boiler installation.

1. Provide a gas meter at the building(s). Install oil meters in both the supply line and the return line of each storage tank.

2. Each boiler, or set of identical boilers, must be equipped with a natural gas totalizer for each boiler, or each set of identical boilers, in accordance with 30 TAC 117.213(a) and 30 TAC 117.479(a).

3. If the boilers to be installed have a maximum capacity less than 40 MMBTUs/hr, then it is acceptable by TCEQ to design one flow meter for a set of identical boilers.

D. Safety relief vent piping shall be extended above the roof, and shall be independent of the other steam vent piping. To avoid long safety relief valve discharge piping, safety relief valves may be located close to the terminal point if there is no shut-off valve between the PRV and the safety relief valve.

E. Steam relief vent piping located downstream of safety relief valves shall be designed per ASME standards.

F. Steam service from a local boiler or from a central plant boiler shall be reduced to the proper working pressures at the individual heat exchangers, prior to the control valve. Provide two-stage pressure reducing valve station when reducing high pressure steam to low pressure steam service.

G. Steam condensate will be collected at the receivers and pumped back to the deaerator and boiler.

H. Each steam pressure reducing station will have a minimum of two air loaded steam pressure-reducing valves. One steam pressure-reducing valve will be sized to provide 1/3 of the required steam capacity and the second steam pressure-reducing valve will be sized to provide 2/3 of the required steam system capacity.

I. The number of condensate pumping systems and deaerator provided will be determined based on condensate loads. Redundant pressure reducing valves will not be provided, but each pressure reducing station will have a manual normally closed bypass valve. Each pressure reducing station shall have a normally open isolation valve located at upstream of each strainer and downstream of each pressure regulator.

J. Heating hot water shall be produced by steam to hot water heat exchangers. The A/E shall allow for a minimum of two steam to hot water shell and tube heat exchangers to handle the heating hot water load. Each exchanger shall be capable of heating the hot water from 120 degrees F to 150 degrees F, at the required flow rate (gpm) to heat the building.

K. Select equipment such that one heat exchanger provides 100 percent redundant capacity based on peak design load.

L. Steam pipe sizing shall not exceed 80 feet per second.

M. Steam relief vents shall be extended to the highest building roof.

N. Design steam distribution system for minimum ¾ inch pipe size. Design steam and condensate piping with loops, bends, and offsets to allow for thermal expansion and keep stresses within allowable limits of the piping material.

O. The piping, fittings, valves and steam specialties used on a low pressure chemically untreated steam distribution system shall be manufactured from Type 304 stainless steel. Humidification steam is produced by an unfired steam boiler.

P. Avoid using expansion joints or ball joints if possible.

Q. Steam traps shall be readily available for ease of maintenance. For renovation project, the A/E shall confirm with Owner to determine if the existing steam condensate system is utilizing (Steam Eye) a monitoring system that detects and identifies failed steam traps.

R. Depending on the size of the installation and the pressure at which steam is generated, use boiler accessories such as feedwater heaters to increase the steam generation cycle efficiency where applicable.

S. Use blowdown separator/recovery units where possible to preheat make-up water to boiler system/deaerator where possible. Size blowdown separator/recovery unit to reduce blowdown water temperature below 120F prior to discharge of water to sanitary drainage system without the addition of potable water.

T. Use flue gas recovery heat exchangers to preheat boiler feed water (and/or serve other heating loads where applicable). Use two-stage flue gas recovery (condensing) where possible to further increase boiler efficiency. Where recovery systems result in condensing of flue gases, design the boiler system with appropriate venting materials, proper sloping, and sufficient removal of condensate. Second stage of heat recovery may be associated with lower temperature heat requirements (e.g., HVAC heating hot water, domestic hot water, desiccant reactivation, etc.).

U. Consider the application of vent condensers as another means to recover waste heat. A deaerator vent is a typical application for a vent condenser.

V. The blowers on large capacity steam boilers often produce excess pressure at part load conditions. While blowers have increased in size due to reduced emissions requirements, there may be an opportunity to acquire some energy savings by using variable-frequency drives. Consider application of VFDs on boilers that have long operating hours at part- load, particularly when loads are at or below 50 percent fire.

W. Meter all building steam supply, hot water supply, condensate return, and hot water return lines if steam is being supplied by a central plant steam system.

X. Fuel oil storage tanks are to meet all EPA and applicable State, city codes and technical standards.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the steam boilers and associated equipment, in the Contract Documents. The boiler(s) and steam distribution system including controls shall be shown on a control diagram. The control diagram shall be complete with, but not limited to, the following:

1. Isolation valves
2. Control valves
3. Pressure and temperature gauges
4. Boiler blowdown cooler and piping
5. Flash tank
6. All steam piping specialties
7. Make up water treatment system (for boilers)
8. Chemical feeder
9. Make up or feedwater controls (interface with boiler)
10. Pressure reducing stations
11. Condensate receivers
12. Deaerator
13. Condensate tank
14. Feed water pumps
15. Flow control and measuring devices
16. Flue gas monitoring system and controls (interface with boiler)
17. Variable frequency drives (if used)
18. Heat exchangers with water side temperature controls.

B. Boilers that serve Vivarium space heating, cagewash hot water, and steam for autoclaves shall be on emergency power. Refer also to Section D3000 for additional emergency power requirements.

C. Texas Commission on Environmental Quality Nitrogen Oxide Emission Compliance Requirements:

1. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 100 MMBtu/hr: i. 0.020 lb Nitrogen Oxides (NO x) per MMBtu; and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206(c)(1)(A) and 30 TAC 117.206(e).

   a. A/E must inform the Owner's Project Manager to contact the Owner's EH&S department, if a unit of the above size will be installed. A unit of this size may trigger some additional federal requirements under Title 40 of the Code of Federal Regulations (40 CFR) as well as state and federal permitting requirements under 30 TAC 116 or 122.

2. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 40 MMBtu/hr, but less than 100 MMBtu/hr: i. 0.030 lb NO x per MMBtu; and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206(c)(1)(A) and 30 TAC 117.206(e).

   a. A/E must inform the Owner's Project Manager to contact the Owner's EH&S department, if a unit of the above size will be installed. A unit of this size may trigger some additional federal requirements under Title 40 of the Code of Federal Regulations (40 CFR) as well as state and federal permitting requirements under 30 TAC 116 or 122.

D. Emissions standards any new boiler with a maximum rated capacity less than 40 MMBtu/hr but greater than 2.0 MMBtu/hr: i. 0.036 lb NOx per MMBtu (or alternatively, 30 ppmv NOx, at 3.0 percent O2 dry basis); and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206 (c)(1)(C, 30 TAC 117.206(e)(1), 30 TAC 117.475(c)(1)(A) and, 30 TAC 117.475(i)(1).

E. Emissions standards any new boiler with a maximum rated capacity greater than 400,000 Btu/hr, but less than or equal to 2.0 MMBtu/hr: i. 30 ppmv NOx at 3.0 percent O2 dry basis; or ii. 0.037 lbs NOx per MMBtu of heat input. Reference: 30 TAC 117.465(a)(4)(A).

F. Emissions standards any new boiler with a maximum rated capacity greater than 75,000 Btu/hr, but less than or equal to 400,000 Btu/hr: i. 40 ng NOx per J of heat output; or ii. 55 ppmv NOx at 3.0 percent O2 dry basis. Reference: 30 TAC 117.465(a)(3)(A).

G. Emissions standards any new boiler with a maximum rated capacity less than or equal to 75,000 Btu/hr: i. 10 nanograms (ng) NOx per Joule(J) of heat output; or ii.15 ppmv NOx at 3.0 percent O2 , dry basis. Reference: 30 TAC 117.213(a) and 30 TAC 117.479(a).

H. The boiler must be able to achieve the applicable low Nox emission standards, as indicated above, 100 percent of the time. Flue gas recirculation or any other technology that will not obtain low Nox emissions 100 percent of the time is not acceptable.

D3025 Steam Boilers and Associated Equipment

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Fire tube boilers are preferred for large scale building projects that have a large demand requirement for medium pressure steam. The fire tube boiler would provide steam to autoclaves, unfired boilers for sterilizers, converters for building hot water, and to steam hot water heaters for domestic hot water.

C. Specify condensing boilers for smaller scale buildings that utilize hot water re-heat. Design Guideline Element D3044 Hot Water Distribution, provides additional information that applies to the use of this type of boiler.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-17-07	Re-Numbered Element From D302001 to D3025	DOS
Rev. 2		Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 1.01 C; 1.01 D; 1.01 E; 2.01J; 2.01 S; 2.01 T & 3.01B)	JCD
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D3025

D3026 Hot Water Heating Boilers

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes criteria for the design of building hot water heating systems including isolation valves, piping, fittings, hydronic specialties, control valves, pumps and boilers.

B. Refer to Design Guideline Element D3044 for waterside distribution requirements.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Boiler fuel selection and system design will be in accordance with the ASHRAE Handbooks and NFPA Standards.

B. Provide natural gas pressure and temperature compensation meters for the boilers 2 MMBTU or greater.

1. Provide a gas meter at the building.

2. Each boiler, 2MMBTU or greater must be equipped with a natural gas totalizer for each boiler in accordance with 30 TAC 117.213(a) and 30 TAC 117.479(a).

3. If the boilers to be installed have a maximum capacity less than 40 MMBTUs/hr, MDACC understands it is acceptable by TCEQ to design one flow meter for a set of identical boilers. MDACC requires one flow meter totalize per boiler.

C. Safety relief vent piping shall be extended above the roof, and shall be independent of the other steam vent piping. To avoid long safety relief valve discharge piping, safety relief valves may be located close to the terminal point if there is no shut-off valve between the PRV and the safety relief valve.

D. Flue ducts shall be routed separate for each individual boiler and avoid using 90 degree elbow bends. The procedures for correctly sizing vents and connectors is published by NFPA in a publication entitled, NFPA 54: National Fuel Gas Code Handbook latest Edition.

E. Every room or space containing boiler(s) shall be provided with combustion and dilution air as required by Chapter 7 of the International Mechanical Code, latest edition.

F. Design piping systems connected to boiler(s) to account for boiler and piping thermal expansion.

G. Provide boiler tube pull clearance for maintenance.

H. Design boiler systems for high efficiency (condensing style boilers operating with low heating water supply temperatures) operation where possible to promote highly efficient heat generating systems. In new facilities, heating water supply temperatures should be 150 deg. F. or less and heating water temperature deltas should be maximized (approx. 30 deg. F.) to use reduced pipe sizes.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the boilers and associated equipment, in the contract documents. The boiler(s) and hot water piping distribution system including controls shall be shown on a control diagram. The control diagram shall be complete with, but not limited to, the following:

1. Isolation valves
2. Control valves
3. Pressure and temperature gauges
4. Pumps
5. Water level controls, and alarms (interface with boiler)
6. Flow control and measuring devices
7. Flue gas monitoring system and controls (interface with boiler)
8. Variable frequency drives

B. Boilers shall be on emergency power. Refer also to Section D3000 for additional emergency power requirements.

C. Texas Commission on Environmental Quality Nitrogen Oxide Emission Compliance Requirements:

1. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 100 MMBtu/hr: i. 0.020 lb Nitrogen Oxides (NO x) per MMBtu; and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206(c)(1)(A) and 30 TAC 117.206(e).

    a. A/E must inform the MDACC Project Manager to contact the MDACC EH&S department, if a unit of the above size will be installed. A unit of this size may trigger some additional federal requirements under Title 40 of the Code of Federal Regulations (40 CFR) as well as state and federal permitting requirements under 30 TAC 116 or 122.

2. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 40 MMBtu/hr, but less than 100 MMBtu/hr: i. 0.030 lb NO x per MMBtu; and

ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206(c)(1)(A) and 30 TAC 117.206(e).

a. A/E must inform the MDACC Project Manager to contact the MDACC EH&S department, if a unit of the above size will be installed. A unit of this size may trigger some additional federal requirements under Title 40 of the Code of Federal Regulations (40 CFR) as well as state and federal permitting requirements under 30 TAC 116 or 122.

3. Emissions standards any new boiler with a maximum rated capacity less than 40 MMBtu/hr but greater than 2.0 MMBtu/hr: i. 0.036 lb NOx per MMBtu (or alternatively, 30 ppmv NOx, at 3.0 percent O2 dry basis); and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.206 (c)(1)(C, 30 TAC 117.206(e)(1), 30 TAC 117.475(c)(1)(A) and, 30 TAC 117.475(i)(1).

4. Emissions standards any new boiler with a maximum rated capacity greater than 400,000 Btu/hr, but less than or equal to 2.0 MMBtu/hr: i. 30 ppmv NOx at 3.0 percent O2 dry basis; or ii. 0.037 lbs NOx per MMBtu of heat input. Reference: 30 TAC 117.465(a)(4)(A).

5. Emissions standards any new boiler with a maximum rated capacity greater than 75,000 Btu/hr, but less than or equal to 400,000 Btu/hr: i. 40 ng NOx per J of heat output; or ii. 55 ppmv NOx at 3.0 percent O2 dry basis. Reference: 30 TAC 117.465(a)(3)(A).

6. Emissions standards any new boiler with a maximum rated capacity less than or equal to 75,000 Btu/hr: i. 10 nanograms (ng) NOx per Joule(J) of heat output; or ii.15 ppmv NOx at 3.0 percent O2 , dry basis. Reference: 30 TAC 117.213(a) and 30 TAC 117.479(a).

D. The boiler must be able to achieve the applicable low Nox emission standards, as indicated above, 100 percent of the time. Flue gas recirculation or any other technology that will not obtain low Nox emissions 100 percent of the time is not acceptable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Fire tube boilers are preferred for large scale building projects that have a large heating demand requirement.

C. Specify condensing boilers for smaller scale buildings that utilize hot water for building heating purposes. Design Guideline Element D3044 Hot Water Distribution, provides additional information that applies to the use of this type of boiler.

D. Use condensing style heaters/boilers with fire-tube type heat exchangers with a robust design not subject to thermal shock of heat exchanger resulting from fluctuations in water temperatures or flows. Provide burner modulation of 5:1 turndown where possible. (Consideration of facility operations with respect to dual-fuel operation is required when using condensing style boilers/heaters.)

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-17-07	Re-Numbered Element From D302002 to D3026	DOS
Rev. 2	02-12-08	2.01 B. - Revised metering requirements for boilers. Added 2.01 D. Addressing Design of Flue Gas Piping	PDN
Rev. 3	04/17/08	Added statements 2.01 E, F, and G	PDN/CC
Rev. 4	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 H; 3.01 B & 4.01 D)	JCD
Rev. 5			

END OF ELEMENT D302002

D3030 TECO Cooling Generating Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. For projects requiring new or modified cooling generating systems via the Texas Medical Center Central Heating and Cooling Services Corporation (TECO), this section includes criteria for the design of building cooling generating systems including isolation valves, hydronic piping and fittings, hydronic specialties, control valves, plate and frame heat exchangers, and primary chilled water pumps.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The system will use N+1 design with a minimum of three plate and frame heat exchangers each sized for 50 percent building peak cooling load to isolate the building's chilled water system pressure from TECO. Refer to Design Guideline Element D3010.

B. Plate and frame heat exchangers must be used to transfer heat from the building chilled water secondary side to the primary (TECO) chilled water side of the heat exchanger. The heat exchanger shall be selected for a 2 degree F approach where the leaving chilled water on the secondary side will not exceed 45 degrees F and the (TECO) chilled water entering on the primary side is 43 degrees F. Whenever possible, the heat exchanger selection shall be selected with primary and secondary chilled water temperature differential at a minimum of 20 degrees F. for new buildings.

1. For renovation projects, the heat exchanger minimum differential temperature shall be coordinated with the owner, but shall not be less than 14 degrees F. Refer to Design Guidelines Element D3045.

C. The maximum pressure drop on the primary or secondary side of the chilled water heat exchanger shall be 8 psi at design flow and load conditions. The maximum inlet and outlet connection velocity shall be 10 feet per second on both the primary and secondary sides of the heat exchanger. A pressure transmitter shall be placed across the primary and secondary chilled water side of the heat exchanger inlet and outlet to provide a reading on the building automation system of the differential pressure.

D. To accommodate for heat exchanger fouling, provide 10 percent excess surface area on each chilled water heat exchanger.

E. The selected heat exchanger frame shall accommodate a minimum of 30 percent more plate count for future requirements. This should be achievable by simply adding plates and without the need for any kind of modification to the frame or equipment pad.

F. Under this design concept, the primary chilled water system will have a minimum of two vertical or horizontal split case pumps (N+1 design). One set will pump TECO water through the TECO-side of the heat exchangers. A secondary chilled water system, minimum three pumps, will circulate building water through the building side of the plate and frame heat exchangers and distribute chilled water to end devices in the building (reference Design Guideline Element D3045).

G. Primary chilled water pumps shall be equipped with variable frequency drives.

H. Primary chilled water pumps shall be on emergency power. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

I. Provide full line size primary pump bypass complete with check valve and two manual, isolation, high performance, soft seat butterfly valves to bypass primary pumps serving the heat exchangers.

J. Provide manual duplex basket strainers at the inlet of primary pumps and wye strainers at the inlet of secondary pumps. Strainers are to be located at serviceable locations and accessible from the mechanical room floor without the use of a ladder or scaffolding. Strainers shall be equipped with a local DP gauges and remote sensor integrated to the building automation system.

K. The A/E shall incorporate a make-up water meter on any connections to the secondary side of the chilled water system. The meter shall be positive displacement type with a non-resetable register.

L. Do not make any piping cross connections between the TECO's side (primary) and the building's side (secondary) of the chilled water system.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the cooling generating system in the Contract Documents.

B. The A/E shall confirm information system environmental requirements and include in load calculations.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	08-23-07	2.01 A. Added DP sensor across the inlet and outlet side of the primary side of frame plate heat exchanger.	PDN
Rev. 2	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraph 2.01 D)	JCD
Rev. 3	07-08-10	Revised 2.01 A, B to require 3 heat exchangers and 3 secondary chilled water pumps; revised 2.01 E to require full line size bypass.	DAB
Rev. 4	09-16-10	Added heat exchanger requirements; changed isolation valves at primary pump bypass from motorized gate to manual butterfly type.	KTB/SK
Rev. 5			

END OF ELEMENT D3030

D3035 Chillers and Associated Equipment

PART 1 - GENERAL

1.01 OVERVIEW

A. For projects requiring new or modified chilled water systems, this section includes criteria for the design of air-cooled and water-cooled chillers including cooling towers, valves and specialties.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. All chillers shall comply with ASHRAE Guideline 3, for Reducing Emission of Fully Halogenated Chlorofluorocarbon Refrigerants, addresses refrigerant emission reduction practices in manufacturing, design, installation and servicing of equipment.

B. Where possible, in locations with simultaneous heating (HVAC heating or domestic hot water) and cooling loads are present, new chillers and similar refrigeration equipment are to utilize heat recovery systems to serve heating/re-heating loads. Heat recovery using desuperheaters, heat recovery barrels, elevated condenser water temperatures, heat pump chiller operation, and/or other opportunities is to be pursued. Recovered heat is to be used for HVAC heating, domestic hot water heating, and low temperature desiccant regeneration. HVAC heating water in such systems shall use low temperature supply/return components/configurations to allow for maximum reuse of waste heat. Refer also to Design Guideline Element DG D3044.

C. During periods when the chilling system is operating with the outdoor wetbulb temperature below design, condenser water supply temperature setpoint is to be reset to track the cooling tower's wetbulb temperature approach line prescribed by the cooling tower manufacturer. During condenser water supply reset periods, chiller minimum condenser water supply temperatures (and minimum pressure differentials between evaporators and condensers) shall be respected to prevent surging of refrigeration machines. Intent is reduce chiller lift and compressor head pressures during periods when outdoor wetbulb temperature is below design values. Strategy is not applicable when in heat recovery modes unless dual condenser barrels or other heat recovery vessels are utilized.

D. For new and existing facilities with evaporative cooling towers, use cooling coil condensate recovery for cooling tower make-up. Intent is to reduce potable water use and chemical treatment of evaporative cooling make-up water, while reducing sewage treatment of condensate. Confirm application of condensate reuse with Project Program requirements. Refer also to Design Guideline Element DG D3041.

E. For a new chilled water plant, select a minimum of two chillers identical in size and design. If anticipated part-load conditions or energy recovery applications justify chiller selection of uneven sizes, the A/E shall prepare a cooling load profile to demonstrate selection of chiller sizes. Identify where chiller(s) are used in heat recovery and heat pump applications.

F. For building renovation projects, a single chiller may be used if the system can be cross-connected to an existing chiller plant. Confirm with Owner.

G. Chiller replacements that are part of an existing building renovation project shall comply with state code requirements pertaining to mechanical rooms that have existing chillers and boilers in the same room with no physical barriers between them. Provisions shall be made during design to install chillers and associated equipment in a separate room from boiler.

H. For chillers located inside mechanical equipment rooms, the refrigerant monitoring system shall comply with State requirements. The monitoring system shall include the requirements and the correct locations of audiovisual alarms. Provisions shall be made at chiller mechanical room exits for emergency shut down of equipment and for chillers not having Group A1 or B1 refrigerants.

I. All refrigerant safety relief devices or rupture disk on refrigeration equipment located within a building shall be piped and routed outside of the building, at locations not less than 15 feet above adjoining grade level and not less than 20 feet from any windows, ventilations, openings, or exits.

J. Provide emergency chilled water flanged piping connections covered with blind flanges and isolation valves for emergency chilled water service. If the chillers are water-cooled units, provide emergency condenser water service connections in addition to chilled water connections.

K. Provisions shall be made to accommodate high velocity flushing of main piping and distribution loops.

L. The selection of a specific refrigeration chiller design requires careful analysis. The following parameters should be considered when determining what type of chiller to use.

1. Life Cycle Cost Analysis of different types of chillers.

2. Size in Capacity (kW or Tons of Refrigeration).

3. Application of service.

4. New System or Addition to Existing System.

M. All chillers including air or water cooled, with reciprocating, rotary screw, centrifugal compressors and direct or indirect fired absorption units, shall meet or exceed the required minimum efficiency per the applicable tables in the latest edition of ANSI/ASHRAE/IESNA Standard 90.1.

N. Chiller staging is recommended on loads greater than 300 tons to take advantage of part-load efficiency. Sequence chillers to meet demand requirements so that each chiller operates at its most efficient part-load.

O. Pump head calculations shall be based on the actual designed piping layout shown on the construction drawings. Add an additional 10 percent safety factor to the final results of the calculation.

P. Condenser and chilled water piping (where marine water boxes are not specified or used) shall be fabricated into removable spool piece sections to permit easier access to tube bundles in the condenser and evaporator sections.

Q. When laying out equipment, provide ample space to service and repair equipment. The tube pull space shall be clearly shown on the Drawings.

R. Air-condition mechanical rooms that contain chillers powered with open drive motors.

S. For new chiller plant construction, provide a designated space, shown on the Drawings for a future chiller(s), equal in size to the largest machine being furnished. Space planning should also be considered with associated pumps, cooling tower, and other equipment to support additional chillers.

T. Cooling tower blowdown drains are to be routed to sanitary drains, and the catch basins shall be sized for the proper capacity to manage surge flow conditions from peak cooling tower blowdown to a void overflow conditions.

U. Elevated cooling towers require stairs and platforms, and access door ways to reach areas outside and within the tower fill area for operation, and maintenance.

V. Cooling tower basin water level controls are to be provided for each individual cooling tower cell and basin isolation gates are to be provided between combined tower cells to permit maintenance to be performed on one tower cell while the adjacent cell is in operation.

W. Emergency power shall be available to the required quantity of chillers deemed to be necessary to support special ventilation environments for all Patient Care (medical) Facilities, Laboratory, or Vivarium areas where required. Refer also to Section D3000 for additional emergency power requirements.

X. Refrigeration machinery rooms shall be mechanically ventilated (exhausted) to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at normal operating and at emergency conditions per IMC. Duct intakes of the mechanical exhaust shall be located within 6 inches above the lowest floor level of the room.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specify that all shop drawings must be submitted in AutoCAD format.

B. A schematic diagram shall have the entire chilled water and cooling tower water systems (if water cooled) including controls shall be shown on a drawing. The diagram shall be complete with, but not limited to the following:

1. Temperature Sensors
2. Control Valves
3. Pressure Differential Assemblies
4. Expansion or Compression Tanks
5. Air Separators
6. All valves and piping specialties
7. Water filters
8. Chemical feeders
9. Water treatment system for cooling tower(s)
10. Make up water connection
11. Cooling tower make up and blowdown meters
12. HVAC condensate recovery (where applicable)
13. Cooling tower basin sediment removal/filtration system(s)
14. Variable speed drives
15. Flow control and measuring devices
16. Primary, and secondary pumps
17. Chillers
18. Plate and frame heat exchangers

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. If hot water reheat coils are being used on a HVAC air distribution system and considerable air conditioning load is occurring year round, the A/E needs to evaluate the use of a chiller that is capable of performing as a heat recovery unit.

C. If the maximum cooling tower tonnage is at or near the capacity limit of a selection, then choose the next larger size of tower; the increase in capacity will add some safety factor to equipment sizing. This added safety factor will reduce energy cost by providing a larger interface area between the water and air, which through the use of a variable frequency drive will decrease the fan horsepower required for a given tonnage. Every effort should be made to accommodate a propeller fan tower in order to avoid the energy penalty associated with centrifugal blowers.

D. Provide or consider/pursue automatic cold water basin sediment removal system and filtration for evaporative cooling towers. Intent is to reduce cooling tower maintenance, increase longevity, and reduce chemical water treatment (biocides).

E. Specify power operated tight, shut off butterfly type valves to isolate the condenser water and chilled water at the inlet and outlet connections.

F. Specify pre-insulated chilled water piping for underground piping.

G. Use horizontal split case pumps for primary and secondary chilled water systems and condenser water systems where applicable. Vertical split coupling inline pumps may be used when space is limited.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-17-07	Re-Numbered Element From D303001 to D3035	DOS
Rev. 2	10-09-07	2.01.E, add the following "for chillers not having Group A1 or B1 refrigerants." 2.01.E.1 Deleted. 2.01.F, replaced ", and directed away from outside ventilation air intakes." with the following "at locations not less than 15 feet above adjoining grade level and not less than 20 feet from any windows, ventilations, openings, or exits." Added 2.01.R. " Refrigeration machinery rooms shall be mechanically ventilated (exhausted) to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at normal operating and at emergency conditions per IMC. Duct intakes of the mechanical exhaust shall be located within 6 inches above the lowest floor level of the room."	PDN / CC
Rev. 3	08-21-08	2.01, Q. - Revised statement to route the tower blowdown sanitary drains, and the catch basins shall be sized for the proper capacity to manage surge flow conditions from peak cooling tower blowdown. 2.01, R. - Added platforms to the tower designs. 2.01, S. - Added the requirements for basin weir gates.	PDN
Rev. 4	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 B; 2.01 C; 2.01 D; 2.01 E; 2.01 T; 3.01 B 12; 3.01 B 13; 4.01 D & 4.01 G)	JCD
Rev. 5			

END OF ELEMENT D3035

D3040 Distribution Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. The D3040 Series Design Guideline Elements address building HVAC distribution systems including air distribution, exhaust and ventilation, heating hot water distribution, and chilled water distribution systems.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to the following HVAC distribution system sub-sections for specific design Element information as appropriate to the Project:

D3041	Air Handling Distribution
D304101	Patient Treatment Air Handling Distribution
D304102	Laboratory Air Handling Distribution
D304104	Pharmaceutical Air Handling Distribution
D304105	MRI Air Handling Distribution
D304106	Data Center Air Handling Distribution
D3042	Exhaust and Ventilation
D304201	Patient Treatment Exhaust and Ventilation
D304202	Laboratory Exhaust and Ventilation
D304204	Ethylene Oxide Sterilization Exhaust and Ventilation
D3044	Hot Water Distribution
D3045	Chilled Water Distribution

B. When designing systems, all service piping and ductwork shall be organized and arranged to preserve ceiling plenum flexibility.

C. Zoning of the building will be established at the onset of design. The A/E shall be responsible for preserving the arrangement of systems within the building.

D. Avoid routing piping through rooms containing electrical, telecommunication, or imaging equipment.

E. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the HVAC hydronic distribution systems and connected components. Locations shall include but not be limited to the following; at each piece of equipment, at each branch take-off from mains, at the base of each riser, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

2.02 TEST, ADUST AND BALANCE (TAB)

A. Ductwork and piping systems must have sufficient length of straight sections for installation of devices and sensors buildings that interface with the automation (BAS).

B. Each item of equipment, including individual terminal units, must have a unique equipment identification number that may be referenced for TAB and BAS Commissioning.

C. For systems that use the ceiling plenum for return air, ensure that return air openings in mechanical room partitions are sufficiently sized for the design return airflow (CFM).

D. Schedule minimum primary CFM for terminal units.

E. Schedule minimum water flows (gpm) at each air handling unit.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include HVAC schematics of the distribution systems as noted in the individual Design Guideline Element sections.

B. The A/E shall provide a duct pressure schedule of each FCU, ERU, AHU, OAHU, and exhaust fan, etc. that will indicate the static pressures on the Drawings for main and branch duct sections for each supply air, return air, relief air, outside air and exhaust air duct distribution system.

C. Prepare sections or profiles of underground piping to indicate elevation with respect to grade, roads, and conflicting utilities, including provision for draining and venting.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Added additional Design Guideline Elements referenced in Part 2; added requirement for duct pressure schedule under Part 3.	SAK
Rev. 2	07-08-10	2.01 A: deleted references to Vivarium Ventilation and Exhaust Elements. This criteria is addressed in the Small Animal (Rodent) Vivarium Design Standards.	PDN
Rev. 3	06-28-12	Added section 2.01E defining shut-off valves location requirements.	JCD
Rev. 4	03-21-13	Added Section 2.02 Test, Adjust and Balance	PDN
Rev. 5			

END OF ELEMENT D3040

PART 1 - GENERAL

1.01 OVERVIEW

A. This section describes criteria for design of facility air handling distribution systems, including air handlers, ductwork, ductwork accessories, terminal units, air devices, and stairwell pressurization systems (if applicable to the project).

B. Additional requirements for patient treatment, laboratory, and other specialized environments are addressed in other Design Guideline elements.

C. Air handling unit selection and performance shall comply with the latest ANSI/ASHRAE/IESNA 90.1. The outside air flow rate must be measured, distributed, and controlled via the BAS. 1 and ASHRAE 170. Outside air requirements are also scheduled in specific system design guidelines serving laboratories or vivariums.

D. The quality and quantity of outside air must meet the latest ASHRAE Standard 62.1 requirements and must also maintain the building pressurization reasonable positive (such as 5 to 15 percent net positive pressurization (outside air - exhaust air)/total supply air]) depending on the building envelope design/construction. Tighter buildings are eligible for less net pressurization.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies. Where direction described in applicable codes are in conflict, the A/E shall comply with the more stringent requirement. The A/E shall be familiar with all applicable standards, codes and ordinances and assure compliance thereto. The system design shall be per the strictest standards.

B. Mechanical rooms must be large enough to allow for air handling unit coil pull space and full space service clearance around the unit for filter replacement to accommodate both major and minor repairs. A minimum clearance of 3 feet must be planned around the unit with additional space at the heating and cooling coil pull locations. Indicate the designated coil pull and maintenance clearance space on the Drawings.

C. Each air handling unit fan equipped with a fan motor size 5-horsepower and above shall be provided with a variable frequency drive (VFD). The high efficiency fan motor shall be compatible with VFD applications, which is controlled by the supply duct static design pressure setpoint.

D. Air handling unit fans shall have an efficiency rating where the ratio of the fan system power to the supply fan airflow rate (main fan) of each HVAC system at design conditions shall not exceed the allowable fan system power indicated in Table 6.5.3.1 of the latest ASHRAE Standard 90.1.

E. Fan arrays are acceptable to use on custom air handling units and energy recovery units (ERU's) with airflow rates of 30,000 CFM and greater unless noted otherwise by Owner.

F. Access doors (or panels) on the air handling unit sections shall always open against the positive side of the door and shall not be blocked by internal filter casings or internal equipment components. Micro switches or safety switch interlocks need to be provided at access doors or panels to protect maintenance personnel from possible injuries from rotating or electrical equipment components inside the air handlers.

G. The use of permanent affixed ladders, stairs, and walkways shall be evaluated on all air handling units to provide safe access to components, filters, and instruments, and damper actuators and switches. This should include the addition of OSHA compliant non-skid steps / stairs from the exit of the accessible compartments to the general walkways, taking into account utility piping directly in the path of maintenance and operations personnel as well as elevation changes between the base floor height of the AHU and the surface directly outside the entry doors of the AHU.

H. Coordinate location of wall-mounted room temperature sensors with furniture and equipment, so that sensor locations do not conflict with tall items of furniture/equipment.

I. Schedule the minimum and maximum water, air flow rates, fan horsepower, entering and leaving coil water and air temperatures, MBTUs, water and air pressure drops, and physical parameters of the coils for each air handling unit.

2.02 COILS

A. If chilled water is used as the cooling medium, the A/E needs to acquire the supply water temperature at the site where the coil will be used. Similarly if hot water is used as the heating medium, the A/E needs to acquire system temperature at the site where the coil will be used. Confirm with Owner's Project Manager.

B. Use a chilled water differential temperature of 16 degrees F for renovation work and 22 degrees F for new buildings. Normal heating coil hot water design differential temperature for new buildings is 30 degrees F. Where other "delta T" conditions may apply to specific projects, advise Owner and obtain review acceptance.

C. Design two (2) coils in a series arrangement if the cooling coil capacity requirement exceeds the capability of a 6-row coil. Chilled water shall be piped in series through both coils and an access section shall be provided between the two coils. Chilled water velocity through the coil tubes should be between 2 fps minimum to 8 fps maximum. (The minimum ARI Standard 410 rating condition for water velocity through a coil is 1.0 fps)

D. Maximum differential pressure across the air side of the cooling coil shall not exceed 0.7 inch w.g.

E. Maximum cooling coil discharge face velocity shall not exceed 450 fpm in variable air volume (VAV) applications and 375 fpm in constant air volume (CAV) applications. Heating coil discharge face velocity shall not exceed 800 fpm. These values are required to allow for an additional margin of 10 percent capacity for future renovations.

F. Pipe spool connections at the coils must be bolted flange connections to allow the coils to be pulled and installed without having to remove the control valves.

G. For new facilities with evaporative cooling towers and/or rainwater harvesting, use cooling coil condensate waste for cooling tower make-up and/or collect condensate in rainwater harvesting cisterns. Provide a dedicated piping system from air handling equipment to point of use or storage. Intent is to reduce potable water use and chemical treatment of evaporative cooling make-up water, while reducing sewage treatment of condensate. Confirm application of condensate reuse with Project requirements.

2.03 OFFICE / ADMINISTRATION AIR HANDLING UNITS

A. Air handling units and distribution systems serving office / administration areas within Owner's buildings shall be variable air volume type using constant volume, series fan-powered terminal units.

B. Office / Administration units will be single fan, single duct, draw-through, re-circulating type with outside and return air introduced to the air handler through duct work.

C. Each air handler shall be a variable volume draw through type and shall include the following components:

1. Air inlet plenum section.

2. 30 percent (MERV 7) pre-filter section.

3. Hot water preheat coil; copper tubes, aluminum fins; maximum 9 fins per inch, minimum 2 fins per inch. There will be no need for preheat if the outside air pretreatment unit is installed. Refer also to the Coils Section of this Design Guideline Element.

    a. A preheat coil is only required if the quantity of outside air has the potential to lower the mixed air temperature below 36 degrees F.

    b. If the building does not have a heating hot water system then electric heating coils are to be used. The electric heating coils shall be powered through the use of an SCR to maintain a controlled leaving air set point. If the electric power requirement of the coil is large where a single SCR application is not viable, then the coil shall be step controlled using a Vernier (combination SCR and contactor) staging sequence.

4. Access section.

5. Chilled water cooling coil; copper tubes, copper fins; maximum 9 fins per inch, minimum 2 fins per inch, maximum 6-row coil. Refer also to the Coils Section of this Design Guideline Element.

6. Properly spaced ultra violet germicidal irradiation (UVGI) lamps shall be located on the leaving air side of the cooling coil. Access section.

7. Direct drive fan preferred; centrifugal airfoil blade type, minimum 12 blades per fan wheel (Plug fans are preferred).

8. High static pressure shutdown control and reset capability.

9. Instrument measurement taps for static pressure, temperature, etc as specified on Drawings.

2.04 OUTSIDE AIR PRETREAT UNITS

A. Depending on the ventilation and air conditioning system design situations, outside air pretreat units may be required to condition and dehumidify all outside air to existing mixed air handling units during a partial building renovation.

B. Outside air pretreat units shall be dedicated for the conditioning and dehumidification of all outside air to mixed air handling units on new construction projects.

C. All outside air pretreat units shall be designed as draw-through type.

D. Each outside air pretreat unit shall include, but not be limited to the following components:

1. Inlet plenum (100 percent outside air).

2. 30 percent pre-filter (MERV 7).

3. Hot water heating coil (preheat position). Refer also to the Coils Section of this Design Guideline Element.

   a. If the building does not have a heating hot water system then electric heating coils are to be used. The electric heating coils shall be powered through the use of an SCR to maintain a controlled leaving air set point. If the electric power requirement of the coil is large where a single SCR application is not viable, then the coil shall be step controlled using a Vernier (combination SCR and contactor) staging sequence.

4. Access section.

5. Chilled water cooling coil; refer also to the Coils Section of this Design Guideline Element.

6. Access section.

7. Direct drive fan preferred; centrifugal airfoil type, minimum 12 blades per fan wheel.

8. Instrument measurement taps for static pressure, temperature, etc.

9. High static pressure shutdown control and reset capability.

10. Properly spaced ultra violet germicidal irradiation (UVGI) lamps shall be located on the leaving air side of the cooling coil. The lamps shall have the capability of developing an intense UV between 250 to 270 nm. Short-wave ultraviolet light shall destroy DNA in living microorganisms and also breakdown organic material found in indoor air.

2.05 ENERGY RECOVERY UNITS

A. The determination of energy recovery is based on the compliance of ASHRAE 90.1 or ASHRAE 62.1 or actual energy recovery needs. Energy recovery systems can be:

1. A variable volume stand-alone unit;

2. A major part of an air outside pretreatment unit; or

3. An air handling unit.

B. Unless otherwise required to comply with applicable codes or standards, energy recovery components should be evaluated by considering equipment installed cost, equipment life, the time value of money, any utility avoided costs, and a simple payback of 5 years or less.

C. All the major parameters of an energy recovery system should be connected to the building automation system.

D. Owner’s Master Construction Specifications address several types of energy recovery units (ERU) that must be evaluated during Schematic Design. The type of energy recovery unit is dependant on exhaust contaminants and exhausts odors.

1. Enthalpy (total energy) wheels. Enthalpy wheels application shall be on a project by project basis, but in no case should be applied in a system serving BSL-3 or higher classifications. Where enthalpy wheels are used, the following should be provided.

a. Three Angstrom molecular sieve type wheels with labyrinth seals;

b. Manufacturer's guarantee of not greater than 0.04 percent cross contamination of the exhaust air concentration by volume;

c. Exhaust and supply fans selected to accommodate wheel purge air from the outdoor air stream into the exhaust air stream;

d. MERV 8 or higher filtration of exhaust air stream upstream of wheel;

e. Exhaust air bypass of wheel to accommodate maintenance activities or other needs;

f. Outside air flush of ERU/OAU/AHU exhaust sections during maintenance activities;

g. Where "Genesis Air" systems are used, position in supply air downstream of enthalpy wheel and/or cooling coil;

h. Cross contamination test stations with tubing to system sampling points; and

i. Commissioned verification of cross-contamination limits.

j. Heating coils may be required to raise the temperature of the outside air to a setpoint limit to raise the outside air to an acceptable supply air temperature to provide heat to the ventilated space.

2. Equipment designs for recovering sensible energy include heat pipes; air to air heat exchangers, wrap around coils, and run around coils.

a. Some designs are more efficient then others, but the condition of the exhaust air determines the type energy recovery be selected.

b. Indirect evaporative heat exchangers and evaporative assist coils (using condensate spray mist in exhaust air upstream of recovery coils) can provide incremental performance enhancement and may merit consideration.

c. Due to added maintenance costs and purge air parasitics, but at no increased energy benefits, sensible energy wheels are generally to be avoided unless a specific project condition mandates otherwise.

d. ASHRAE 62.1 provides four (4) classifications for return air transfer air and exhaust air. Protection of patients is a high priority in a healthcare facility and the design of any energy recovery system needs to affirm that cross contamination of contaminated air into the outside air stream can be demonstrated to not pose a known health risk in the system where applied.

2.06 OFFICE TERMINAL UNITS

A. Select terminal units at maximum 1500 CFM capacity for noise and space considerations.

B. Locate terminal units for full maintenance access above the ceiling. Ensure that all terminal unit controllers and operators are located minimum 24 inches from any obstruction (walls, pipe, etc.). Electrical access panels on terminal units and electrical heater panels require (per NEC) a minimum 42 inch clearance.

C. Consider future renovation when laying out terminal unit zoning. The maximum number of exterior or interior office rooms per terminal unit is limited to no more than four rooms.

D. Specify constant volume, ultra quiet series fan-powered series terminal units with heating coil for office applications where space heating is required at building perimeter zones, level one entrances and corridors, and zones with a roof exposure. If the existing building does not have or use hot water heating systems then electrical power for electric heating coils must be controlled with the use of an SCR. In either case each VAV terminal and heating coil shall be controlled by the building automation system with a supply air temperature setback mode.

E. Specify constant volume, series fan-powered terminal units, typically without zone heating for interior spaces. A/E to evaluate, however, whether zone supplemental heating may be needed for interior zones to maintain environmental comfort while achieving minimum indoor air quality requirements for certain occupancies, such as, conference rooms, etc.

F. Single-zone, constant volume terminal units are to be used for rooms where once-through ventilation is required such as toilet rooms and janitor's closets.

G. Single zone, variable volume terminal units cooling only are to be used for areas that are typically unoccupied, including interior corridors, elevator lobbies, electrical equipment rooms, rooms with mechanical equipment, telecommunication rooms with electronics, etc. Confirm with Owner.

H. Refer to Owner's Master Construction Specifications for acceptable liners for terminal units.

I. Terminal units shall have night setback and override capability through featured thermostat from the building automation system.

J. For high occupancy areas (20 or more occupants) at building perimeter zones such as conference rooms, utilize single-zone, variable volume terminal units with supplemental heat and CO_2 override controls. The intent is to increase room supply air volume if CO_2 levels in the space are not achieved during a heating condition [supply air is at a minimum.

K. For high occupancy areas (20 or more occupants) at building interior zones, the need for CO_2 override controls may not be necessary and should be evaluated on a case by case basis. For interior zones, the sensible heat gain to the room will track with the amount of people in the room, the amount of supply air will track with the amount of people in the room, and therefore the amount of outdoor air will track with the amount of people in the room.

2.07 AIR DEVICES

A. For office applications, building perimeter supply ceiling devices shall be off-white louvered face with round neck, or Titus Omni directional square panel face diffusers with round neck. Review diffuser selection with Owner prior to preparing Project Specifications.

B. Interior and general supply ceiling devices shall be off-white louvered face with round neck, or Titus Omni directional square panel face diffusers with round neck. Diffuser size is to be based on flow rate for proper flow within noise criteria limits set forth by Design Guideline Element D3002 Sound Criteria.

C. Perforated return air grilles or Titus Omni directional square face panel diffusers shall be provided in open areas and individual offices for return to air handling unit. Diffuser is to be based on flow rate for proper flow within noise criteria limits set forth by Design Guideline Element D3002 Sound Criteria.

D. Coordinate location of air devices and device frame style with architectural drawings. Do not create the short circuit of air flow inside the conditioned or ventilated space.

2.08 FAN COIL UNITS

A. Draw through fan coil units with 30 percent pre-filter, hot water pre-heat coil, cooling coil and direct drive fan, sections shall be mainly used for environmental control mechanical equipment rooms.

B. Draw through direct expansion (DX) fan coil units (with 30 percent pre-filter, a direct expansion refrigerant cooling coil and direct drive fan, section shall be only used for environmental control of elevator machine rooms, telecommunications (IDR/MDR) rooms or as the redundancy purpose. If a fan coil unit is outside of the electrical, telecommunication, or elevator machine room space that it serves, then chilled water coils can be used in lieu of the electric heat and DX coil.

C. Telecommunications rooms shall be served from floor air handlers during normal operating hours and fan coil units after normal building operating hours to support the unoccupied set back or shut down of main air handling units. Refer to Design Guideline Element D501001 Electrical System for Telecommunications Rooms for specific fan coil unit power requirements during emergency conditions.

2.09 UNIT HEATERS

A. Hot water or electric unit heaters shall be used for supplemental heating of diesel generator rooms and loading dock areas if the loading dock area is enclosed.

B. Electric unit heaters must be explosion proof if they are located in a space where explosive vapors may exist.

2.10 STAIRWELL PRESSURIZATION FANS (IF APPLICABLE)

A. The IBC lists physical building height criteria, for determining an application of when stairwell pressurization fan system is required.

B. The stairwell pressurization system shall meet or exceed NFPA requirements.

C. Two fans shall be provided for pressurization of each building exit stairwell. One fan shall be located at the top of the stairwell and the other fan shall be located near the bottom of stairwell.

D. The fan shall be variable volume using a VFD and shall maintain positive static pressure in each stairwell. The differential pressure across the stairwell access door shall not exceed the maximum opening force of 30 pounds as specified in the latest edition of NFPA 92A.

E. Specify properly sized motorized dampers for relief. Do not specify gravity dampers.

2.11 DUCTWORK

A. Low pressure ductwork is defined as ductwork subjected to velocities of 1600 fpm or less, and operating pressure of 2 inches w.g. or less, positive or negative.

B. Low-pressure ductwork required for the project shall include the following:

1. Air-conditioning supply air systems downstream of terminal units and fan coil units.
2. Outside air intake plenums.
3. Where noted elsewhere in Owner's Master Construction Specifications.

C. Spin-in dampers shall be provided at all individual, low-pressure take-offs.

D. Medium and high-pressure ductwork is defined as ductwork subject to operating pressures in excess of 2 inches w.g., positive or negative and up to 6 inches w.g. positive or negative.

E. Types of medium and high-pressure ductwork include the following:

1. Air conditioning supply air systems from air handling unit discharge to terminal units.
2. Exhaust distribution systems.
3. Where noted elsewhere in Owner's Master Construction Specifications.

F. Construct elbows with radius of not less than 1-1/2 times width of duct on centerline. Comply with SMACNA Standards. Use smooth radius elbows where feasible.

G. Transform duct sizes gradually, not exceeding 20 degrees divergence and 30 degrees convergence. Comply with SMACNA Standards.

H. Ductwork Sizing: The following criteria will be utilized for sizing ductwork for the various systems:

1. Medium pressure supply ductwork upstream of air terminal units will be sized for a maximum pressure drop of 0.15 inches of water per 100 feet of ductwork for ducts carrying up to 12,000 CFM. For ductwork over 12,000 CFM, sizing will be based on maintaining a maximum velocity of less than 2,000 feet per minute (fpm).

2. Medium pressure ductwork from outside air handling units to floor air handling units shall be sized at a maximum friction loss of 0.15 inches of water per 100 feet of duct but shall not exceed 2,000 fpm.

3. Low pressure supply ductwork downstream of air terminal will be sized for a maximum pressure drop of 0.08 inches of water per 100 feet of ductwork for ducts carrying up to 8,000 CFM. For ductwork over 8,000 CFM, sizing will be based on maintaining a maximum velocity of less than 1,500 feet per minute.

4. Transfer openings and return air sound boots shall be sized for 500 fpm at the air handler mechanical room wall and 300 fpm at all other locations.

I. Low-pressure ductwork will be utilized downstream of the terminal units to transport supply air to the space.

J. Office/Administration areas may have a ceiling plenum return air system.

K. . For systems that use the ceiling plenum for return air, ensure that return air openings in mechanical room partitions are sufficiently sized for the design return airflow (CFM).

L. Flexible runs of ductwork to air devices are not to exceed six (6) feet in length. Flexible duct to terminal units shall not exceed two (2) feet.

M. Non-metal rigid ductwork shall not be used.

N. Indicate manual air volume balancing devices in supply, return, and exhaust mains, branch mains, and terminal branches.

O. Depending on mixed air conditions, hot water heating coils may be eliminated at mixed air units served with pretreated outside air.

2.12 EXHAUST AND INTAKE LOUVERS

A. Coordinate louver selection with architectural drawings. To allow for future expansion of the HVAC system ventilation requirements, the maximum design face velocity at the louver face must not exceed 450 fpm.

B. All air intake louvers must include bird screen, and in some cases depending on the location and height of the air intake, the louvers may need to include removable insect screens located on the leaving air side of the louver. This requirement also applies to spaces such as boiler rooms and diesel generator rooms, etc, where combustion air may be required.

C. Air intake locations shall be coordinated with the building general exhaust system, kitchen exhaust, plumbing vents, generator exhaust, grease traps, trash dumpsters, vehicle exhaust, etc., to avoid introduction of undesirable odors into the building, under all conditions.

D. The bottom of all outside ventilation air intakes for occupants shall be located as high as practical but not less than twelve (12) feet above ground. Select outside air intake louvers for a maximum face velocity of 450 fpm using a free area of 50 percent.

E. Due to potential entrainment of contaminated air or odors into outside air intake louvers, A/E to evaluate the need for a building wind tunnel study, to aid in finalizing the best locations for the ventilation air intake louvers. Ventilation air intakes for occupants shall not be located near potential locations where vehicles idle such as porte-cocheres, garage entrance and exits, loading docks, trash compactors or near LN_2 and CO_2 bulk storage tanks.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include the following on the Contract Documents as applicable to the Project:

1. A schematic of the stairwell pressurization system.
2. A schematic of the outside air distribution system and main air handling unit(s).
3. Enlarged ¼-inch scale of outside air handling unit and floor air handling unit mechanical room plans.
4. Separate mechanical floor plan drawing for each floor.
5. Schedule of air handling unit and each terminal unit indicating inlet size and design airflow rate settings (design and minimum airflow).
6. Schedule minimum and maximum CFM for terminal units.
7. Each item of equipment, including individual terminal units, must have a unique equipment identification number that may be referenced for TAB and BAS Commissioning.
8. Provide a schedule of each fire/smoke damper indicating size, pressure drop, and compliance with maximum velocity limit for use in testing dampers.

B. All ductwork, without exception, shall be indicated on Drawings in double line format. Minimum rectangular duct size shall be 8 inch x 6 inch.

C. Do not route condensate drains to discharge through exterior walls, unless approved by Owner. Show all condensate drain piping on Drawings including drain trap dimension requirements for each cooling coil condensate drain. The equipment pad height dimension plus the air handling unit frame rail height must exceed the total trap height for floor mounted units. Clearance requirements must also be shown on drawings for ceiling mounted fan coil units. Sizing of coil drain traps shall be in accordance with the detail figures:

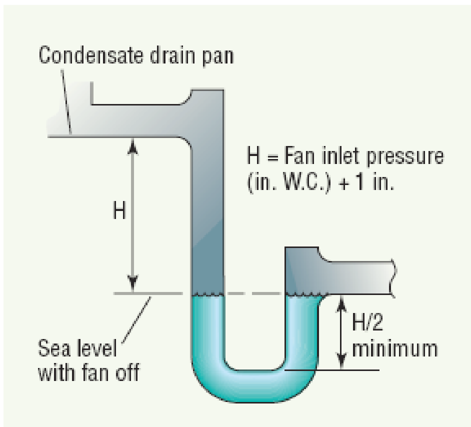


Figure 1. Drain for Draw Through Coil.

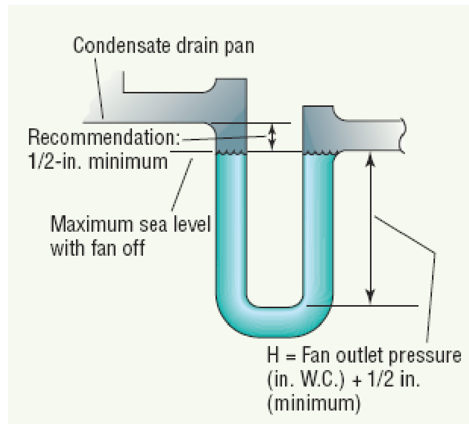


Figure 2. Drain for Blow Through Coil.

Piping plugs are to be hand tight to seal openings at top of the pipe tees.

D. Evaluate the effectiveness of pretreating outside air to air handling units, using general exhaust and building relief air with an enthalpy wheel or heat recovery pipe. Consider energy recovery options such as wraparound coils and liquid desiccant (Kathabar) for energy recovery on once-through air conditioning and ventilation systems.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Use variable frequency drives for static pressure control.

C. Do not specify forward curved fans. Owner's preference is direct drive plug type fans with a minimum of 12 blades per wheel.

D. Specify insulated Type 304 stainless steel IAQ drain pans on all air handling units. Drain pan shall extend 18 inches to 24 inches beyond cooling coil section. Outside air pretreat air handling units shall have drain pans that extend a minimum of 24 inches beyond the cooling coil section.

E. Intermediate drain pans must be insulated on the bottom of the pan.

F. Outside air to each air handling unit shall be controlled by modulating motor actuated dampers on the outside air intake or combination dampers on both return air and outside air intake. Depending on the design of the HVAC system, either airflow controllers or CO_2 controllers control the dampers.

G. A/E to investigate the feasibility of adding bi-polar ionization tubes or similar product in the air handling units under the following applications to enhance indoor air quality and potentially reduce outside air requirements per ASHRAE 62 addenda: 1) in 100 percent outdoor air handling units that serve patient care areas and 2) for air handling units that utilize mostly re-circulated air that serve office/administrative areas.

H. All supply ductwork shall be wrapped with fiberglass insulation per Owner Master Construction Specifications.

1. Supply and return air duct shall be insulated in accordance with the appropriate Climate Zone where the Project is located and also per the Minimum Duct Insulation R-Value tables in ASHRAE Standard 90.1.

2. Field applied duct lining material is not permitted in the supply air ducts.

3. Refer to Owner's Master Construction Specifications for acceptable sound attenuators, etc. Refer also to Design Guideline Element D3002 Sound Criteria. Where duct velocity generated air noise is a concern, attenuation options may include oversized duct to permit operation of lower velocities, lower static pressures, and lower fan horsepower.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Clarified location of O.A. intakes, maximum louver face velocity revised from 500 to 450 fpm. Added consideration for using Kathabar liquid desiccant.	PDN
Rev. 2	02-28-07	Revised Part 2 Office Terminal Units, deleting hot water, added criteria to be more descriptive about type and use of VAV terminals units.	PDN
Rev. 3	04-26-07	Added descriptive wave lengths to UV lamps.	PDN
Rev. 4	08-09-07	2.06 C. Added maximum number of rooms per terminal unit.	PDN
Rev. 5	01-11-08	2.05 B. Revised fan locations and required capacity for exhaust fan to assure no cross contamination occurs between the exhaust air and the ventilation supply air.	PDN
Rev. 5	02-19-08	1.01 A and C, 2.01F. 2.03 B. Deleted directly into mechanical space. 2.03 B. 2.04 A added variable air volume, 2.04 D.8. Deleted 65% final filter requirement, 2.05 B. Deleted the supply air fan placement requirement, 2.05 A. Added 2.05 F., 3.01 2. and 5.	YZ/ PDN

Issue	Date	Revision Description	Reviser
Rev. 6	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation.	JCD
Rev. 7	06-09-09	2.07 A. Replaced perimeter supply slot diffusers with square type diffusers.	JCD
Rev. 8	03-02-10	Editorial where the following was redundant in paragraphs 2.08 B & C "Locate fan coil units and associated piping outside electrical and telecommunication equipment rooms. When possible, locate fan coil units and associated piping within mechanical equipment rooms".	PDN
Rev. 9	07-08-10	Revised 1.01 A. and added 1.01 B. to address requirements for more specialized patient treatments, labs, and environmental rooms. Revised 202 B, reduced diff. temp from 25 to 22 degrees, 2.02 D, added max, dp across airside of the cooling coil, 2.02 E. cooling coil maximum face velocity set from 400 to 450 fpm allows for 10% capacity margin. Added 2.02 F. water conservation requirements. Revised 2.12 D. maximum face velocity for louver was changed from 500 to 450 fpm allows for 10% capacity margin. 2.10 C. Stairwell changed from one to two fans. 3.01 C. added energy recovery system options. Majority of changes are editorial.	SAK / DAB / PDN
Rev. 10	08-12-10	Revise 2.02 Use a chilled water differential temperature of 16 degrees F for renovation work.	KB / PDN
Rev. 11	09-16-10	Revised 3.01 C. and added Figures 1 and 2	PDN
Rev. 12	02-17-11	Added 2.03 C. b. statement directs the A/E our preferred use of SCRs to stage heaters. Revised 2.04 A, B, added D.3.a. statement on the direction of using staged SCR for electric preheat coils.	PDN
Rev. 13	05-17-12	Revised 2.06 D. to change the energy medium used for re-heat coils on terminal units. If the building has hot water for heating available in the building then use it. Electric heating is to be used on new administrative buildings, and where building hot water does not exist.	PDN
Rev. 14	10-30-12	Added 2.01 G. that request the use of ladders, stairs, and walkways to give access to AHU components, etc.	JLM / PDN
Rev. 15	04-11-13	Added OA airflow measurement requirement 1.01 C., added schedule of AHU performance parameters 2.01 I., Added for AE to assure opening size in wall of ceiling plenum is adequate for air flow rate 2.11K., and added 3.01 6., 7, for terminal unit requirements.	FL / PDN
Rev. 16	07-25-13	Editorial correction to conflicting information in paragraph 2.03 statement C.2.; Changed "30 percent (MERV 7) pre-filter section." To read as "MERV 7 pre-filter section."	JD / PDN

END OF ELEMENT D3041

D304101 Patient Treatment Air Handling Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Elements D3041 and D300101 on air handling distribution with additional criteria for projects involving design of patient treatment or clinical space.

B. Refer to Design Guideline Element D3041 for the following:

1. General design criteria related to outside air pretreat units, terminal units, air devices, fan coil units, unit heaters, stairwell pressurization fans, ductwork, and exhaust / intake louvers.

2. Special Contract Document Requirements and products applicable to the Project.

C. Air Handling Unit selection shall be compliant with ASHRAE 90.1.

D. Refer to NFPA 92A for Smoke Control Systems Utilizing Barriers and Pressure Differences.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Air handling systems that serve outpatient and inpatient care areas shall be designed as single duct VAV distribution systems.

B. Air handling units serving inpatient areas shall have redundant (N+1) fan systems. Multiple supply and return air fans or fan array technology shall be incorporated in the unit design to achieve redundancy.

C. Dual duct air handling units are to be specified only when an existing air handler serving a dual duct air distribution system is replaced.

D. Air handling systems that serve Operating Rooms (OR), prep, and post-anesthesia care units (PACU) shall have redundant air handling units and return air fan systems.

2.02 SPECIAL VENTILATION REQUIREMENTS

A. Patient care areas that require special ventilation include Operating Rooms, Catheterization Labs, Airborne Infection Isolation Rooms, Protective Environment (PE) Rooms, Laboratories, and local exhaust systems for hazardous agents. These areas require redundant mechanical systems to ensure infection control and to ensure that ventilation deficiencies do not occur due to loss of power of major HVAC equipment components.

B. Airborne Infection Isolation Rooms:

1. Rooms must be designed as once-through ventilation systems served with dedicated redundant (N+1) exhaust air fan systems. The quantity of supply air to each isolation room shall meet the required supply and exhaust air offset to maintain the room at a negative pressure per Facility Guideline Institute (FGI) Healthcare requirements and also meet room total cooling heating load requirements.

2. The exhaust airflow rate from the isolation room shall meet the minimum required air change rate and also maintain constant exhaust airflow during all modes of system operation. The patient private restroom shall be considered part of the room exhaust air requirement.

3. For each project, evaluate with the Owner if the total exhaust from all combined isolation rooms be filtered with a bag-in and bag-out HEPA filter caisson prior to being discharged to the outdoors by a high plume exhaust fan.

C. Protective Environment (PE) Rooms:

1. Rooms must be designed at proper outside ventilation and recirculation air change rates, and maintained at the required minimum positive pressure with respect to the corridor and adjacent rooms or spaces per FGI Healthcare requirements. Filter the supply air to PE rooms using MERV 18 HEPA filters.

2. The quantity of supply air to each PE room shall meet the required supply and return air offset to maintain the room at a positive pressure with respect to adjacent spaces and the corridor and to also meet the room’s cooling and heating load requirements.

3. The exhaust airflow rate from the patient restroom shall be included in the required air change rate and to maintain constant exhaust airflow during all modes of system operation.

D. General Operating Room (OR):

1. Rooms must be designed at proper outside ventilation and recirculation air change rates, and maintained at the required minimum positive pressure with respect to the corridor and adjacent rooms or spaces per the AIA requirements. Filter supply air to rooms using MERV 17 HEPA filters.

2. The quantity of supply air to each room shall meet the required supply and return air offset to maintain the room at a positive pressure with respect to adjacent spaces and to also meet room total cooling and heating load requirements.

3. The A/E must consider special exhaust air requirements if a laser knife will be used in the room to perform cutting and cauterizing of tissue and blood vessels.

4. The exhaust airflow rate from the room shall meet the minimum required air change rate and also maintain constant exhaust airflow during all modes of supply air system operation.

5. If explosive anesthetic medical gases are used in the room, then an emergency smoke purge fan must meet the required air change rate and also maintain the affected operating room at a slightly negative pressure with respect to the sterile processing suite and adjacent operating room and corridors.

E. Orthopedic Operating Rooms:

1. Rooms designed for surgery or bone marrow transplants shall have an outside ventilation rate of 4 air changes per hour and a recirculation rate of 40 air changes per hour. Orthopedic Operating Rooms shall be maintained at the required minimum positive pressure with respect to the corridor and adjacent rooms or spaces per AIA requirements. Filter supply air to rooms using MERV 18 HEPA Filters.

2. The quantity of supply air to each room shall meet the required supply and return air offset to maintain the room at a negative pressure respect to adjacent spaces and to also meet room total cooling and heating load requirements.

3. The A/E must consider special snorkel exhaust requirements if a laser knife will be used in the room to perform cutting and cauterizing of tissue and blood vessels.

4. If explosive anesthetic medical gases are used in the room, an emergency smoke purge fan must meet the required air change rate and also maintain the affected room at a slightly negative pressure with respect to the sterile processing suite and adjacent operating rooms and corridors.

F. Catheterization (Cath) Lab:

1. Labs must be designed at proper outside ventilation and recirculation air change rates of and maintained at the required minimum positive pressure with respect to the corridor and adjacent rooms or spaces per AIA requirements. Filter supply air using MERV 17 HEPA filters.

2. The quantity of supply air to each Cath Lab shall meet the required supply and return air offset to maintain the room at a positive pressure with respect to adjacent spaces and also to meet room total cooling and heating load requirements.

3. The exhaust airflow rate from each Cath Lab room shall meet the minimum required outdoor ventilation air change rate.

4. If explosive anesthetic medical gases are used in the Cath Lab, an emergency smoke purge fan shall meet the required air change rate and also maintain the affected Cath Lab at a slightly negative pressure with respect to adjacent Cath Labs and corridors.

2.03 PATIENT TREATMENT AIR HANDLING UNITS

A. Each air handling unit shall be a variable volume, draw through type and shall include the following components:

1. Mixing air plenum section.

2. Pre-filter section MERV 7 as rated by ASHRAE Standard 52.2-99.

3. Hot water pre-heat coil. Prefer that coil supply and return headers be piped on one side of the air handler. Refer also to requirements listed in Design Guideline Element D3041.

4. Access section.

5. Chilled water-cooling coil: prefer that coil supply and return headers be piped on one side of the air handler. Refer also to requirements listed in Design Guideline Element D3041.

   a. If two cooling coils are required to achieve the design leaving air temperature setpoint, the two coils need to be piped in series, and an access section will be required to maintain the second cooling coil.

6. Access section.

7. Fan section: direct drive fans preferred; centrifugal type with an airfoil blade design; minimum 12 blades per fan. The fan wheel speed shall be controlled with a VFD.

8. MERV 14 (HEPA) final filters, unless noted otherwise in this Design Guideline Element.

9. Discharge plenum.

10. High static pressure and smoke detection shutdown control and reset capability.

11. Instrument measurement taps for static pressure, temperature, etc.

2.04 TERMINAL UNITS AND AIR VALVES

A. This section addresses design of terminal units for zone air distribution in patient treatment areas. Refer to Design Guideline Element D3041 for general design criteria related to terminal units.

B. Variable air volume terminals that modulate supply air based on ASHRAE 62.1 and room temperature shall be confined only to spaces that do not require constant air change rates and/or critical pressure differentials with respect to adjoining spaces.

C. Specify single duct, constant air volume (CAV) terminals with zone heat for operating rooms and exam rooms where air change rates need to remain constant.

D. Specify single duct variable volume terminal units (except where medical protocol or applicable Code/Standards may otherwise require a constant volume terminal unit) with hot water zone heating coils. Protective Environment Rooms and Airborne Infection Isolation Rooms will require air valves that are capable of maintaining a constant offset between supply air and return or exhaust air from the space which is dependant on the function of the room. Hot water reheat coils are used to maintain room temperature settings.

E. For all occupied patient spaces, both exterior and interior zones, the minimum hot and cold settings of terminal units shall be such that minimum ventilation needs per ASHRAE 62.1 for the occupants are met at all times.

F. Dual duct terminal units VAV or CAV should be used for renovations when existing building are served by dual duct air handling systems.

G. Specify double wall casing liners for all terminal units that serve the following areas , per the Master Construction Specifications:

1. All inpatient rooms, including airborne infection isolation rooms and protective environment rooms

2. All operating and (invasive) procedure rooms

3. Surgery prep and post-anesthesia care units (PACU), recovery rooms

4. Laboratories not served by laboratory air valves

H. When zoning patient treatment areas, design no more than three (3) exam rooms per terminal unit.

2.05 AIR DEVICES

A. Air supply for all operating rooms and Cath Labs shall be from laminar flow supply air devices in the ceiling, located near the center of the work area. Design should consider turbulence and other factors of air movement to minimize fall of particulates onto sterile surfaces.

B. Each operating room and Cath Lab must have at least two (2), return air inlets located as remotely from each other as practical. Return or exhaust air inlets shall be near the floor level per FGI Guidelines. Smoke evacuation exhaust air grilles are to be installed in the ceilings of ORs and Cath Labs where nitrous oxide will be used for anesthesia.

C. Wall mounted exhaust air devices shall be located near the floor and at the head of the patient bed for Post-Operative Rooms where patients have received anesthesia using nitrous oxide gas.

D. Supply air devices serving Protective Environment (PE) rooms shall be located above the patient bed and exhaust air devices shall be located near the patient room door.

E. Exhaust air devices shall be located directly above the patient bed on the ceiling or on the wall near the head of the bed for patient Airborne Infection Isolation Rooms.

2.06 HUMIDIFICATION

A. For air distribution systems located in climate zones where low humidity conditions exist during the winter months, the humidifier shall be a steam manifold jacketed type with return air duct-mounted sensor/controller and supply duct-mounted high limit switch. The humidifier shall be installed downstream of the final filter of the air handling unit. Clean steam must be used for humidification purposes.

B. For air distribution systems located in climate zones where high humidity conditions exist except for short periods of time during the winter months, a packaged electronic humidifier can be used in lieu of the standard steam system humidifier. When an electronic humidifier is used in the design, the makeup water to the unit needs to be a 50/50 mix of either RO or soft water mixed with domestic potable water.

C. Humidity requirements for each Operating Room, Orthopedic Operating Room, and Cath Lab shall be individually maintained.

2.07 DUCTWORK

A. Except for patient Airborne Infection Isolation Rooms and Protective Environment Rooms, which are 100 percent exhausted, return air shall be ducted back to the air handling unit and shall be considered as a design standard for all patient care areas.

B. Duct sections shall be made of stainless steel where clean steam humidifiers are installed, and stainless steel train piping or tubing shall be placed at the bottom of the duct to prevent condensed steam from remaining inside the supply air duct.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Consider the use of heat recovery components in the design of the system where the sensible and latent heat from outside air is transferred to the exhaust air. Refer to Design Guideline Element 3041 for energy recovery requirements.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-11-07	Revised 2.01 B and C, 2.02 A, B rolled in 2.04 to 2.02 Revised 2.02 G, I, J, and K, 2.06 now is 2.05, revised 2.05 F and added G. 2.06 redefined as Humidifiers.	PDN

Issue	Date	Revision Description	Reviser
Rev. 2	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.02 B3; 2.02 B 5; 2.02 G 1; 2.02 G 3; 2.03 D 6 a; 2.03 D 6 b; 2.04 B & 4.01 B)	JCD
Rev. 3	07-23-09	Added 1.01 D. reference standard.	PDN
Rev. 4	07-08-10	Revised 2.02 A., 2.02, B.8. 2.03. Deleted requirement for dual duct AHU. Editorial corrections to other sections.	PDN
Rev. 5	05-17-12	2.02 B. 2 Revised Pre-Filter from MERV 8 to 7, and 2.02 B 8. Revised the Final filter From MERV 18 to 14.	JR / VS PDN
Rev. 6	06-14-12	2.03 B added clarification that VAV terminals for hospitals are to be double wall construction.	JR / VS PDN
Rev. 7	06-28-12	2.03 E. Revised the statement to direct the engineer to use double wall terminal units for all patient and clinic areas.	VS/PDN
Rev. 8	07-19-12	Updated terminology; created 2.02 Special Ventilation Requirements; updated 2.03 ,2.04 B. C. D. and F., and G., Air Handling Units; revised 2.05 Air Devices, and 2.07 A.	SK / VS/ PDN

END OF ELEMENT D304101

D304102 Laboratory Air Handling Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3041 on air handling distribution with additional criteria for projects involving design of laboratory space.

B. Refer to Design Guideline Element D3041 for the following:

1. General design criteria related to outside air pretreat units, terminal units, air devices, fan coil units, unit heaters, stairwell pressurization fans, ductwork, and exhaust / intake louvers.

2. Special Contract Document Requirements and products applicable to the Project.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Design dedicated air handling systems to serve laboratory and associated laboratory support areas. Where project conditions permit, office / administrative space should be served by a separate air handling system. Refer to Design Guideline Element D3041.

B. One air handling system may serve both laboratory and office areas depending on the complexity and scale of the Project. If a single air handling system is designed, supply air serving the office areas shall be used as make-up air for the laboratories or returned back to the air handling unit.

C. The need for humidification is to be evaluated based on laboratory needs during Programming. If humidification is required, locate humidifiers inside air handling units or combined zones where possible. Humidifiers must utilize chemically untreated clean steam at 15 psig. Humidity control is to be provided based on the smallest number of zones which can provide the needed humidification (to reduce installation and maintenance costs), while also providing energy efficient system operation. A/E shall evaluate and recommend if humidification is necessary on any particular air handling unit.

2.02 LABORATORY AIR HANDLING UNITS

A. Custom air handling units shall be provided for the conditioning and dehumidification of all outside air to laboratories, designated support rooms, and flex rooms that are used as interim laboratory space. The option of using an energy recovery device must be considered to help reduce energy consumption and utility cost in conditioning and dehumidifying outside air. Refer to Design Guideline Element D3041 for energy recovery requirements.

B. Air handling units serving the laboratory spaces provide conditioned air through a ducted air distribution system. Each air handler shall have filters supply fans and other mechanical components shall be configured as N+1 redundancy or with the redundant components being on standby status. The supply fans, dampers, etc. shall be interlocked with respective system exhaust air fans. Each fan must be accessible for maintenance and replacement without service interruptions.

C. Each air handler shall be a variable volume draw through type (except where space protocol and applicable Code/Standards merit otherwise) and shall include the following components:

1. Inlet plenum (100 percent outside air).

2. Inlet smoke dampers.

3. Access section.

4. 30 percent pre-filters as rated by ASHRAE Standard 52-76 or MERV 8 pre-filters as rated by ASHRAE Standard 52.2-99.

5. Hot water pre-heat coil: prefer that coil supply and return headers be piped on one side of the air handler. Refer also to requirements listed in Design Guideline Element D3041.

6. Access section.

7. Chilled water cooling coil: prefer that coil supply and return headers be piped on one side of the air handler. Refer also to requirements listed in Design Guideline Element D3041.

   a. If two cooling coils are required to achieve the design leaving air temperature setpoint, the two coils need to be piped in series, and an access section will be required to maintain the second cooling coil.

8. Fan Section: direct drive fan preferred; centrifugal type fan with an airfoil blade design; minimum 12 blades per fan. The fan wheel speed shall be controlled with a VFD.

9. 90 percent final filters as rated by ASHRAE Standard 52-76 or MERV 13 final filter as rated by ASHRAE Standard 52.2-99.

10. Discharge plenum.

11. Discharge smoke dampers.

12. High static pressure and smoke detection shutdown control and reset capability.

13. Instrument measurement taps for static pressure, temperature, etc.

D. Maximum cooling coil discharge velocity shall not exceed 400 fpm.

E. Cooling coil capacity requirement should be sized using a 20 degree differential entering and leaving chilled water temperature where possible. Chilled water piping shall be series counter flow. Refer to Design Guideline Element D3030.

F. Maximum heating coil discharge velocity shall not exceed 800 fpm.

G. The access sections and fan section shall have service lights.

2.03 TERMINAL UNITS

A. Distribution of conditioned air to each zoned room or corridor shall be controlled by a variable volume terminal unit equipped with a hot water reheat coil. Terminal units must be constant volume where required by space protocol and applicable Codes/Standards.

B. Zones such as office and administrative areas with an exterior exposure at the building perimeter shall be served by ultra quiet constant volume series fan powered terminals units with ECM fan motors and supplemental zone heat for all occupied space on the first floor level, at zones below the roof level, and for zones that require supplemental heating to meet minimum outside air requirements for indoor air quality.

C. Terminal units must have air flow rate settings to achieve either positive or negative room pressurization requirements. The offset between supply and exhaust airflow rates shall be minimum 90 CFM to allow transfer air at each door entrance.

D. Terminal units shall be made of aluminum material for rooms with MRI machines or similar equipment.

2.04 AIR DEVICES

A. Interior and general supply air ceiling devices shall be louvered face with functional performance similar to the Titus TDX-AA diffuser. Labs with MRI machines or similar equipment shall use diffusers made with aluminum.

B. Size the diffuser on delivery of design air flow rate within the established noise criteria limit. Supply air throw velocities shall not exceed 1.5 feet per second at a room elevation 6 feet above the finished floor.

C. Laminar flow diffusers (similar to Kruger TAD model) are to be used at room locations where Chemical Fume Hoods (CFH) and Biological Safety Cabinets (BCS) are being used.

D. A/E needs to evaluate the effects of diffusers with 2 or 3 directional throws in areas that may be impacted by air throw near chemical fume hoods, radioisotope hoods, BSCs, and also chemical balance rooms. Other diffusers with proven desired effect in research laboratories should also be considered.

2.05 DUCTWORK

A. Laboratory spaces require a once-through system; no return air. Air supplied by this system will be relieved via a ducted exhaust system. Refer to Design Guideline Element D304202 Laboratory Exhaust and Ventilation.

B. Ductwork, quench piping, and supports placed within MRI/NMR rooms shall be constructed with non-ferrous material.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. If there are adjacent structures where airborne effluent has the potential to affect the Project, the A/E shall evaluate the need for a building wind tunnel study to aid in finalizing the height and location of the outside air intake.

B. Owner prefers to locate outside ventilation air intakes on the side of the building and not on the roof.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 2 Air Devices: Added item D and revised item C.	PDN
Rev. 2	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01B; 2.01 F; 2.01 G; 2.02 A; 2.02 B; 2.02 C 5; 2.02 C 7; 2.02 E; 2.03 A &2.03 B)	JCD
Rev. 3	07-08-10	Deleted criteria from 2.01 A.C.D.& E that is stated under Element D3041. Revised 2.01 B adding statement on return duct from office HVAC system. Revised 2.02 E temperature differential, Revised 2.30 A, B.	SAK/PDN/ DAB/GSN /TP
Rev. 4	09-16-10	Revised 2.01C to evaluation application for humidification; Revised 2.02E cooling coil temperature differential. Clarified 2.03 B.	KTB/SK

END OF ELEMENT D304102

D304104 Pharmaceutical Air Handling Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3041 on air handling distribution with specific criteria for projects involving design of pharmaceutical spaces.

B. Refer to Design Guideline Element D3041 for the following:

1. General design criteria related to outside air pre-treatment units, terminal units, air devices, motor requirements and ductwork.

2. Special Contract Document Requirements and products applicable to the Project.

C. Design shall be in accordance with the United States Pharmacopeia (USP) – National Formulary (NF) Standards latest Edition of USP 27-NF 22, and General Tests and Assays Chapter 797, Pharmaceutical Compounding Sterile Preparations (CSP).

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Design a dedicated air handling system to serve the pharmacy and associated support areas. The room where CSP’s are prepared shall have a clean room environment and it shall be served with (N+1) air conditioning and ventilation systems to maintain the clean room certification.

B. When BSC's are used for compounding the buffer area and anteroom shall be ISO Class 7. An ISO Class 8 anteroom or a demarcation line can be used when laminar airflow workbenches are used for compounding.

C. ISO Class 7 areas shall receive no less than 30 air exchanges per hour (ACH) of HEPA filtered supply air. The recirculating primary engineering control (PEC) with a HEPA filter, such as laminar airflow workbench or biological safety cabinet, can contribute no more than 15 ACH of the room’s requirement, with the supply as providing no less than 15 ACH.

D. The recirculated ACH and the outside ACH depends on either the personnel support staff doing the compounding work, number of chemical or BSC exhaust hoods, and pressurization requirements of the prep areas or labs within the room envelope. The minimum outside air requirement shall comply with ASHRAE standards. Office or administrative spaces shall be served by a separate air handling system. Refer to Design Guideline Element D3041.

E. Local pressure indicators and alarms are to be used where controlled pressure requirements are necessary to maintain certification of the pharmacy lab room environment.

F. If required, the pharmacy compound space shall be served by duct mounted steam injection humidifier that uses chemically untreated 15 psig clean low pressure steam. A humidity sensor located in the room will provide feedback control to increase or decrease the demand for steam. If a building steam system is not available for use, a commercial steam generator or ultrasonic humidifier unit can be used to develop clean low pressure steam for humidification purposes.

G. Outside air intake locations shall be clear of building general exhaust system, kitchen exhaust, plumbing vents, generator exhaust, grease traps, trash dumpsters, vehicular exhaust, etc., to avoid introduction of undesirable odors or gases into the building, under all conditions.

H. Select outside air intake louvers for a maximum face velocity of 500 fpm and free area of 50 percent. Coordinate louver selection with architectural drawings.

2.02 PHARMACUEUTICAL AIR HANDLING UNITS

A. These dedicated custom air handling units shall be provided for conditioning and dehumidification of all designated preparation, and storage support rooms. The option of using an energy recovery device needs to be considered to help reduce energy consumption and utility cost in conditioning and dehumidifying the outside air, refer to Part 3 of this Element and refer to Section D3041 for energy recovery requirements.

B. Air handling units serving the pharmaceutical spaces provide filtered recirculated and conditioned air through a ducted single zone air distribution system using hot water reheat coil terminal units. Each air handler shall have filters and redundant active mechanical components such as supply fans, etc. The supply fans, dampers, etc. shall be interlocked with respective system exhaust air fans.

C. Each air handler shall be a variable volume draw through type (except where space protocol and applicable Code/Standards merit otherwise) and shall include the following components:

1. Inlet plenum.
2. Inlet outside air and smoke isolation dampers.
3. Access section.
4. Pre-filter section, 3 to 10 μm, 30 percent as rated by ASHRAE Standard 52-76 or MERV 8 as rated by ASHRAE Standard 52.2-99.
5. Access section.
6. Medium efficiency filter section, 1 to 3 μm, 65 percent as rated by ASHRAE Standard 52-76 or MERV 10 as rated by ASHRAE Standard 52.2-99.
7. Hot water pre-heat coil: Refer to requirements listed in Section D3041.
8. Access section.
9. Chilled water cooling coil: Refer to requirements listed in Section D3041.

a. If two cooling coils are required to achieve the design leaving air temperature setpoint, the two coils need to be piped in series, and an access section will be required to maintain the second cooling coil.

10. Properly spaced UVGI lampsare to be located on the leaving air side of the cooling coil or or bi-polar ionization located on the upstream side of the cooling coil. The lamps shall have the capability of developing an intense UV between 250 to 270 nm. Short-wave ultraviolet light shall destroy DNA in living microorganisms, and also breakdown organic material found in indoor air.

11. Access section.

12. Fan Section: direct drive fan preferred; centrifugal type fan with an airfoil blade design; minimum 12 blades per fan. The fan wheel speed shall be controlled with a VFD.

13. Final filter section: 0.3 to 1µm, 90 percent as rated by ASHRAE Standard 52-76 or MERV 14 as rated by ASHRAE Standard 52.2-99.

14. Discharge plenum.

15. Discharge smoke dampers.

16. High static pressure and smoke detection shutdown control and reset capability.

17. Instrument measurement taps for static pressure, temperature, etc.

D. Maximum cooling coil discharge velocity shall not exceed 400 fpm.

E. Cooling coil capacity requirement should be sized using a 20 to 25-degree differential entering and leaving chilled water temperature where possible.

F. Maximum heating coil discharge velocity shall not exceed 800 fpm.

G. The access sections and fan section shall have service lights.

2.03 TERMINAL UNITS

A. Distribution of conditioned air to each zoned room or corridor shall be controlled by a variable volume terminal unit equipped with a hot water reheat coil. Terminal units are to be constant volume where required by space protocol and applicable Code/Standards.

B. Terminal units must have air flow rate settings to achieve either positive or negative room pressurization requirements. The offset between supply and exhaust airflow rates shall be minimum 80 CFM to allow transfer air at each door entrance.

2.04 AIR DEVICES

A. Interior and general supply air ceiling devices shall be aluminum Omni directional square panel face diffusers are to be used for offices, conference rooms and support spaces.

B. Size the diffuser on delivery of design air flow rate within the established noise criteria limit. Supply air throw velocities shall not exceed 1.5 feet per second at a room elevation 6 feet above the finished floor.

C. Laminar flow diffusers (TAD) equipped with 99.99 percent or MERV 19 filters where required to trap particles of <0.3 μm. These filters are to be used in the diffusers for critical laminar flow spaces locations, and also where BSC II recirculation cabinets are also being used.

2.05 DUCTWORK

A. Refer to Design Guideline Element D304102 Laboratory Air Handling Distribution.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. If there are adjacent structures where airborne effluent has the potential to affect the Project, the A/E shall evaluate the need for a building wind tunnel study, to aid in finalizing the height and location of the outside air intake.

B. Consider the use of energy recovery components in the design of the system where the sensible and latent heat from outside air is transferred to the exhaust air. Refer to Section D3041 for energy recovery requirements.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.02A; 2.02 B; 2.02 C; 2.02 C 7; 2.02 C 9; 2.02 D; 202 E; 2.03 A; 2.03 B & 3.01 B)	JCD
Rev. 2	09-16-10	Revise 1.10.B. added motor requirement, 2.01 D. deleted the statement about 7.5 hp motor minimum size for VFD	PDN

Issue	Date	Revision Description	Reviser
Rev. 3	07-25-13	Revised 2.01 C, D, to clarify the 30 ACH and G., also 2.01 B. and G.10 to include bi-polar ionization to remove bacteria from air.	GSN & PDN

END OF ELEMENT D304104

D304105 MRI Air Handling Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3041 on air handling distribution with specific criteria for projects involving design of MRI spaces.

B. Refer to Design Guideline Element D3041 for the following:

1. General design criteria related to outside air pre-treatment units, terminal units, air devices, motor requirements and ductwork.

2. Special Contract Document Requirements and products applicable to the Project.

C. HVAC requirements for the MRI suite vary widely with the capacity and make of the imaging unit. Information pertaining to indoor design conditions, internal heat gain, and shielding against the Radio Frequency (RF) and EMI (Electro-Magnetic Interference) etc. shall be obtained from the equipment manufacturer during the Project Design Development phase.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Central air handling system or single computer room air handling units serving the MRI shall be able to maintain the MRI space at 74 +/- 2 degrees F dry bulb, and the relative humidity at 50 percent. The electronic modules that power and controls of the MRI machinery are to be maintained at the manufacturer’s recommended temperature and relative humidity conditions.

B. The MRI electronics room and other associated computer support areas a served by dedicated air conditioning system to maintain temperature and humidity requirements. Any office / administrative space shall be served by a separate air handling system. Refer to Design Guideline Element D3041.

C. HVAC equipment for MRI Suites shall be on emergency power. Refer also to Section D3000 for additional emergency power requirements.

2.02 MRI SUITE AIR HANDLING SYSTEM

A. MRI Gantry Room:

1. Provide a dedicated, air-handling unit to serve the examination room and other spaces associated with the MRI suite. Depending upon the specific needs of various spaces, conditioned air shall be supplied by either constant or variable air volume terminal units serving as temperature control zones. Note the following guidelines:

a. An automatic emergency 100 percent exhaust system, in the gantry room, to remove helium gas during an accidental spill. The minimum capacity of the exhaust system shall be 12 air changes per hour. The gas shall be discharged at the highest point of the building. The oxygen sensors shall activate the exhaust system when the level of oxygen drops below a predetermined level. It is usually 18 percent.

b. Provide separate vents to remove helium gas produced during boil-off and quench of the magnet. While the boil-off is a normal venting phenomenon, the quench occurs when a super conductive magnet becomes resistive. Coordinate sizes of HVAC equipment, including pressure drops with the magnet manufacturer. Helium liquid turns into gas and tends to occupy enormously high volume.

c. The air distribution ductwork shall be constructed of either FRP or aluminum material to maintain the integrity of the magnetic field.

d. Return duct mounted temperature and humidity sensors are to be used to control and monitor MRI room. The devices are to be located downstream of the duct wave guides which are located at the duct penetration.

B. Computer Room:

1. The air supply outlets shall be located at the floor level with the air directed toward the cabinet inlets. The return air inlets shall be located at the ceiling level, above the cabinets, and near equipment exhaust.

2. The physical location of the cooling unit should be coordinated with the magnetic field line and should be located at a distance to maintain the integrity of the magnetic field or not be affected by the intensity of the magnetic field.

3. The supply air entering the computer room shall meet the minimum and maximum temperature and humidity requirements set forth by the manufacturer of the MRI to comply with the manufacturers warranty requirements.

4. Provide water sensor capable of providing alarms locally and also the BAS on the raised deck and under the raised flooring. The alarm shall sound upon detection of water on the floor.

C. MRI Cooling Units:

1. Dedicated closed-loop water-cooling equipment shall be provided remove the heat generated by the MRI and control equipment. The cooling equipment shall comprise of a dedicated air-cooled, chiller, circulating pump and interconnecting piping, valves, and indicating flow meter are required. If a central chilled water system is available with in the building, then interconnecting piping, valves, and indicating flow meter are required.

2. The pH level, total solid content, total hardness, and alkalinity of the circulating water shall be within the limits prescribed by the equipment manufacturer.

3. The limits of the inlet water temperature, pressure drop through the equipment, and maximum inlet water pressure shall be in accordance with the equipment manufacturer's specification requirements.

4. Water piping design and installation shall meet "Radio Frequency" (RF) requirements. Piping routed and supported in walls and chases shall be provided with clearly marked and identified access doors for servicing valves and other piping specialties.

2.03 TERMINAL UNITS

A. Distribution of conditioned air to each zoned room or corridor shall be controlled by a constant volume terminal unit equipped with a hot water reheat coil.

B. Constant volume terminal units must have air flow rate settings to achieve either positive or negative room pressurization requirements. The offset between supply and exhaust airflow rates shall be minimum 80 CFM to allow transfer air at each door entrance.

2.04 AIR DEVICES

A. Interior and general supply air ceiling devices shall be aluminum Omni directional square panel face diffusers are to be used for the MRI and Computer room spaces.

B. Size the diffuser on delivery of design air flow rate within the established noise criteria limit. Supply air throw velocities shall not exceed 1.5 feet per second at a room elevation 6 feet above the finished floor.

C. Laminar flow diffusers are to be located over the gantry where the patient will be receiving intravenous injections equipped with 99.97 percent or Merv 19 filters where required to trap particles of 0.3 micron. These same devices are to be used at room locations

2.05 DUCTWORK

A. Refer to Design Guideline Element D304102 Laboratory Air Handling Distribution.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. If there are adjacent structures where airborne effluent has the potential to affect the Project, the A/E shall evaluate the need for a building wind tunnel study, to aid in finalizing the height and location of the outside air intake.

B. Consider the use of heat pipe in the design of the system where the sensible and latent heat from outside air is transferred to the exhaust air, and cross contamination will not occur between the two air streams.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	05-03-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.01 D)	JCD
Rev. 2	09-16-10	Revise 1.01 B. added motor requirement. Deleted statement in 2.01. C. in reference to minimum 7.5 hp requirement for VFD.	PN
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D304105

D304106 Data Center Air Handling Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3041 on air handling distribution with specific criteria for projects involving design of a Data Center spaces

B. Refer to Design Guideline Element D3041 for the following:

1. General design criteria related to outside air pre-treatment units, terminal units, air devices, motor requirement and ductwork.

2. Special Contract Document Requirements and products applicable to the Project.

C. HVAC requirements for the Data Center vary with the capacity and type of the electronic equipment for example requirements will vary depending on whether processors are cooled with water or cooled racks or combination with conventional computer room air conditioning (CRAC) units. The A/E must obtain Information pertaining to indoor design conditions, internal heat gain, and shielding against the radio frequency (RF) from the equipment manufacturer during the project Design Development phase.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The Data Center will be served by multiple power distribution paths, with one path active and a single, active path for cooling distribution. Equipment components serving the Data Center must have (N+1) redundancy and must be separate from the primary utility infrastructure equipment for the building. The A/E shall provide recommendations to the Owner on levels of redundancy for infrastructure components as described within this Design Guideline Element.

B. Any office / administrative space shall be served by a separate air handling system. Refer to Design Guideline Element D3041.

C. All HVAC equipment and components necessary to maintain temperature and humidity requirements for the Data Center shall be connected to emergency power. Refer also to Section D3000 for additional emergency power requirements.

D. Design Data Center HVAC systems consistent with ASHRAE Design Guidelines for Data Centers and ASHRAE Advanced Design Guideline for Data Centers (to be released in January 2009).

2.02 INDOOR DESIGN CONDITIONS

A. Space temperature and humidity conditions for computer equipment and power distribution units (PDU) are within the limits as shown in the following Table unless different temperature and humidity requirements are stipulated by the manufacturer of the electronic computer equipment.

Occupancy	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Data Center & Telecom Rooms	64 -70	64 -70	30 – 55
Office Areas	74 ± 2	72 ± 2	30 - 60
Electrical and UPS Equipment Rooms	60 - 80	60 - 80	Not Controlled

B. Evaluate designs for data centers that include underfloor air distribution to bottom of server racks with discharge ducted directly to above ceiling plenum return systems. Evaluate also system designs to include hot aisle/cold aisle with similar underfloor air distribution and above ceiling return similar to above. Intent is to limit the server rack load to the space and increase the space design temperature, while reducing supply airflow and increasing supply/return air temperature differential. Consider CFD modeling to confirm suitable dissipation and collection of server rooms, or perform commissioning in operating system/room to accomplish intended performance.

2.03 INTERNAL LOADS

A. The mechanical system loads will be based on the following electrical and equipment loading for the various spaces. Note, however, that the internal loads for these spaces must be determined based on actual electrical and process requirements of the lighting and equipment to be installed. Lighting design and respective heat loads to comply with maximum connected power densities as established by ASHRAE 90.1-2007.

Occupancy	Lighting (W/SF)	Equipment (W/SF)
Data Center	1.5	Based on Actual
Office Areas	1.1	0.75
Equipment Rooms	1.5	Base on Actual
Storage Rooms	0.8	0.5

2.04 DATA CENTER AIR HANDLING SYSTEM

A. The Data Center will be conditioned by CRAC units (with down-flow air delivery for under floor air distribution. Each CRAC Unit will be provided with an infrared humidifier to maintain indoor space conditions. Design the CRAC layout and capacity for a level of redundancy such that the Data Center air conditioning requirements are not compromised should any one unit fail to operate or be de-energized due to maintenance needs. If a particular CRAC unit fails to operate, the adjacent unit must be able to accommodate the needed cooling capacity.

B. Evaluate humidification/dehumidification requirements of data centers HVAC system. Where dehumidification is of main concern, conditioned outside air shall be provided from an air handling pretreatment unit equipped with a desiccant wheel or liquid desiccant system capable of reducing the dew point temperature and also reduce reheating requirements of the outside air being supplied to the Data Center envelope. Where used, desiccant dehumidification shall use recovered energy for activation of desiccant media. Confirm humidification/dehumidification concepts as acceptable with Owner prior to design of system.

C. A dedicated HVAC system must meet temperature, humidity and air distribution requirements as required by the manufacturer UPS.

D. Provide a pressure relief path from the Data Center envelope to relieve the air from the Data Center during a discharge of FE-25 system. The CRAC Units are to be interlocked to shut down when the fire suppression system is initiated.

E. The raised floor framing shall be seal sealed around the perimeter minimize the leakage of supply from the floor plenum space.

F. The A/E shall discuss optimum placement of CRAC units during Design Development in accordance with proposed equipment rack locations. All CRAC Units shall be located at as close to the perimeter wall as reasonably achievable. The CRAC Units are to be designed to permit complete maintenance access for repair and replacement from all three sides. Clearance requirements as recommended by the manufacture of the CRAC Units are to be included in the location criteria of electronic equipment.

G. CRAC Units serving the Data Center will have the following minimum components:

1. Packaged, chilled water cooling coil, factory assembled, pre-wired and pre piped units, consisting of cabinet, fans, filters, humidifier, controls. Assemble unit for down-flow air delivery in a draw-through configuration.

2. MERV 9 or DSP 40 percent efficient pre-filters; 2 inch thick, replaceable, dry type as rated on ASHRAE Standard 52.2.

3. Chilled water cooling coil, maximum 6 row, 9 fins per inch.

   a. Each coil to be piped for counter flow operation.

4. All coils shall have copper tubes with aluminum fins.

5. Double inlet centrifugal fan.

6. Stainless steel drain pan.

7. Infrared humidifier consisting of high intensity quartz lamps mounted above stainless steel evaporator pan.

8. NEMA 250; Type 2 control cabinet enclosure, UL listed, with combination magnetic starters with overload relays, circuit breakers, and fusible control circuit transformer. If fan motors are equal to or greater then nominal 7.5 horsepower then use VFD option.

9. Microprocessor Control System.

10. Communications serial interface for continuous remote monitoring and alarming through the building automation system and critical load monitoring software package, as referenced under the Division 26 Specifications.

11. If VAV option is used then isolation dampers located at the discharge or return air plenum to preclude reverse flow of supply air through the non-operating CRAC units.

H. The air supply outlets shall be located at the floor level with the air directed toward the cabinet inlets. Use ASHRAE publication, "Thermal Guidelines for Data Processing Environments", dated January, 2004. In the following Figure 1, racks within the Data Center are arranged such that there are cold aisles and hot aisles.

   a. The cold aisle consists of perforated floor tiles separating two rows of racks. The chilled air from the perforated floor tiles is exhausted from the tiles and is drawn into the fronts of the racks. The inlets of each rack (front of each rack) face the cold aisle.

   b. This arrangement allows the hot air exhausting the rear of the racks to return to the CRAC units; thus, minimizing hot exhaust air from the rack circulating back into the inlets of the racks. CRAC units are placed at the end of the hot aisles to facilitate the return of the hot air to the CRAC unit and maximize static pressure to the cold aisle.

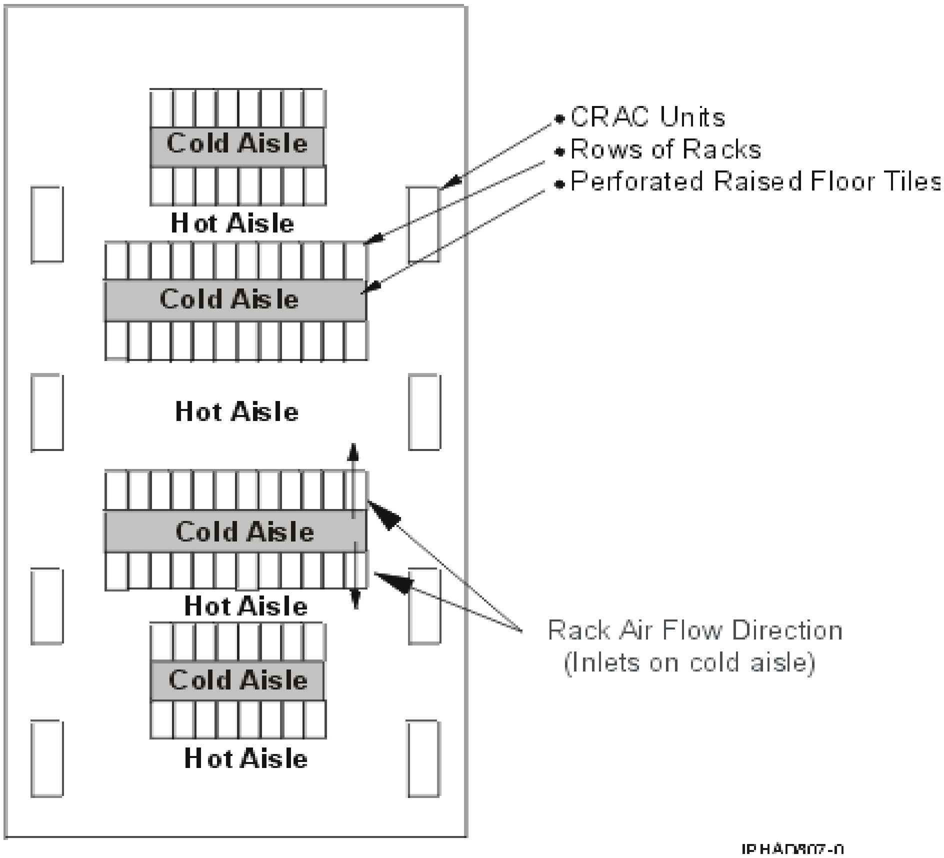


Figure 1: Hot aisle and cold aisle arrangement

I. A metal pan should be provided under the chilled water and CRAC condensate piping rack below the raised access floor to contain any water leaks. The galvanized metal pan will be welded and caulked to be watertight. The pan shall be designed to avoid restricting airflow from the CRAC units to the perforated floor register tiles that allow air to cool the equipment loads within the Data Center. In general, design the chilled water and condensate drain piping layout such that air circulation to perforated floor diffusers is not hindered.

J. Provide a leak detection system below the raised access floor with an LED panel and a serial interface for continuous monitoring. The leak detection system will illustrate the exact location of the leak under the floor as identified via a floor plan; and not only to identify leaks based on distance. The leak detection system as well as all other monitored data shall be capable of being locally and remotely monitored.

2.05 TERMINAL UNITS

A. Distribution to corridors, electrical rooms, and equipment rooms shall be served by single duct variable volume terminal units.

B. The criteria for terminal units serving office areas are referenced in Design Guideline Element D3041.

2.06 DATA CENTER AIR DEVICES

A. Interior and general supply air ceiling devices shall be perforated registers in the raised floor. If VAV option is used as the floor plenum supply air distribution, then the air device is a perforated floor diffuser grille with an integral electric actuated air valve. Refer to Design Guideline Element D3401 for type of supply grilles to use for offices.

B. Size the diffuser on delivery of design air flow rate within the established noise criteria limit.

2.07 DUCTWORK

A. Refer to Design Guideline Element D3041 Air Handling Distribution.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	05-03-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs2.01 D; 2.01 E; 2.02 B; 2.03 A 7 2.03 B)	JCD
Rev. 2	09-16-10	1.01B. added motor requirement, 2.01. C. deleted minimum 7.5 hp requirement for VFD.	PN
Rev. 3			

END OF ELEMENT D304106

PART 1 - GENERAL

1.01 OVERVIEW

A. This section describes building exhaust and relief systems. Refer to Design Guideline Element D3041, Air Handling Distribution, for design criteria related to ductwork and ductwork accessories.

PART 2 - DESIGN CRITERIA

2.01 GENERAL EXHAUST

A. With the exception of general laboratory exhaust, the exhaust systems may be interlocked with the supply air system to shut down when the supply air system shuts down during unoccupied hours for energy conservation. For research laboratory applications, refer to Design Guideline Element D304202.

B. Toilet exhaust air quantity shall be based on ASHRAE 62.1 using 70 CFM exhaust airflow per restroom fixture.

C. Plan for a general exhaust system to exhaust toilet rooms, janitor’s closets, and general building exhaust requirements including general laboratory exhaust as applicable.

D. Provide additional exhaust systems as needed for generator exhaust and for specific applications.

E. Provide at least one pressure independent, 2-position constant volume exhaust air terminal per floor to measure and control all general exhaust.

2.02 BUILDING PRESSURE RELIEF SYSTEM

A. Plan for a building pressure relief system consisting of a riser, fan and associated controls to relieve the building of excess outside air that cannot be exhausted through the building general exhaust system. For research laboratory applications, refer to Design Guideline Element D304202.

B. Evaluate the effectiveness of recovering the relief system energy for pretreatment of outside air into the building using an enthalpy wheel or heat recovery pipe. Refer to Design Guideline Element D3041 for energy recovery requirements.

C. Provide at least one pressure independent, 2-position constant volume exhaust air terminal per floor to measure and control all relief exhaust.

2.03 KITCHEN EXHAUST SYSTEMS

A. Design food service exhaust systems to control heat, moisture, and grease. A dedicated grease exhaust system will be provided for kitchen hoods in the food service area.

B. The kitchen equipment supplier will typically provide the hoods. Hoods will be UL listed and equipped with fire suppression systems listed under UL300.

C. Specify a dedicated welded stainless steel Type 316L ductwork (18 gage minimum) to transport grease-laden vapors from the kitchen hoods to the building exterior.

D. Plan for a separate dedicated, welded stainless steel ductwork (18 gage minimum) to transport moisture-laden air from the dishwashers to the building exterior. A dedicated exhaust fan shall be provided and control interlock to start upon start of the dishwasher and stop (time delayed) on when dishwashing machine is shutdown. The fan wheel and casing shall be fabricated with appropriate materials to withstand the corrosive conditions of the moisture-laden exhaust air.

E. Specify cleanouts at approximately every 20 feet in horizontal ductwork sections and at changes in direction.

F. Fire rated enclosure for kitchen grease exhaust ductwork system must be rated for shaft protection in accordance with U L 2221 or must be enclosed by a fire rated shaft enclosure. Cleanouts must remain accessible without disturbing the fire barrier.

G. All kitchen and dishwasher exhaust ductwork shall be routed up to the building roof or alternatively through the building exterior wall or lower level roof depending on wind tunnel/air quality analysis results.

H. Kitchen exhaust system shall comply with NFPA 96.

I. Locate building air intakes as to ensure the cleanest possible air. Locate exhaust discharge where exhaust air cannot be easily reintroduced into the building outside air intakes.

J. Provide a grease collector at kitchen exhaust fans and pipe the collector for convenient cleanout and servicing.

K. Provide dedicated exhaust fan systems for each Type 1 grease exhaust hood with a fryer or grill, and also for Type 2 hoods with broilers and ovens. <u>The optimum goal is to reduce as much make-up air as possible if the kitchen equipment being served is not in use</u>.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the general exhaust and pressure relief systems in the Contract Documents.

B. All fans shall be direct drive where possible and specified with a variable frequency drive if the motor is 5 horsepower and greater.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Refer to Design Guideline Element D3041 for additional criteria on outside air intakes.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 2 Kitchen Exhaust System, paragraph 7 - added the words "U.L. rated".	PDN
Rev. 2	12-09-08	Included sustainability requirements to paragraph 2.02 B based upon TGCE's evaluation.	JCD
Rev. 3	07-08-10	Revised 2.03 F; remaining comments are editorial for clarification purposes.	SAK/ DAB/ PDN
Rev. 4	09-16-10	Added requirement for exhaust and relief air terminals; added requirement for dedicated exhaust from each grease exhaust hood.	KTB
Rev. 5	02-17-11	2.10 E editorial, 2.03 D added exhaust fan for kitchen dishwasher, 2.03 K underline to strengthen the statement.	PDN

END OF ELEMENT D3042

D304201 Patient Treatment Exhaust and Ventilation

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3042 with additional criteria on exhaust systems unique to patient treatment facilities.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Exhaust outlets of ventilating systems, combustion equipment stacks, medical-surgical vacuum systems, plumbing vents, or areas that may collect vehicular exhaust or other noxious fumes shall be located at least 25 feet from outside air intakes.

B. Exhaust outlets from areas that may be contaminated shall be above roof level and arranged to minimize recirculation of exhaust air into the building.

C. Due to chase space limitations within existing buildings, coordinate with MD Anderson Cancer Center on possible location of new exhaust risers and fan locations.

D. General exhaust systems serve toilet rooms, janitor’s closets, soiled utility rooms, dark rooms, recovery rooms, and general laboratories as an example.

E. Special exhaust systems include dedicated exhaust for critical areas, such as airborne infectious isolation, laboratory fume hoods, etc.

F. Each dedicated exhaust system has its own unique set of requirements for air quantity, construction of materials, type of discharge, controls, emergency power, and hours of operation. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

G. Locate exhaust discharge where it cannot be easily reintroduced into the building outside air intakes.

2.02 AMBULANCE ENTRANCE VENTILATION

A. Exhaust fan to ventilate this area shall be activated automatically whenever an ambulance enters and shall continue to operate for five minutes after departure. Provide 0-15 minute time delay.

B. Provide a thermostat to cycle the exhaust fan when the ambulance entrance space temperature exceeds 85 degrees F.

2.03 AIRBORNE INFECTIOUS ISOLATION EXHAUST

A. Provide a dedicated exhaust system.

B. Provide a redundant fan to facilitate maintenance such that exhaust system may be operated 24 hours per day, 7 days per week.

C. Provide fan selection data on a performance curve and ensure that the fan discharge is directed vertically upward with a discharge velocity of 3500 fpm.

D. Minimum stack height shall be 12-feet.

2.04 DECONTAMINATION EXHAUST

A. Provide a dedicated exhaust system.

B. A/E shall confirm actual requirements with the Owner during the Project design phase.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the general exhaust and pressure relief systems in the Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Refer to Design Guideline Element D3041 for additional criteria on outside air intakes.

D304201 Patient Treatment Exhaust and Ventilation

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.01 F)	JCD
Rev. 2	07-08-10	Editorial clarifications and corrections.	SAK
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D304201

D304202 Laboratory Exhaust and Ventilation

PART 1 - GENERAL

1.01 OVERVIEW

A. This section supplements Design Guideline Element D3042 on exhaust and ventilation with additional criteria for projects involving design of laboratory exhaust and ventilation systems.

B. Refer to Design Guideline Element D3042 for the following:

1. General design criteria related to exhaust and ventilation systems.

2. Special Contract Document requirements and products applicable to the Project.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. In general, laboratory exhaust systems shall comply with procedure and support room ventilation air requirements of NFPA 45, 90A, NIH, CDC, OSHA Regulation 29 CFR, Part 1910, ACGIH a Manual for Recommended Practice for Design 27^{th} Edition, and ANSI/AIHA Z9.5-2003.

B. Special exhaust systems as noted below and where determined to be hazardous, shall not be housed in the same chase that contains environmental supply, return, and exhaust ducts. Special exhaust systems shall be labeled "hazardous" consistent with specification requirements.

1. Laboratory hood exhaust systems.

2. Biological laboratory exhaust.

3. Radioactive hot lab exhaust.

4. LN_2 freezer room exhaust system. Refer to Design Guideline Element Z4050.

C. Where laboratory classification is BSL-1 or BSL-2 and laboratory protocol does not allow for hazardous exhaust as a portion of the laboratory exhaust system, combined environmental/laboratory exhaust systems may be used and may be located in the same chase as environmental supply and return ductwork. The combination environmental/laboratory exhaust ductwork should still be labeled "hazardous" to be consistent with specification requirements.

D. All other ductwork carrying make-up air that is connected to special exhaust systems may be installed in the same chase that carries environmental supply and/or return ducts.

E. Exhaust fans serving laboratory hoods shall be connected to an emergency power source. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

F. Evaluate recirculation of air in non-laboratory areas.

G. Evaluate sensible cooling in low hazard, high heat load areas.

2.02 LABORATORY HOOD EXHAUST FANS

A. While the type of exhaust system depends on hood characteristics, incorporate the following features into the design to avoid excessive noise levels and ensure accurate air balancing.

1. Exhaust shall be continuously monitored and an alarm system (local audible and visible alarm and an alarm at MD Anderson Cancer Center's central monitoring services, shall be provided for each hood and biological safety cabinet).

2. Select exhaust fans to operate at low tip speed (approximately at 50 percent of the maximum permissible tip speed) and maximum static efficiency.

3. Furnish to the Owner for review during the Design Phase, fan selection data on a performance curve and ensure that the fan discharge is directed vertically upward.

4. Size ductwork to maintain velocity in the ductwork between 1500 and 2000 fpm to prevent condensed fumes or particulate from adhering to the walls of the ducts or settling out onto horizontal surfaces and to address acoustical issues.

5. Perform a sound analysis for each exhaust fan and provide sound attenuation, if required.

6. To ensure that design airflow is achieved on manifolded and shared exhaust systems, specify pressure independent, factory-set, field-adjustable automatic airflow controls for each fume hood and biological safety cabinet.

7. An independent flow monitor shall be provided with provisions to alarm locally and also to alarm to the building automation system (BAS). Provisions must be incorporated in the design to allow access to the independent flow monitor.

B. Each laboratory exhaust air system shall have a corresponding supply air system to comply with laboratory, hood exhaust air, and laboratory ventilation exhaust air change (AC/hr) requirements listed below:

Room Description	**Occupied[3] AC/hr (minimum)**	**Unoccupied AC/hr (minimum)**	**Vacant[4] AC/hr (minimum)**
Fume Hood Rooms	6	6	4
Radio Chemistry	10	6	4
Laboratories[4]	6	4	4
Equipment Room[4]	6	6	4
Tissue Culture Room[3]	6	6	4
Dark Room	10	10	4
Storage Room	4	4	4
Glass Wash Room	10	6	4
Cold Room	4	4	4

Notes:

1. Occupied defined as space with personnel present during specific time.
2. Vacant defined as space that is not assigned to a lab user and that does not have equipment that generates chemicals.
3. BSL3 and Tissue Culture Rooms are exempt from the occupied and unoccupied air change rate.
4. Room shall have override capability for changing from unoccupied to occupied modes.

C. Actual air change rates may exceed the above stated rates to maintain temperatures in the laboratory or prevent a hazardous environment. By definition, one AC/hr is the total of supply air and infiltration air from the surrounding space provided in one hour divided by the total room volume.

D. Laboratory exhaust fans shall be an N+1 redundant system capable of maintaining constant volume with the capacity to exhaust listed rooms at the required minimum ventilation design air change rates.

E. Exhaust fans shall be direct drive. Where exhaust air filters require or merit such, exhaust fans shall be powered through the use of variable frequency drives that vary fan speeds to maintain exhaust air conditions during exhaust air filter loading. Fan speed is determined by maintaining an airflow measurement or static pressure setpoint (adjustable) from the BAS.

F. The design exhaust rate through standard fume hoods, standard radioisotope fume hoods, and biological safety cabinets (BSCs) will be determined based on maintaining full containment at the maximum possible sash opening.

   1. Laboratory chemical hood operation: Face velocities should be between 80 and 125 fpm at the maximum sash height with an optimum level of 100 fpm during occupied periods for standard fume hoods. Face velocity may be reduced to 60 fpm during unoccupied periods (via zone presence sensors at the hoods or room occupancy sensors).

   2. Non-traditional chemical fume hoods (e.g. high performance fume hoods, application specific installations, etc.) are excluded from the above statements 2.02 F. and F.1.

G. Either variable or constant volume bypass type hoods will be utilized. For substantial organic chemistry areas, variable volume type hoods with restricted bypasses will be utilized for those spaces. In addition to fume hoods, the BSCs, flammable storage cabinets, and acid storage cabinets will be served as follows:

   1. Typical fume hoods and Class II Type B1 cabinets should be combined into a single laboratory exhaust system.

   2. Radioisotope hoods should have a dedicated exhaust system.

   3. Organic chemistry hoods may also require a dedicated exhaust air system.

   4. Acid storage cabinets will be ventilated utilizing a 2-inch galvanized pipe directly connected from the cabinet to the fume exhaust ductwork. An exhaust air valve will not be utilized for the cabinet.

   5. Some Class II Type B2 BSCs will utilize bag-in/bag-out 99.97 percent HEPA filters located on top of the BSC cabinet with supply air filters contained within the BSCs.

H. The type of filtration components that will be placed in the laboratory exhaust shall be evaluated during Schematic Design based on the work being performed in each of the laboratories and exhaust hoods.

I. Instruments that control air valves shall be capable of changing the state of room pressurization, which will be dependent on current and future use of the laboratory.

J. Storage rooms that contain laboratory specialty gases or liquid nitrogen stored in dewars shall be ventilated and shall have the appropriate gas detection monitoring and alarm systems per OSHA requirements to protect personnel from accidental asphyxiation.

2.03 LABORATORY EXHAUST DUCTWORK

A. Specify welded stainless steel Type 316L ductwork, 18 gage minimum, for exhaust air ductwork from BSCs, laboratory glassware washers, and chemical fume hoods where corrosive chemicals may be used. For hoods that use radioactive isotopes, specify Type 316 polished welded, stainless steel ductwork. Exhaust ductwork from synthesis labs should be Type 316L stainless or other suitably rugged/ inert material due to the corrosive and toxic exhaust.

B. Galvanized steel can be used on general exhaust system ductwork.

C. Specify exhaust ductwork used to transport air from BSC's where radioisotopes are used to be labeled with the standard "Caution Radiation Symbol" magenta on yellow background at 20 foot intervals. Equip BSC's with proper filtration components to capture potential contaminates.

D. Route exhaust ductwork through the building roof at a distance of 25 feet and downwind from any outside air ventilation air intake. The final location and orientation of the laboratory exhaust or outside air intake will be determined from wind tunnel results.

E. The allowable exhaust air stack height shall be minimum 12 feet above centerline height of air intake or roofline. The stack discharge air velocity shall be equal to or greater than 3000 fpm (3600 fpm for an NIH funded project).

F. Locate exhaust discharge stacks where exhaust air cannot be easily reintroduced into building outside air intakes. Owner prefers to locate outside ventilation air intakes on the side of the building; not on the roof. Refer to Design Guideline Element D3041 for additional criteria on outside air intakes.

2.04 AIR DEVICES

A. Refer to Sound Criteria in Design Guideline Element D3002.

B. Specify exhaust square panel face diffusers similar to Titus Omni directional diffusers with round necks in open laboratory areas. Increase neck sizes for the diffuser since they are being used for exhaust air purposes.

C. Air valves shall be used to control the exhaust airflow rates from rooms, hoods, and BSCs via feedback signals from stand alone controllers and setpoints (adjustable) from the BAS.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Include a single line riser drawing of the general exhaust ventilation exhaust systems in the Contract Documents. This shall be initially provided in the Schematic Design Submittal.

B. When high plume exhaust fans are being considered in the design of a laboratory exhaust system, note plume heights, design airflow rates, static pressure requirement, and maximum brake horsepower requirements on the equipment schedule on the Drawings.

1. A/E shall consider wind velocities as listed in the Appendix of the "Climatic Design Information" chapter of ASHRAE Handbook of Fundamentals or airport weather data.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Evaluate energy recovery units as appropriate to the application in accordance with the latest edition of ANSI/ASHRAE/IESNA 90.1. Refer to Design Guideline Element D3041 for energy recovery requirements.

C. Evaluate the use of proximity occupant sensors when there is less than 800 square feet of floor space per hood to reduce the open sash face velocity to 60 fpm when the workspace in front of the fume hood is not occupied (typical for VAV fume hoods in support space rooms or alcoves with dedicated supply paired with the fume hood exhaust and not required in open labs unless there is a high density of hoods).

D. Specify high efficiency / low exhaust volume design for constant volume fume hoods installed in rooms smaller than 1500 square feet of floor space per hood (typical for radioisotope fume hood installations) or variable volume rooms where fume hood density dictates minimum airflow rates.

E. Specify high plume, dilution mixed flow fans with direct drives for laboratory exhaust where feasible.

F. Evaluate and provide test data for manufacturers of HVAC airflow tracking equipment proposed on the Project that are not currently specified in Owner's Master Construction Specifications, Proposed products should operate with BACnet open protocol and should also be compatible with the building automation system.

G. Evaluate an exhaust ductwork material that is capable of withstanding the corrosion products from a synthesis laboratory.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	

D304202 Laboratory Exhaust and Ventilation

Issue	Date	Revision Description	Reviser
Rev. 1	02-27-07	Part 2 Laboratory Exhaust Hoods added Titus; Part 2.1 revised Table for Tissue Culture Room AC rate from 8 to 12 for unoccupied mode; revised to exception on AC rates lab temp, and prevent hazardous environment; revised 150 to 125 fpm; deleted B3 and Class III BSCs; revised 10 ft to12 ft on exhaust stacks; revised Air Devices; added criteria that A/E to evaluate use of duct material serving synthesis labs; deleted additional exhaust requirement for RI room.	PDN
Rev. 2	11-15-07	Revised AC/hr values in the table of 2.02 B. including the additions of notes and editorial format changes.	PDN / CC
Rev. 3	03-04-08	Added 2.01B.4, added AC/hr value in the table of 2.02 B. for LN_2 Freezer Room, revised 2.02. J. and added 2.02 K.	PDN
Rev. 4	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 B; 2.01 B 4; 2.01 D; 2.02 D; 2.02 E; 2.02 F; 2.02 G; 2.02 H; 4.01 B & 4.01C)	JCD
Rev. 5	01-08-09	Revised AC/hr values and note 2 in the table of 2.02 B.	PDN / CC
Rev. 6	07-08-10	Revised 2.02 A. 5. B., D, and G.1.: Deleted 2.02 G.2. entirely. AC/hr values and notes in the table. Relocated statement about high plume exhaust fans from Paragraph 2.03A to 3.01B. Revised 4.01E.	SAK / DAB / GSN
Rev. 7	09-16-10	Added new guidelines under 2.01A; revised ductwork velocity requirement under 2.02A, 4.	KTB / SK
Rev. 8	05-17-12	Added reference to Z4050 in paragraph 2.01 B.4, deleted LN2 requirements from table 2.02 B. and deleted paragraph 2.03 D.	PDN
Rev. 9	06-14-12	This revision was made to update this guideline in accordance with MS 11 53 13 Rev 2.02 F. added descriptive word standard for radioisotopes revised the 100 fpm sash velocity requirement to read as the full Rev. 8containment maximum possible sash opening. 4.01C. added direction to the engineer to consider proximity sensor when floor space is less than 800 square feet.	GN / CHL / PDN

END OF ELEMENT D304202

D304204 Ethylene Oxide Sterilization Exhaust and Ventilation

PART 1 - GENERAL

1.01 OVERVIEW

A. This section describes exhaust and ventilation requirements for Ethylene Oxide (EtO) Sterilization systems. Refer to Design Guideline Element D3041, Air Handling Distribution, for design criteria related to ductwork and ductwork accessories.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The EtO sterilization equipment room shall be provided with 20 minimum air changes per hour per and be maintained at a 0.02 inches (minimum) negative pressure with respect to surrounding areas. A pressure monitor with alarm and visible status indicator shall be installed to continuously indicate pressure differential.

B. The EtO exhaust system shall have a dedicated exhaust fan and be identified as EtO Equipment Exhaust. The ductwork shall also be labeled as “Caution EtO Exhaust” at 25 foot intervals.

C. The discharge point of the stainless steel exhaust stack shall be at the highest elevation of the building or adjacent building, and a minimum of 25 feet (7620 mm) above any outside intake, operable window or personnel passageway located on the roof of the building.

D. EtO is exhausted at a constant controlled rate through welded stainless steel ductwork.

E. Local exhaust air intake shall be located directly above the top of the access door to each EtO sterilizer.

F. When the drain is not located in the EtO sterilizer equipment room, ventilation is required to be provided locally by a capture box over the drain.

G. When the ethylene oxide gas cylinder is not located in the EtO sterilizer equipment room or recess room, a local exhaust shall be positioned no more than one (1) foot above or behind the point where the change of the cylinder takes place or the cylinder must be enclosed in a specialty gas cabinet.

H. Ventilation of the sterilizer relief valve is required through a pipe connected to the outlet of the relief valve exhausted directly to the outdoors, located at a point high enough to be away from personnel, public, and any air-conditioning or ventilation air intakes.

I. Equipment-function sensors are to be used to directly monitor the operation of the sterilizer and exhaust ventilation system fan and components. Sensors are to be used to indicate the presence of air flow in the ventilation exhaust ducts, and warning lights are to be used indicate that the sterilizer is in a purge cycle. Sensors should be connected to an audible alarm and a warning light to alert the operator of an equipment malfunction. Air flow sensors must be alarmed and be interlocked to prevent sterilizer operation upon loss of dedicated exhaust air flow.

J. Exhaust ventilation shall be designed where the majority of net flow of air is from the supply air entering loading room and passing through wall registers to the mechanical access room.

K. In the mechanical access room, air should enter all openings in the upper portion of the enclosure with a face velocity of 50 fpm to 100 fpm. This velocity should be measured when all equipment in the enclosure is at operating temperature.

L. The ventilation rate in the mechanical access room should be sufficient to keep the temperature below a maximum of 100 degrees F in the area where the EtO cylinders are located.

1. To take advantage of heat generated within the room since air in the equipment will rise, the exhaust should be located near the ceiling and the EtO supply can be located near the floor.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the general exhaust and pressure relief systems in the Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Refer to Design Guideline Element D3041 for additional criteria on outside air intakes.

D304204 Ethylene Oxide Sterilization Exhaust and Ventilation

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D304204

D3044 Hot Water Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses design criteria for the Project's heating hot water system, including all isolation valves, hydronic piping and fittings, hydronic specialties, control valves and secondary pumps required to distribute heating hot water to the building air handling units, fan coil units, unit heaters, and reheat coils.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. In new facilities the hot water heating distribution system shall be designed to maintain 150 degrees F to 120 degrees F heating water temperature via the steam / hot water shell and tube heat exchangers as noted in Design Guideline Element D3020 for the building air handling units, fan coil units, unit heaters and reheat coils. During periods when heating system demand is below peak capacity, heating water supply temperature is to be reset (down to 100F) to meet the building heating demand. Reduced heating water supply temperatures are intended to reduce heat loss through piping systems while satisfying heating loads.

B. In sizing hot water piping, do not exceed 3 feet friction loss per 100 feet equivalent length. For copper piping systems, do not exceed 2 feet per second water velocity where maximum water temperatures will be in excess of 140 degrees F. and do not exceed 4 feet per second water velocity where maximum water temperatures will be less than 140 degrees F.

C. Minimum ¾ inch pipe size.

D. The heating hot water system shall be designed with 2-way control valves except for the 3-way valve on a single terminal device at the end of the piping loop. The size of the 3-way valve shall not exceed 1 inch. A/E to recommend if 3-way valve is unnecessary on any specific project.

E. The A/E shall allow for redundant hot water pumps. Select equipment such that one pump can be placed on standby and still be capable of maintaining system capacity based on peak design load. Pumps shall be vertical split case, horizontal split case or split-coupled vertical in-line type, selected at 1750 rpm. Pump configuration will depend on the scheduled capacity limits. Provide with end suction diffuser if five (5) pipe diameters at the suction end cannot be achieved.

F. Hot water pumps shall be equipped with variable frequency drives if motor is 5-horsepower and greater.

G. Heating hot water distribution system piping shall be insulated.

H. Indicate isolation valves for the piping system on each floor as appropriate to the Project.

I. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the HVAC hydronic distribution systems and connected components. Locations shall include but not be limited to the following; at each piece of equipment, at each branch take-off from mains, at the base of each riser, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

J. Hot water piping shall not be routed above any rooms with rooms with electrical power distribution, electronics, or medical equipment, research equipment, and elevator equipment.

K. Heating hot water pumps shall be on emergency power. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

L. Closed loop heating hot water piping system shall have a chemical pot feeder.

M. In new facilities, maximize heating water temperature differential of 30 degrees F. Provide full size air and dirt separator on the heating hot water distribution loop.

N. Incorporate a 2 inch drain at the lowest point of each riser. If the pipe riser is not located in a mechanical room, then indicate the full size drain hard piped to the nearest suitable floor drain.

O. Incorporate a 2 inch quick fill at the lowest point of each riser. All risers shall have full size dirt legs.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the heating hot water system, and also include locations details of full size drip / dirt legs on the drawings that show piping risers in the Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 A; 2.01 B & 2.01 J)	JCD
Rev. 2	07-08-10	Revised 2.01A; Added 2.01 L.	DAB
Rev. 3	09-16-10	Revised 2.01D and E; added notes L through N, Section 2.01.	KTB
Rev. 4	06-28-12	Added section 2.01I defining shut-off valves location requirements.	JCD
Rev. 5	11-15-12	Added A/E to detail piping riser drip and dirt legs on piping risers. Paragraph 3.01 A.	PDN

END OF ELEMENT D3044

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses design criteria for the Project’s chilled water distribution system (secondary), including all isolation valves, hydronic piping and fittings, hydronic specialties, process heat exchangers (PHEX), control valves and pumps required to distribute chilled water to the building air handling units and fan coil units.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The chilled water piping shall be sized where the friction loss will not exceed 3 feet per 100 feet of (equivalent length) pipe.

B. Minimum ¾ inch pipe size.

C. The A/E shall allow for a minimum of three (3) horizontal centrifugal split case, vertical centrifugal split-case, or split-coupled vertical in-line secondary chilled water pumps. Pump configuration will depend on the scheduled capacity limits. Pumps shall be selected at 1750 rpm. Provide with end suction diffuser if five (5) pipe diameters at the suction end cannot be achieved.

D. Unless stated otherwise in Design Guideline Element 1010 Project Summary, select equipment such that one pump provides 50 percent redundant capacity based on peak design load.

E. The secondary chilled water pumps shall be equipped with variable frequency drives.

F. Provide line shut-off valves at locations required for proper operation, servicing and troubleshooting of the HVAC hydronic distribution systems and connected components. Locations shall include but not be limited to the following; at each piece of equipment, at each branch take-off from mains, at the base of each riser, where recommended by equipment manufacturers and at strategic locations to allow sectional isolation while limiting disruption of services to large portions of the system.

G. Chilled water piping shall not be routed above rooms with electrical power distribution, electronics equipment, medical equipment, research equipment, and elevator equipment.

H. Chilled water pumps shall be on emergency power. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

I. Closed loop chilled water piping systems shall include a chemical pot feeder.

J. In new facilities, maximize chilled water temperature differential (minimum 20 degrees F.) Refer to Design Guideline Element D3010.

K. Provide a tap into a non-stagnant domestic cold water pipe that will be used as a backup source in case chilled water piping serving the PHEX must be isolated. The domestic water pipe size and backflow preventer will need to meet the higher a flow rate (gpm) due to the lower differential temperature across the PHEX.

L. The secondary chilled water system shall include a safety relief piping to nearest floor drain. A high pressure alarm switch shall alert MD Anderson Monitoring Services of an abnormal condition via the building automation system.

M. Incorporate a 2 inch drain at the lowest point of each riser. If the pipe riser is not located in a mechanical room the show the full size drain on the drawing being hard piped to the nearest suitable floor drain.

N. Incorporate a 2 inch quick fill with backflow preventer at the lowest point of each riser. Quick fill shall be full size and hard piped to the nearest domestic water pump.

O. All risers shall have full size dirt legs.

P. Provide manual duplex basket strainers on the TECO side at the inlet of the primary and wye type strainers on the inlet side of the secondary chilled water pumps. Strainers are to be located at serviceable locations and accessible from the mechanical room floor without the use of a ladder or scaffolding. Strainers shall be equipped with a local differential pressure gauges and remote sensor integrated to the building automation system.

Q. Indicate air vents at the top of each riser.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the chilled water distribution system in the Contract Documents.

B. Indicate the location all pumps, heat exchangers, air and dirt separators, expansion tanks, emergency chilled water connections for portable chiller, and etc. on floor plans. Include spacing requirements on chilled water piping layout drawing to allow for the installation of the thickest insulation material for each given pipe diameter. Refer to the insulation specification table for type of insulation and material thickness.

C. The A/E shall include a chilled water system distribution schematic indicating information required to clearly illustrate the intent of system design including, but not limited to, supply source, primary and secondary pumps, heat exchangers, expansion tanks, strainers, supply and return piping, piping risers, pressure, and temperature sensors, including branch piping and shut-off valves to equipment.

D. The A/E shall include either a tight shut off bypass butterfly or a gate valve of the appropriate size between the supply and return water piping at the top of the riser to permit proper water velocities or achieve pipe flushing criteria. The A/E shall also include locations details of full size drip / dirt legs on the drawings that show piping risers.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Specify pressure-independent 2-way control valves for chilled water coils and heat exchangers, as applicable to the Project. Use of 3-way valves is not acceptable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 3: added instructions to included pipe spacing requirements on Drawings to allow installation of insulation; added piping layout requirements.	PDN
Rev. 2	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 I & 2.01 K)	PDN
Rev. 3	07-08-10	Revised 2.01 D, E: added requirement for 3 pumps, one sized at 50 percent capacity; Added 2.01 L: process heat exchangers.	DAB/PDN
Rev. 4	09-16-10	2.01: deleted minimum flow bypass control; 2.01 J: Revised chilled water temperature differential; added additional requirements under 2.01 L through Q.	KTB/SK
Rev. 5	06-28-12	Added section 2.01F defining shut-off valves location requirements.	JCD
Rev. 6	11-15-12	Added requirement for AE to detail properly sized dirt legs on chilled water piping riser drawings. Paragraph 3.01 D.	PDN

END OF ELEMENT D3045

D3050 Central Plant Chilled Water Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses design criteria for the Project's chilled water distribution system, including all isolation valves, hydronic piping and fittings, hydronic specialties, control valves and pumps required to distribute chilled water through the South Campus Research Park piping network.

B. The basic philosophy of the satellite central plants at South Campus Research Park and the underground chilled water piping network includes the ability to serve any load from any plant allowing maximum reliability and redundancy within the final interconnected system.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The chilled water piping shall not exceed 10 feet per second or 3 feet friction loss per 100 equivalent length in feet. Chilled water velocities are kept in normal range between 4 to 8 feet per second (fps) with maximum up to 10 fps for abnormal short term operating situations.

B. Peak day supply temperature of 40 degrees F and return temperature of 54 degrees F are expected.

C. Minimum ¾ inch pipe size for run-outs fan coil units.

D. The A/E shall allow for a minimum of two (2) centrifugal split case or split-coupled vertical in-line primary and secondary chilled water pumps. Pump configuration will depend on scheduled capacity. Pumps shall be selected at 1750 RPM.

E. Select equipment such that one pump provides N+1 redundant capacity based on peak design load.

F. The chilled water pumps and condenser water pumps shall be equipped with variable frequency drives (VFD), unless it is determined by the A/E the use of a VFD is not required for a certain application.

G. Chilled water piping shall not be routed above rooms with electrical power distribution and electronics equipment.

H. Supply and return pipes must be the same diameter.

I. Supply and return piping dead legs are to have appropriate drain and vent valves.

J. Parallel pipes may run side-by-side or stacked.

K. Minimum of 5 feet of cover over chilled water pipes.

L. The system design pressure is 150 psig.

M. Hydrostatic test pressure at 225 psig with no leakage over a four-hour period.

N. Underground flange connections should be avoided when possible.

O. Valve boxes must be used at all underground valve locations.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The A/E shall include a schematic of the chilled water distribution system in the contract documents.

B. Indicate the location all pumps, air separators, expansion tanks, etc. on floor plans.

C. The A/E shall include a chilled water system distribution schematic drawing that indicates information required to clearly illustrate the intent of system design including, but not limited to, supply source, primary pumps, expansion tanks, strainers, supply and return piping, piping risers, pressure, and temperature sensors, including branch piping and shut-off valves to equipment.

D. The A/E shall include either a flanged butterfly or a gate valve of to permit proper water velocities or achieve pipe flushing criteria.

E. The A/E shall include either a flanged 2 inch or greater bypass butterfly or a gate valve of the appropriate size to permit proper water flow at underground supply and return piping dead legs.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. The A/E shall use a hydraulics model to determine the size of the chilled water supply pumps. A system hydraulics model shall be developed to determine the remaining chilled water network pipe sizes to support a totally built-out system along with incremental models for various in-process or future phases of system development.

C. Seamless piping 18 inch diameter and smaller shall be insulated with a minimum of 2 inch polyurethane insulation with a protective jacket.

D. Twenty-four (24) inch diameter supply pipe shall also be insulated unless it has more than 20 feet of cover.

E. All piping will be protected from corrosion with exterior coating/jacketing and due to certain instances of installation the piping and valves are to have cathodic protection

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	05-17-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D3050

D3060 Building Automation Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. Provide a building temperature control/building automation system (BAS) for the space temperature control and monitoring of defined environmental conditions. General system operation is described within this Design Guideline Element.

B. The temperature control/building automation system will be accomplished utilizing a direct digital control system per Owner's Building Automation Specifications. Owner has two different versions of building automation specifications. The Owner will direct the A/E in writing on which specification version applies to the Project upon authorization to proceed with the Design Development Phase.

C. Edit MD Anderson Specialty Equipment Control Standard Drawing Templates for systems as appropriate for the Project. Create control drawings as necessary using the same format provided in the templates. For additional information visit the following Internet URL:

http://www2.mdanderson.org/depts/cpm/standards/bas.html

D. Written sequences of operation are described within Element D3060 subsections that supplement this Design Guideline. Refer to the Control Standard Drawing Templates for systems that are not described within these Element D3060 subsections.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Actuation of dampers, control valves, and air terminals will be accomplished utilizing electronic actuation. For devices where speed of response or shut-off pressures are critical, these devices will utilize pneumatic actuation. Actuation of valves, dampers, etc. exposed to an outside environment will be accomplished utilizing electric actuators. Confirm with Owner for specific applications where more discussion may be required to make a recommendation about the type of actuator.

B. A duplex type control air compressor will be provided with refrigerated air dryers, PRV's, and associated appurtenances for pneumatic devices.

C. Air handling unit (AHU) fail safe operation shall fail to cool unless the there is a potential for a freeze condition to damage equipment. Only AHU exposed to a freeze hazard shall fail to heat. Air terminals and valves less than one (1) inch in size may fail in place where applicable.

D. The BAS and its associated equipment (i.e. air compressor) will be connected to emergency power, with a plug-in uninterruptible power supply (UPS) device provided for the computer equipment. Refer also to Section D3000 for additional emergency power requirements.

E. Components of the BAS that should be connected to emergency power and UPS are the multiplexers, the unit direct digital control (DDC) controllers controlling/monitoring critical systems (air handling and associated terminal units, steam and chilled water), and the communication panels.

F. All primary controllers and control panels shall be protected from any memory loss due to a loss of power by one or a combination of the following:

1. Volatile RAM shall have a battery backup using a lithium battery with a rated service life of fifty (50) hours, and a rated shelf life of at least fifty years.

2. EEPROM, EPROM or NOVROM non-volatile memory.

G. Coordinate BAS network and telecommunications requirements with telecommunications design.

H. The BAS shall be capable of reporting to the Owner’s 24-hour Monitoring Services Control Center located at 1515 Holcombe Boulevard, Room B2.4481.

I. The BAS shall be capable of monitoring digital inputs and analog inputs not related to HVAC control. The A/E shall confirm the quantity and the location of these additional inputs into the BAS with the Owner. These additional DDC inputs shall be referred to as Client Critical Alarms and shall report to the Owner's 24-hour Monitoring Services Control Center.

J. All primary controllers shall have the capability of direct connection to the Ethernet Network.

K. Wireless sensors may be used for wall mounted sensors located in office and administrative areas, where approved in advance by the Owner.

2.02 GENERAL SYSTEM OPERATION

A. The chilled and hot water pumps supplying water to the building loop will operate in a lead/lag/standby mode of operation to equalize run time on each pump. When a pump is signaled to start, the lead pump will be started. On an increase in the system flow requirement beyond the capacity of the lead pump, the lag pump will be started. Both pumps will run at the same speed. When both pumps slow to 40 percent on falling system flow requirements, one pump will shut down and stay off 5 minutes. The designation of the lead/lag/standby pump will be adjustable. Variable frequency drives will be utilized to modulate the speed of all pumps to meet the variable flow requirements of the system.

B. The chilled or hot water flow to the majority of the coils in the air handling units, computer room air-conditioning units and fan-coil units will be controlled utilizing two-way control valves. The chilled or hot water flow to the coils in last air handling unit or fan coil unit on a distribution piping circuit will be controlled utilizing three-way control valves to maintain a minimum flow in the system. A differential pressure transmitter between the chilled water supply and return mains will be utilized to vary the speed of the pumps, via the variable frequency drives, to maintain a constant pressure (adjustable) differential between piping mains. Similar control sequence is also applied to the hot water system.

C. Constant volume and variable volume terminal units will utilize internal multi-point flow sensor to acquire airflow measurement at each inlet along with separate, pressure independent velocity control loops.

D. AHU fail safe operation shall fail to “cool” unless there is potential for a freeze condition to damage equipment. Only AHU’s exposed to a freeze hazard shall fail to heat. Air terminals and valves less than 1 inch in size may fail in place where applicable.

E. During occupied periods all variable volume air terminal units will be at normal or maximum airflow setting. During unoccupied periods, the variable volume air terminal units will be either at normal airflow position or setback mode and the two position air terminal units will be at the minimum airflow position. During power outages, all air terminal devices will be at the fail position airflow setting.

F. Offices/Administration Spaces:

1. Air handling units will operate in the occupied mode from 7 a.m. to 6 p.m., Monday through Friday. The air handling unit will operate in a night setback mode from 7 p.m. to 6 a.m., Monday through Friday, Saturday, and Sunday.

2. Space thermostats will be equipped with an occupant override button to override the system into the occupied mode.

3. Variable frequency drives will be utilized to modulate the fan speed to vary the supply air quantity based on system airflow requirements and to compensate for filter loading.

4. Refer to other Design Guideline Element D Sections for operating hours of other types of occupied space.

5. Variable air volume and fan powered terminal units will modulate to maintain space temperature set point. During power outages, all air terminal devices will be at the fail position airflow setting.

G. General exhaust systems will operate 24 hours/day, 365 days per year. Pressure dependent, manual-balancing dampers will be provided at each general exhaust branch connection for balancing purposes. Exhaust fans will be constant volume.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Edits to each BAS Master Construction Specification Section shall be performed in Microsoft Word software. All editing shall be performed using the “Track Changes” option with all changes not accepted. This allows the Owner to review all changes proposed to the Master Specifications.

B. Decision-making guidance to the A/E is provided throughout the Master Specifications in the form of “Editor’s Notes” so that the A/E may make prudent decisions and specify the most effective requirements for the system being installed and for those that have to use them.

C. Only those items listed in Blue Italic Text are to be modified. All other items in the Master Specifications are to remain unchanged unless prior, explicit permission has been obtained by Owner.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s BAS Master Construction Specifications for requirements of BAS systems and components. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. The Owner’s BAS Master Construction Specifications set forth guidelines to assist the A/E in specifying and procuring controls for building systems. The intent of the Specifications is not to require a “one-size-fits-all” solution because that is simply not in the best interest of the Owner. It is ultimately the A/E’s responsibility to assess systems to be controlled and the environments in which they will be installed, commissioned, and operated.

C. The BAS Master Construction Specifications apply the following principles to the control systems in the order they are presented:

1. Principle 1:

    a. The control system must first and foremost provide effective and reliable control, commensurate with the systems it is controlling. Obviously the types, complexities and the criticalities of the systems being controlled will dictate the quality/power of the control system that should be applied to them.

    b. The ultimate quality of the control system is primarily dictated by the components that sense, execute logic for, actuate, and document the systems they are controlling.

    c. These components are generally specified in Master Specification Section BAS Basic Materials, Interface Devices, and Sensors and BAS Field Panels. These Specifications apply the concept of an “Application Category: for controllers whereby the performance requirements of the controllers are grouped into categories. The Master Specifications must remain unchanged.

2. Principle 2:

    a. The manufacturer and installer must be highly qualified with extensive experience and must be committed and bound to thorough Commissioning (Cx). While the control system power/quality is very important, equally or more important is the expertise and commitment of the installing Contractor and their collaboration with the overall commissioning team.

b. Qualifications should ensure that a quality Contractor with an extensive proven track record is specified and that effective, thorough commissioning of the control systems by that Contractor – whether or not a formal commissioning process is employed – is essential. Given this, there lies a challenge to the A/E to fairly restrict installers to those that can deliver effectively within the context of both the construction and the service/support arenas.

c. To address this, Master Specification Section BAS – General provides for qualifications of both the installer and manufacturers of the systems. Master Specification Section BAS Commissioning dictates a high standard for commissioning of the system by the installer.

3. Principle 3:

   a. The control installation must be fully documented as consistently as practical with nothing required to fully operate and maintain the system withheld from the Owner. The system must always be put in the context of the enterprise (Owner's WAN) and implemented and documented using standard approaches wherever possible.

   b. Point naming conventions, programming logic, network configuration requirements, security information, etc. must be strictly adhered to and totally documented. No element for the continued operation and maintenance of the control system may be withheld in any way.

   c. No part of the installation may be considered confidential or proprietary information. This Master Specification requires applicable documentation throughout. These requirements are not optional; however, certain documents are only applicable for certain approaches.

4. Principle 4: Specify Sequence of Operations Logic.

   a. The A/E must specify all DDC point types and counts (point summary) for all equipment sequences of operation on the Drawings to precisely define the BAS and the A/E must specify the logic of equipment sequences of operations.

   b. Often sequence of operation is specified only in general, and often ambiguous, terms, with much of the sequence left to the Contractor's programmer. The programmers should not be put in the position of having to complete the A/E's sequence, which often resort to sequences, which are not optimal for the Project.

5. Principle 5: Require Sufficient Instrumentation.

   a. The A/E must require instrumentation to support both the sequence of operations, and the data acquisition capability to support equipment performance monitoring and building diagnostics analysis. A listing generally establishing minimum instrumentation requirements is included with the Master Specifications. This identifies minimum instrumentation for common types of systems.

b. The A/E is responsible for requiring additional instrumentation as necessary to support the sequence of operations, or to supplement data acquisition capabilities when the nature of the equipment or systems to be installed makes this feasible.

c. Additional higher end devices shall be specified for control of critical systems or areas in the facility. It is the responsibility of the A/E in consultation with Owner to specify the appropriate products for the application.

D. Application of these Principles to a given project requires the A/E to research and consider the project-specific environment and requirements and to edit the BAS Master Construction Specifications appropriately. The specific decision depends on a number of other important variables, including the specific HVAC control applications being served, the critical nature of the area or facility being served, the quality and capabilities of the local installer, and operator capabilities.

E. All instrument wiring conduit must be sealed at the device box, wall, or ceiling penetration.

F. All HVAC controls specified on the Drawings shall comply with MD Anderson Cancer Center standards. Each piece of mechanical equipment which requires building automation shall have the following five (5) pieces of information specified in a single Drawing sheet for each piece or system of mechanical equipment:

1. Sequence of Operation. Detailed specific directions on how this equipment or system was designed to operate.

2. Schematic drawing of the mechanical equipment or system of mechanical equipment. Schematic drawing shall display the exact mechanical hardware in the correct physical orientation to the equipment that is specified to be installed. All building automation control sensors and apparatus shall be represented in this schematic drawing in the correct physical orientation and tagged with a logical acronym and a unique number identification.

3. Material list of building automation sensors and apparatus spreadsheet. Five columns shall be divided with the following information specified in the rows:

   a. Control Device: Corresponding logical acronym and a unique number identification used in the schematic drawing.

   b. QTY: The quantity of the apparatus specified.

   c. Product Number: Space is left blank unless a specific model number is required to meet the design intent.

   d. Manufacturer: Space is left blank unless a specific manufacturer’s product is required to meet the design intent.

   e. Description: Phrase which accurately describes the apparatus.

4. Building Automation points summary spreadsheet. Four columns shall be divided with the following information specified in the rows:

a. BAS Acronym: To be left blank to be populated by Owner.

b. Point Descriptor: Short description of the building automation point required.

c. Point type:

1) DI (digital input).

2) AI (analog input).

3) DO (digital output).

4) AO (analog output).

d. Remarks.

5. Installation Notes. Any additional directions necessary to ensure that the functional and design intent is achieved shall be listed and tagged.

G. The A/E shall organize the above five (5) categories of information into a single Drawing sheet whenever possible as follows:

Top Right:	Building automation points summary spreadsheet.
Bottom Right:	Material list of building automation.
Top Center:	Sequence of operation.
Top Left:	Installation notes.
Bottom Left:	Schematic drawing of the mechanical equipment.

H. Examples of this sheet format layout are available upon request.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-06-07	Part 4: Added HVAC controls drawing requirements.	SAK
Rev. 2	05-08-07	Added Client Critical Alarm criteria under Part 2.	SAK
Rev. 3	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 D & 2.01 L)	JCD
Rev. 4	07-08-10	Part 1: added reference to control standard drawing templates; Part 2, 2.01A: revised pneumatic actuation requirement; 2.01H: updated Monitoring Services room location; 2.02A: added standby mode on pumps; deleted TECO detail.	DAB/VMJ
Rev. 5	04-11-13	Changed document title from “Controls and Instrumentation” to “Building Automation Systems”.	DOS
Rev. 6			
Rev. 7			
Rev. 8			

END OF ELEMENT D3060

D306001 Primary and Secondary Chilled Water System

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes control requirements for the primary and secondary chilled water system.

PART 2 - DESIGN CRITERIA

2.01 PRIMARY CHILLED WATER SYSTEM SEQUENCE

A. The chilled water system will use chilled water supplied by the Central Plant. The chilled water system will be energized and controlled by the building automation system (BAS). Emergency power shall be available to power these pumps if they serve Patient Care facilities, Laboratory, or Vivarium facilities where air conditioned ventilation air is required. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

B. The primary chilled water pumps will be lead/lag alternated based on weekly run time.

C. The lead chilled water pump will be energized and its respective variable speed drive will be ramped up if the differential pressure (DP) across TECO mains drops below 12 psi (adjustable).

D. After a five-minute (adjustable) time delay, if the lead chilled water pump cannot maintain the required DP (12 psi-adjustable) and chilled water pump speed exceeds 80 percent (adjustable), then the lag pump will be energized and its respective variable speed drive will be ramped up. The speed of both primary pumps will be modulated by the BAS in unison to maintain the required DP (12 psi-adjustable) in the primary chilled water mains.

E. When the chilled water pump speed drops below 40 percent (adjustable for a period of 30 minutes (adjustable), the lag pump will be de-energized.

F. Each chilled water heat exchanger shall have temperature sensors to modulate its control valves to maintain secondary chilled water temperature at 45 degrees F (adjustable).

G. Dedicated temperature and flow sensors shall be installed on the primary chilled water main headers to monitor and measure consumption BTUs and demand.

H. .If the TECO supply chilled water pressure exceeds 50 psig (adjustable) and TECO chilled water supply temperature is less than 43 degrees F (adjustable) and the secondary chilled water temp is less than setpoint + 1 (adjustable) for 60 minutes, primary pumps shall be turned off (pump bypass mode).

I. If the TECO supply chilled water pressure is less than 50 psig (adjustable) or TECO supply temperature exceeds 43 degrees F. or the secondary chilled water temp exceeds [setpoint +2] (adjustable) for 15 minutes, the lead primary pumps shall be turned on (pump mode).

J. If the secondary chilled water temp is [setpoint +3] or greater (adjustable), immediately turn on the lead primary pumps (pump mode).

K. Normal operating conditions shall be with the primary pump bypass mode. Cycle on each primary pump for 15 minutes each week.

2.02 SECONDARY CHILLED WATER SYSTEM SEQUENCE

A. The secondary chilled water pumps will be lead/lag based on run time. Emergency power shall be available to power these pumps if they serve Patient Care facilities, Laboratory, or Vivarium facilities where air conditioned ventilation air is required. Refer also to Design Guideline Element D3000 for additional emergency power requirements.

B. The lead chilled water pump will be energized and its respective variable speed drive will be ramped up on a call for cooling.

C. After a five-minute (adjustable) time delay, if the lead chilled water pump cannot maintain the required DP (14 psi adjustable), and the chilled water pump speed exceeds 80 percent (adjustable), then the lag pump will be energized and its respective variable speed drive will be ramped up. The speed of both secondary pumps will be modulated by the BAS in unison to maintain the required DP (14 psi-adjustable) in the secondary chilled water mains located at the top of the each riser.

D. When lead and lag total chilled water pump speed drops below 40 percent (adjustable) for a period of 30 minutes (adjustable), the lag pump will be de-energized.

E. Dedicated temperature and flow sensors shall be installed on the secondary chilled water main headers to monitor and measure consumption BTUs and demand.

2.03 CHILLED WATER HEAT EXCHANGER CONTROL SEQUENCE

A. The lead Heat Exchangers shall be enabled at all times. When the lead Heat Exchanger control valve is 80 percent open (adjustable) for 15 minutes (adjustable), the lag Heat Exchanger shall be enabled. Each Heat Exchanger shall modulate its associated control valve independently to maintain CHW supply set point of 45 degrees F (adjustable). When both lead and lag control valves are less than 30 percent open (adjustable) for 60 minutes (adjustable), the lag Heat Exchanger shall be disabled.

B. Heat Exchanger enable/disable: Isolation valve shall fully open and control valve shall modulate to maintain Building CHW supply set point at 45 degrees F (adjustable). When the Heat Exchanger is disabled, the isolation valve shall fully close and the control valve shall modulate fully closed.

C. Heat Exchanger Lead/Lag: The designation of the lead/lag Heat Exchangers shall be adjustable and independent of pump lead/lag designation. The BAS shall monitor runtime of all Heat exchangers. Heat exchangers alternate to equalize equipment runtime every Wednesday at 10:00 a.m. The Heat Exchangers with the least runtime become the lead Heat Exchangers.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 A 1 & 2.02 A 1)	JCD
Rev. 2	09-16-10	Revisions throughout document.	KTB / SK
Rev. 3	09-15-11	Revised 2.01 I.(adjustable) changed from +3 degrees to +2	GN / PDN
Rev. 4			
Rev. 5			

END OF ELEMENT D306001

D306002 Hot Water System

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes control requirements for the hot water system.

PART 2 - DESIGN CRITERIA

2.01 HOT WATER PUMPS

A. Hot water system pumps will be energized and controlled by the building automation system (BAS). Hot water pumps will be lead/lag alternated based on run time.

B. The lead hot water pump will be energized and its respective variable speed drive will be ramped up on a call for heating.

C. After a five-minute (adjustable) time delay, if the DP cannot be met and total hot water demand exceeds 90 percent (adjustable) of the lead pump flow, the lag pump will be energized and its respective variable speed drive will be ramped up. The speed of both hot water pumps will be modulated by the BAS in unison to maintain the required differential pressure (DP) (10 psi-adjustable) in the hot water mains located at the top of the main riser.

D. When hot water demand drops below 80 percent (adjustable) of the capacity, based on flow, of the lead pump, for a period of ten minutes (adjustable), the lag pump will be de-energized.

E. Hot water system demand will be monitored by a flow measuring device and temperature sensors in the system supply and return mains. In the night setback and morning warm-up periods, the speed of the hot water pumps will be limited so that hot water demand will not exceed the current monthly peak tonnage demand in the occupied periods.

2.02 HOT WATER CONVERTER SEQUENCE

A. All hot water system converters will be energized and controlled by the BAS to heat the heating hot water. This will maximize the heat transfer and reduce the hot water flow resistance.

B. The lead hot water converter will be energized on a call for heating. The hot water converter's respective two-position control valve will be open when the converter is energized.

C. After a five-minute (adjustable) time delay, if the hot water demand, based on flow, exceeds 95 percent (adjustable) of the capacity of the lead hot water converter, then the lag hot water converter will be energized.

D. When hot water demand, based on flow drops below 90 percent (adjustable) of the capacity of the lead hot water converter for a period of ten minutes (adjustable), then the lag hot water converter will be de-energized.

E. When hot water demand drops to 30 percent (adjustable) of the capacity, based on flow, of the lead pump, the pump speed will remain constant. Upon a further reduction of the hot water system flow, the hot water system minimum flow bypass valve will be modulated open by the BAS to maintain system DP (adjustable).

F. A temperature sensor located in the hot water system supply main will, through the hot water control systems, maintain the hot water system leaving temperature. When the outdoor ambient temperature is 60 degrees F or above, the hot water system supply temperature set point will be 120 degrees F and when ambient temperature is 32 degrees F, or below, the hot water system supply water temperature set point will be 160 degrees F. When the outdoor ambient temperature is between 32 degrees F and 60 degrees F the hot water system supply temperature set point will be reset inversely with change in outdoor ambient temperature.

G. The hot water system will use steam from the TECO central plant or steam from a fire tube boiler to generate hot water. The steam system will have a steam control valve for each converter. These valves will be modulated as required to maintain the required hot water system supply water temperature.

H. A pressure sensor in the steam line downstream of each steam control valve will, through the BAS, activate a trouble alarm at the operator’s workstation if the steam pressure exceeds 60 psig.

2.03 CONDENSATE RETURN UNIT SEQUENCE

A. Unit will consist, at a minimum, of a duplex pump with receiver tank and operating controls.

B. The unit will be energized to run continuously via integral level controls. A high water level sensor will, through the BAS, activate a trouble alarm at the operator’s workstation (MD Anderson Cancer Center Monitoring Services).

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D306002

D306013 Fan Coil Cooling Only

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes control requirements for fan coil cooling only units.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. All units will consist of a chilled water cooling coil and a filter section. Control units as follows:

1. All units will be energized and controlled by the building automation system (BAS) based on a time of day (TOD) schedule. The unit fan will run continuously when the unit is energized. The chilled water coil control valve will be fully closed when the unit is off.

2. The respective space temperature sensor will, through the TEC controller, control the fan VFD or ECM motor as required to maintain the space temperature set point (75 degrees F – adjustable). A temperature sensor mounted in the fan coil unit discharge ductwork will, through the TEC controller, control the two-way cooling coil control valve as required to maintain a constant leaving air temperature set point (55 degrees F - adjustable [and resettable, where applicable]). Fan coil units that utilize a constant airflow rate / variable air temperature control scheme may be utilized in select applications. Coordinate with the Owner as needed to determine fan coil unit control scheme.

3. Filter DP switch:

   a. A differential pressure airflow switch across the filter section will, through the TEC controller, activate an alarm when the filter pressure loss exceeds the high limit set point of 0.30 inches static pressure (adjustable).

4. A differential pressure airflow switch will indicate fan failure (when the fan is energized) and initialize a trouble alarm at the operator’s workstation.

5. Fans greater than 2,000 CFM capacity will include a smoke detector in the supply air ductwork, which will be hard-wired into the motor control circuit to shut down the fan; an auxiliary contact will notify the fire alarm system and send an alarm to the operator’s workstation.

6. Where provided, a float switch in the auxiliary drain pan will deenergize the unit and send an alarm to the operator’s workstation when the contact is closed.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specify that all shop drawings must be submitted in AutoCAD format.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner’s Master Construction Specifications. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.01 A 2)	JCD
Rev. 2	01-15-09	Revised sustainability requirements based upon additional TGCE comments. (Paragraph 2.01 A 2)	JCD
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D306013

D306014 Fan Coil Heat/Cool

PART 1 - GENERAL

1.01 OVERVIEW

A. This section includes control requirements for fan coil heating and cooling units.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. All units will consist of a chilled water cooling coil, a hot water heating coil, and a filter section. Control units as follows:

1. All units will be energized and controlled by the building automation system (BAS) based on a time of day (TOD) schedule. The unit fan will run continuously when the unit is energized. The chilled water and hot water coil control valve will be fully closed to flow through the unit when the unit is off.

2. The respective space temperature sensor will, through the TEC controller, control the two-way cooling coil and heating coil control valve as required to maintain the space temperature set point (75 degrees F – adjustable). Where heating and cooling valves operate independently, a 3-degree deadband shall be programmed to ensure no simultaneous heating and cooling.

3. Filter DP switch:

   a. A differential pressure airflow switch across the filter section will, through the TEC controller, activate an alarm when the filter pressure loss exceeds the high limit set point of 0.30 inches static pressure (adjustable).

4. A differential pressure airflow switch will indicate fan failure (when the fan is energized) and initialize a trouble alarm at the operator's workstation.

5. Fans greater than 2,000 CFM capacity will include a smoke detector in the supply air ductwork, which will be hard-wired into the motor control circuit to shut down the fan; an auxiliary contact will notify the fire alarm system and send an alarm to the operator's workstation.

6. Where provided, a float switch in the auxiliary drain pan will deenergize the unit and send an alarm to the operator's workstation when the contact is closed.

D306014 Fan Coil Heat/Cool

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specify that all shop drawings must be submitted in AutoCAD format.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D306014

D4000 Fire Protection General Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. Fire protection systems design shall be performed by individual(s) licensed in the State of Texas and having minimum five years design experience related to the types of systems included within this Project.

B. Where it is considered by the A/E that proposed systems design cannot comply with the requirements stated and referenced herein, the consultant shall communicate such concerns to the Owner's Project Manager in writing and resolve non-compliance in sufficient time during the design phase of the Project to meet Contract schedule obligations.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies.

B. Fire Sprinkler Systems shall be designed to meet requirements for 100% sprinklered building.

C. The A/E is required to make themselves aware of all applicable codes and ordinances and assure compliance thereto.

D. Where provisions for building expansion are required, systems equipment capacity, pipe sizing and arrangement shall accommodate proposed demand.

E. The building fire protection water supply systems shall be metered and isolated from the municipal water supply in accordance with the Municipality's requirements.

2.02 ELEVATOR SPRINKLER PROTECTION

A. Elevator fire protection shall comply with NFPA 13, NFPA 70, NFPA 72, and ANSI/ASME A17.1 or A17.3 as applicable.

2.03 RENOVATION WORK

A. Owner normally requires the installation of wet-pipe sprinkler systems in existing buildings undergoing major infrastructure upgrade that are not presently fully protected by 100% fire sprinkler systems.

B. Any additions, deletions and/or changes shall not compromise the integrity of existing systems.

C. Existing water supply shall be tested and improved as required to meet requirements of NFPA and Owner's Standards.

D. Existing fire detection (fire alarm) and fire protection (fire sprinkler systems) shall be maintained and remain code complaint throughout project lifespan.

E. In support of maintaining NFPA compliant systems, ILSMs (Interim Life Measures) shall be enacted that may direct system reconfigurations (for example installing a temporary fire alarm system or turning sprinkler heads up to deck).

F. Communications concerning strategies to maintain NFPA compliant fire detection and fire protection systems during construction shall occur as soon as project scope is determined.

G. Strategies to maintain fire detection and fire protection systems NFPA code compliance shall be documented in project drawings and ILSM documentation.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Room names and numbers, and column lines and designations shall appear on all floor and partial floor plans as they appear on Architectural sheets.

B. Floor and partial plans shall include finished floor elevations, graphic scales and north arrows.

C. Floor plans shall show piping, valves, equipment, etc. on the floor that they are to be installed.

D. A separate plumbing roof plan shall be included for projects having components located on, in or penetrating through roofs, such as roof manifolds, penthouses, etc.

E. The A/E shall be specific and precisely show all points of connection for utilities.

F. Performance data schedules for all equipment shall be shown in schedules on the Drawings.

G. All construction details shall be shown on the Drawings and shall not be bound in the Specifications.

H. All equipment and material specifications shall be bound in the Specifications.

I. Plans shall clearly indicate location and ratings of all fire and smoke partitions, barriers, walls, and horizontal exits.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-19-09	Paragraph 2.01 B. - Added statement requiring design to meet 100 percent sprinkled building criteria. Paragraphs 2.02 B, C and D. - Deleted explanations addressing elevator sprinkler protection.	BG
Rev. 2	07-08-10	Paragraph 2.01 E. – Replaced “City of Houston” with “Municipality”.	DOS
Rev. 3	12-20-12	Added requirements for maintaining fire detection and protection systems for Project duration. Paragraphs 2.03 D - G	BG
Rev. 4			
Rev. 5			

END OF ELEMENT D4000

D400001 Open Parking Garage General Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses fire suppression standpipe systems within and to five feet beyond garage building perimeter.

B. Fire protection systems design shall be performed by individual(s) licensed in the State of Texas and having minimum five years design experience related to the types of systems included within this Project.

C. Where it is considered by the A/E that proposed systems design cannot comply with the requirements stated and referenced herein, the A/E shall communicate such concerns to the Owner's Project Manager in writing and resolve non-compliance in sufficient time during the design phase of the Project to meet Contract schedule obligations.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies.

B. The A/E is required to make themselves aware of all applicable codes and ordinances and assure compliance thereto.

C. All portions of an open parking garage building shall be protected in accordance with Design Guideline Element Z2005Design shall comply with codes and standards referenced within these Elements and include, but not be limited to, calculations, specifications and detailing fire department connections, pipe penetrations, pipe supports and any special requirements.

D. Where provisions for building expansion are required, systems equipment capacity, pipe sizing and arrangement shall accommodate proposed demand.

E. Provide adequate spaces for the installation, servicing and inspection of all equipment, valves and appurtenances.

F. Pipe drains to a location that can accept maximum expected discharge without flooding.

G. Do not locate piping within electrical or telecommunications rooms.

H. Piping shall be located to minimize space requirements and shall not interfere with the flow of pedestrian traffic, vehicular traffic or parking. All piping shall be protected from damage by other means approved by the Owner.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, system schematic and details indicating all information required to clearly illustrate the intent of system design, including but not limited to, location and size of fire department connection(s) (Siamese), standpipes, standpipe mains, shut-off and drain valves and fire hose valves.

B. Column lines and designations shall appear on all floor and partial floor plans as they appear on Architectural sheets.

C. Floor and partial plans shall include finished floor elevations, graphic scales and north arrows.

D. Floor plans shall show piping, valves, equipment, etc. on the floor that they are to be installed.

E. Graphically identify each standpipe and fire hose connection on plans and riser schematic. Identification on riser schematic shall correspond to Identification on plans. Graphically indicate floor levels and floor elevations on riser schematic.

F. Details shall be provided for all components that require installation explanation beyond the information included within plans and riser schematic.

G. All construction details shall be shown on the Drawings and shall not be bound in the Specifications.

H. All equipment and material specifications shall be bound in the Specifications.

I. Refer to individual Element sections for additional document requirements applicable to the various systems.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

D400001 Open Parking Garage General Design Guidelines

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-19-09	Paragraph 2.01 C. - Deleted manual standpipe protection, deleted references to NFPA 88A an IFC. Added reference to Element Z2005.	BG
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D400001

D4010 Wet Standpipe and Sprinkler Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. This section addresses wet standpipe and sprinkler systems.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies

B. All portions of the building shall be provided with standpipe protection and 100 percent sprinkler protection. All conditioned portions of the building shall be protected with wet pipe sprinkler systems. All areas of the building subject to temperatures of less than 40 degrees Fahrenheit shall be protected by either dry pendent type sprinklers from a wet pipe system or by dry pipe systems.

C. Areas containing sensitive equipment which would be considered a major loss due to accidental fire sprinkler discharge or leakage shall be protected by a double-interlock preaction type sprinkler system.

D. Design shall comply with codes and standards referenced within these Design Guideline Elements and include, but not be limited to, calculations, specifications and detailing fire and jockey pumps, in-coming water service, fire department connections, pipe penetrations, and any special requirements.

E. Provide automatically controlled fire pumps for all fire protection systems where hydraulic calculations indicate that the municipal water pressure is not adequate to supply the building sprinklers and/or standpipes. Lower level sprinkler systems may be served by municipal water pressure when water pressures are proven adequate.

F. Fire pump size shall be based on the requirements of NFPA. Water supply to fire pumps shall meet the requirements of NFPA. A single fire pump system may feed multiple buildings, provided special approval from the Owner’s Environmental Health and Safety Department is obtained.

G. A jockey pump shall be provided for pressure maintenance to keep the fire pump from operating due to sprinkler flow switch alarm testing and minor losses in the system.

H. If electric, the fire pump shall be a horizontal split case pump with high efficiency motor. The fire pump controller shall include an automatic transfer switch for backup operation from the emergency power system and incorporate Wye Delta closed transition starting.

I. Consider two-stage fire pumps or variable speed controllers to serve buildings having over twenty-five (25) floors.

J. Pumps installed within the City of Houston shall draw water from a break tank provided in accordance with City of Houston requirements.

1. Fire tank may be combined with domestic pump water storage if deemed practical.
2. The fire water break tank shall be sized in accordance with NFPA 20.
3. Provide two fill valves for fire water storage compartment. Provide individual manual shutoff valves with tamper switches to isolate each fill valve to accommodate servicing.
4. Provide full line size valved bypass around block and fill valves for fire water tank compartment to allow manual filling.
5. Electrical power serving tank level control and monitoring shall be from emergency source.

K. Provide full line size bypass with double-check valve assembly around surge tank and fire pump.

L. Provide adequate spaces for the installation, servicing and inspection of all equipment, controls, valves and appurtenances.

M. Where the height of the building dictates, divide the floors into separate zones of fire water service such that the number of pressure reducing valves required is minimized.

N. Sprinkler systems shall not be fed by the same standpipe on two adjacent floors.

O. Inspector's test valves shall be installed for each sprinkler control valve assembly equipped with a flow switch and piped to a stairwell drain test riser within the building. When used in combination with the drain and test riser requirements for testing standpipes equipped with pressure-regulating hose valves, the drain test riser size shall be a minimum size of 3 in. Each drain test riser discharge shall be piped to the exterior of the building. The exterior discharge point shall not discharge on a sidewalk, driveway or any other area that could result in staining, water accumulation or soil erosion. When exterior piping is not feasible, the drain test riser shall be piped to a suitable drain having sufficient capacity to accept full flow of pressure-regulating hose valves. When a project cannot meet this requirement, an alternative plan must be submitted for approval by the Project Management team and Environmental Health and Safety, before installation of fire protection system.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Develop plans, schedules, system schematic and details indicating all information required to clearly illustrate the intent of system design, including but not limited to, location and size of In-coming water supply, fire department connection(s) (Siamese), Fire pump and controller, jockey pump, test header, test loop, risers, standpipes, standpipe mains, zone control valves, water flow switches, drain discharge locations, fire department valves and fire hose cabinets.

B. Graphically identify each standpipe and fire hose connection on plans and riser schematic. Identification on riser schematic shall correspond to Identification on plans. Graphically indicate floor levels and floor elevations on riser schematic.

C. Details shall be provided for, pumps, water storage tanks and all other components that require installation explanation beyond the information included within plans and riser schematic.

D. Schedules shall clearly identify: Capacity, size, model, options and other requirements for pump equipment.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and piping specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-19-09	Paragraph 2.01 A. - Added reference to Element Z2005. Paragraph 2.01 B. - Changed 42 degrees to 40 degrees Fahrenheit. Paragraph 2.01 I. - Added option for variable speed controllers.	BG
Rev. 2	07-08-10	Paragraph 2.01 J. 3. - Added requirement to provide isolation valves with tamper switches to accommodate servicing break tank fill valves.	DOS
Rev. 3	12-08-11	2.01 J. 2. – Revised fire water break tank sizing criteria. 2.01 N & O – Clarified riser drain and PRV test discharge requirements. 3.01 A. – Added requirement that drain discharge locations be identified on drawings.	JJ & DOS
Rev. 4			
Rev. 5			

END OF ELEMENT D4010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design standards and requirements for electrical load calculation. This is a design standard and is not intended to be used as a Specification.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The electrical loads are assumed to be the criteria for distribution to allow the stated maximums to occur in localized areas (to be defined during programming) while the maximum average electrical loads anticipated are as follows (A/E to confirm that listed loads are compliant with all applicable codes):

1. Building Loads (VA/sq ft):

   a. For Lighting Power Densities use the Space-by-Space method and parameters as listed in the latest edition, or addendum, of the Energy Standard for Building Except Low-Rise Residential Building ANSI/ ASHRAE/ IESNA Standard 90.1.

   b. Office: receptacle – 4 VA/sq ft

   c. Corridor: receptacle – 0.5 VA/sq ft

   d. Mechanical area: power – actual motor horsepower

   e. For all other designated areas, use applicable code requirements and industry standard parameters and recommendations, and submit in writing proposed load parameters.

2. Branch Circuit Load Calculations:

   a. Lighting: 125 percent of total VA

   b. Receptacles: 180VA per outlet for non-dedicated outlets

   c. Special Outlets: Actual installed VA of equipment served

   d. Motors: Actual motor VA

3. Panelboards Demand Factors:

   a. Lighting: 125 percent of total VA

   b. Receptacles: 100 percent of first 10kVA plus 50 percent of all over 10kVA

   c. Motors: 125 percent of VA of largest motor plus 100 percent of VA of all other motors

4. Engine-generator Sets:

   a. Engine generator sets shall be sized using NEC at a load to capacity not to exceed 80 percent with consideration given to capacity for the addition of load in the future. Also, generator shall be sized for motor starting requirements and harmonic content of the load.

   b. Engine-generator sets shall be capable of picking up a minimum of 100 percent nameplate kW and power factor, less applicable derating factors with the unit at operating temperature.

   c. Engine-generator sets shall have a motor starting or surge kVA capability of three times the rated kVA based upon a recovered sustained RMS voltage drop of no more than 10 percent of no load voltage with the specified load kVA at or near zero power factor. Maximum instantaneous voltage dip shall not exceed 10 percent at this load and power factor level.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Specific consideration must be given to the latest edition or addendum of ANSI/ASHRAE/IESNA Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings. The Architect and Engineer of Record will be required to sign and seal a statement that stipulates that the design complies with the requirements of this standard. This written certification with backup documentation must be submitted to MD Anderson at the time of completion of the Construction Documents.

B. The Engineer shall submit the following calculations to MD Anderson: short circuit calculations, protective device coordination study, arc flash analysis, load calculations, generator-set sizing calculations, voltage drop calculations, and lighting calculations per ASHRAE 90.1. MD Anderson reserves the right to request additional calculations to suit the Project.

   1. Short Circuit Calculations: Prepare calculations for all new Projects and renovations to existing electrical distribution systems.

   2. Protective Device Study: Prepare and submit to MD Anderson a short circuit and coordination study to justify the selection of equipment for all new Projects and renovations to existing large electrical distribution systems.

   3. Arc Flash Analysis: Arch Flash Analysis shall be provided per the requirements of applicable edition of NFPA 70E. Arch Flash hazard warning signs and labels shall be in conformance with MD Anderson specification.

   4. Load Calculations: Prepare calculations for all new Projects and renovations to existing Distribution Systems.

   5. Generator Set Sizing Calculations: All applicable Projects.

6. Lighting Calculations: All Projects.

7. Voltage Drop Calculations: All Projects.

8. Lighting energy density calculations per ANSI/ASHRAE/IESNA 90.1: Applies to all Projects.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.01 A 4 a)	JCD
Rev. 2	02/24/09	Deleted reference to 2004 version of ASHRAE 90.1. The 2007 version was adopted by the State 01/01/09. Paragraphs 2.01 A. 1. and 3.01 B. 7.	DOS
Rev. 3	12/13/12	Added requirement of "Arch Flash Analysis shall be provided per the requirements of applicable edition of NFPA 70E. Arch Flash hazard warning signs and labels shall be in conformance with MD Anderson specification." Paragraph 3.01 B.	JD
Rev. 4			
Rev. 5			

END OF ELEMENT D5000

Element D | Services

Electrical

D500001 Electrical Renovation General Design Guidelines

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section supplements Design Guideline Element D5000, with specific criteria for Projects involving construction of alterations to existing buildings.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The A/E is responsible for surveying existing buildings to determine if adequate space is available for electrical Work and equipment. A/E must not rely upon MD Anderson furnished as-built drawings alone.

B. Early in the design phase, arrangements must be made with the MD Anderson Project Manager for access above ceilings to determine field conditions and to locate existing electrical components and utility services.

C. Modification versus Replacement – Where equipment must be modified to be physically utilized in a Project, the following must be evaluated:

1. Determine if one manufacturer must be used for final responsibility of the modified equipment.

2. Determine if a legitimate cost saving will be realized by modifying the existing equipment rather than installing new. If yes, then modification should be considered.

D. Age and Physical Condition:

1. The length of time in service of the wiring, devices and equipment should be reviewed prior to considering reuse.

2. The equipment should be capable of remaining in use for a minimum of 10 years of additional life or having 40 percent of remaining life, if not the equipment shall be replaced.

3. Where equipment has been in operation for a number of years, MDACC shall, in cooperation with Engineer, conduct a physical inspection of terminals, insulation, switching contacts, control wiring etc., , using recommendations offered by Engineer and other information it deems appropriate, determine what actions are to be included in the project scope..

E. Parts Availability:

1. After the Engineer's site survey's the availability of spare parts for existing equipment should be determined.

2. Where the Project involves extending an existing system but the existing equipment spare parts are not available, the Engineer should inform the MD Anderson Project Manager in writing. Specific directions will be given at that time.

F. Conduit and Junction Boxes (Boxes):

1. Conduit and boxes in existing walls to be demolished shall be removed.

2. Conduit and boxes in existing walls to remain shall be abandoned in place (if not reused) and the boxes shall be provided with blank covers.

3. Conduit in existing or new ceilings that is not intended for reuse shall be removed back to the panel from where it originates.

4. Conduits that had been run in the existing concrete slab shall be saw-cut off as they enter the slab and then sealed to prevent moisture access.

G. Conductors:

1. Conductors with deteriorated or damaged insulation shall be replaced. Conductors must be meggered to assure insulation integrity.

2. Conductors that are not to be reused shall be removed back to the nearest junction box. Where the entire circuit is to be removed, the conductors shall be removed back to the panelboard from which they emanate.

3. Disconnection and removal of telephone cabling may not be the responsibility of the Contractor. Verify with MD Anderson.

4. Disconnection and removal of communication, Nurse Call, Fire Alarm wiring, etc., shall be the responsibility of the Contractor.

5. Contractor shall not attempt to fish new conductors through an existing conduit with existing conductors. All conductors shall be replaced.

H. Wiring Devices:

1. Remove devices that are not installed at reusable locations. Boxes shall be blanked.

2. Existing receptacles and switches in good condition, located at acceptable places, may be reused. Non-hospital-grade receptacles shall be replaced in all patient care areas, including but not limited to Exam and Treatment Rooms, with hospital-grade receptacles.

I. Lighting Fixtures:

1. Lighting fixtures that cannot be reused shall be removed, including associated wiring to ceiling-mounted junction boxes.

2. Where fixtures are determined to be reusable in new or existing ceilings, they shall be taken down, cleaned and re-lamped prior to re-installation. An economic analysis of labor costs shall be made for reuse or replacement of fixtures.

J. Panelboards:

1. Consider panelboards for reuse if physical condition, ratings and circuit capacity requirements are met.

2. Panelboards shall be installed in new or existing electrical closets. Corridor-mounted panel boards shall not be used without specific instructions. Refer to other articles of this Manual for closet requirements.

3. In major secondary distribution renovation projects, existing panelboard back boxes may be used as pull boxes for branch circuit transfer. All branch circuit conductors shall be tagged to identify which circuit number they are being transferred to in the new panel. Provide a requirement, in the Contract Documents, for the Contractor to develop and type an accurate Circuit Directory.

4. Provide in the Contract Documents for the Contractor to balance the loads during the branch circuit transfer.

K. Owner Retained Equipment:

1. After consulting with MD Anderson, determine if the following items should be retained by the Owner:

   a. Disconnects of 100 A (amperes) Motors and larger

   b. Fire Alarm Devices

   c. Nurse Call System Components

   d. Panelboards and Circuit Breakers

   e. Lighting Fixtures

   f. Special Receptacles

   g. Transformers

2. Contractor is to properly dispose offsite equipment not to be retained by Owner.

L. Concealed or Exposed:

1. Conceal all work wherever possible. Wherever it is physically impractical to conceal conduits due to economic considerations, the Engineer shall consult with the Owner to determine acceptable alternatives.

2. All conductors shall be installed in conduit or in surface metal raceway.

3. Where permission is granted, type AC cable (hospital grade) may be used to fish down to outlets in existing walls as long as lengths do not exceed 3 m (10 feet). Locate a junction box directly above ceiling for the conduit drop to the new outlet. This, however, is not permitted for emergency circuits. Emergency circuits are to be routed in conduit.

4. Surface metal raceways shall not be installed on the floor. Service to equipment in open areas shall be served from under the slab or through Tele/power poles wired from the ceiling.

M. Continuity of Service:

1. Services passing through areas of remodeling shall be maintained throughout construction period.

2. Circuits that are modified as part of the remodeling Project, which serve areas adjacent to the construction area, shall be re-circuited as part of this Project.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Required demolition of existing electrical systems must be indicated on the Drawings.

B. Specific detailing of interfaces between alterations and existing to remain shall be clearly indicated on the Drawings.

C. Where existing equipment must be modified to be physically used on a Project, evaluate if initial and operational cost savings will be realized by modifying the existing equipment rather than installing new. Provide recommendations.

D. Provide Section(s) to resolve conflicts. Location of new equipment and services must be coordinated with all involved parties. Phasing of construction Work must be coordinated with all involved parties. Phasing of construction work must be coordinated with operation of the facility and MD Anderson staff and be accounted for in the design.

E. If MD Anderson wishes to retain existing electrical equipment considered obsolete as a result of modification, A/E should note this on the demolition Drawings; otherwise, the Contractor in accordance with General Conditions of the Contract will dispose of it.

F. Note on the Drawings if applicable to the Project, that services passing through areas of renovation shall be maintained throughout the construction period.

G. Required demolition of existing electrical systems must be indicated on the Drawings.

H. Specific detailing of interfaces between alterations and existing to remain shall be clearly indicated on the Drawings.

I. Where existing equipment must be modified to be physically used on a Project, evaluate if initial and operational cost savings will be realized by modifying the existing equipment rather than installing new. Provide recommendations.

J. Provide section(s) to resolve conflicts. Location of new equipment and services must be coordinated with all involved parties. Phasing of construction Work must be coordinated with all involved parties. Phasing of construction work must be coordinated with operation of the facility and MD Anderson staff and be accounted for in the design.

K. If MD Anderson wishes to retain existing electrical equipment considered obsolete as a result of modification, A/E should note this on the demolition Drawings; otherwise, the contractor in accordance with General Conditions of the contract will dispose of it.

L. Refer to Owner's Design Guideline Element D5010 Electrical Service and Distribution for the requirement of Coordination Study and Arc Flash Hazard Analysis, which may apply to some renovation projects.

PART 4 - PRODUCTS

4.01 GENERAL

A. New equipment shall be compatible with existing components and systems to which they interface.

B. If existing equipment will be reused, the A/E shall check availability of spare parts.

C. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 D 2 & 2.01 D 3)	JCD
Rev. 2	5-17-12	Added 3.01 L for the requirements of Coordination Study and Arc Flash Hazard Analysis.	PL
Rev. 3			

END OF ELEMENT D500001

D501001 Electrical System for Telecommunications Rooms

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design standards and requirements for electrical distribution for telecommunications equipment rooms. This is a design standard and is not intended to be used as a Specification.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The design for electrical distribution for telecommunications equipment rooms shall comply with the National Electrical Code and Owner's Design Guideline Elements D50 Electrical.

B. This section specifies requirement on power, grounding, standby power, and wiring requirements for voice system equipment and associated peripheral equipment installed in the equipment room.

C. A 24-hour lighting system shall be provided to insure that personnel working in telecommunications equipment rooms are able to see the equipment and labels attached to the equipment. All lighting fixtures in the telecommunications rooms shall be on emergency power. The light intensity level must be a minimum of 50 foot-candles at the surface of finished floor. Lighting fixtures shall be installed a minimum of 8 feet 6 inches above finished floor.

D. 120V (and where required, 208V) power as both normal power and UPS shall be provided. UPS power may be via a stand-alone unit, a centralized UPS, or in combination with emergency generator backup.

E. A centralized UPS is highly recommended and preferred for all new building construction, or whenever a full, or major, renovation of an existing building occurs.

F. HVAC equipment serving telecommunications rooms shall be fed from emergency power.

2.02 INTERMEDIATE DISTRIBUTION ROOMS (IDR)

A. Each IDR shall have a minimum of a quad outlet comprised of two separate, dedicated circuits (one regular power and one emergency power) mounted at the top of the data rack. Minimum power shall consist of two 15A/120V circuits with twist lock connector or two 30A/208V circuits with twist lock connector. The quantity, location, and type of power outlets shall be determined and coordinated with MD Anderson Network Services and Telecommunications Services Engineering, for specific project requirements.

B. In addition, each IDR shall have one wall-mounted 15A/120V electrical duplex outlet on dedicated emergency power, a minimum of one wall-mounted 15A/120V electrical duplex on normal power, and one 30A/208V outlet with twist lock connector on normal power.

C. Each IDR shall also include a 15A/120V duplex outlet on dedicated emergency power circuit mounted on wall 7'-0" AFF for paging system.

D. Each system cabinet along with the auxiliary cabinet requires a separate power outlet. These outlets shall not be shared with other equipment, shall not be switched, and shall be located outside the cross-connect field (wire wall) area. Exact requirements vary from project to project and shall be determined and coordinated with MD Anderson Network Services and Telecommunications Services Engineering.

E. Outlets located below raised floors should be located within 2 feet of the cabinet it serves.

F. All electrical circuits should be dedicated for the specific telecommunications room, preferably via a dedicated electrical power panel(s) inside the room.

2.03 CONDUITS AND WIREWAYS FOR TELECOMMUNICATIONS

A. Refer to Owner’s Design Guideline Element D5030 Communications for following design criteria.

1. Outdoor and indoor wireways for communications cables.
2. Outdoor and indoor pull boxes for communications cables.
3. Cable trays and dividers for communications cables.
4. Conduit inner ducts for fiber optic cables.

PART 3 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	07-29-10	Initial Adoption of Element	
Rev. 1	06-14-12	2.01 C: Changed “3 feet above finished floor” to “the surface of finished floor”, aligning with the requirement of Element D5030 2.03 O.	BRH
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D501001

D5010 Electrical Service and Distribution

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design standards and requirements for electrical service and distribution. This is a design standard and is not intended to be used as a Specification.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Provide primary electrical equipment infrastructure systems specifically designed and selected to minimize life-cycle costs, and install this system and equipment above the 500-year flood plain for flood mitigation purposes, to maximize the useful life expectancy of the equipment.

B. If tenant areas will be determined during detailed programming, they will be individually metered.

C. The following electrical power distribution components to be sized per projected loads (known loads, future loads, and design factors):

1. Service transformers
2. Busducts
3. Feeders
4. Power panelboards
5. Transfer switches

D. The following electrical power distribution components to be sized per known loads only and design factors:

1. Distribution transformers
2. Lighting and appliance branch-circuit panelboards
3. Branch circuits

E. Pay special attention to the size of electrical rooms, working spaces, and dedicated equipment spaces for the devices sized per known loads only as they may need to be replaced in the future with larger size components. Coordinate with the Owner and seek written approval for any deviation from this design requirement.

F. Normal Power Distribution

1. In MDACC facilities, the primary source of normal electrical power is obtained from public utility. While majority of the MDACC facilities are fed by 4160 volts utility source, some

facilities at remote locations are fed by 480 volts. The A/E shall evaluate the degree of reliability required for a given project. Design issues such as separately routed primary feeders, transformer placement, and switchgear location all bear on the reliability issue.

2. Primary power for the facility shall be obtained from a local public utility usually at 4.16 kV. The primary system shall be dual fed, double ended. Two feeder circuits shall be routed to the project site feeding utility transformers. The two dual utility feeders shall be independently fed from two separate utility substations to preserve electrical reliability. Each of the utility feeders shall be sized to serve the entire facility should the other feeder fail.

3. The double ended main-tie-main switchgear shall consist of connections for primary 4.16kV feeders, medium voltage vacuum circuit breakers, and 4160 – 480/277 V transformers. Branch feeder circuit breakers shall be draw-out mounted type capable of being withdrawn on rails for inspection and maintenance. The breakers shall be electrically operated. Surge arresters shall be provided at the main switchgears.

4. Electrical distribution voltages for the project will be one of the following:

   a. 480V, 3 phase, 3 wire will be distributed to motor control centers to serve concentrated motor loads.

   b. 480/277V, 3 phase, 4 wire will be distributed to distribution panels to serve 277V lighting panels and step-down transformers to obtain 208Y/120V.

   c. 208Y/120V, 3 phase, 4 wire will be distributed from branch circuit panelboards to serve receptacles and equipment.

5. Feeder Sizes: primary feeders shall be sized based upon transformer capacities and calculated demand load, including future growth. Feeders shall be sized for a maximum of 2 percent voltage drop.

6. Branch circuits shall be sized for a maximum of 3 percent voltage drop.

7. Minimum Bus Sizes:

   a. 277V Lighting Panels: - 125A

   b. 120V General Receptacle Panels: - 225A

   c. 480V Motor Control Center: - 600A

8. Panels shall be flush mount (where practical), 42 space.

9. Motor Control Centers will contain combination disconnect starter units, 120V control transformer, control devices on front cover and push-to-test pilot lights.

10. Distribution equipment such as switchgears, switchboards, panelboards, and distribution boards shall be housed in dedicated electrical rooms. Electrical rooms shall be designed in such a way that meets NEC requirements of working space, headroom, dedicated spaces above electrical equipment, entrance and exit doors. The size of dedicated

electrical rooms shall accommodate the initial installation of core and shell as well as anticipated final installation of build-outs. 480V feeder conduits and/or plug-in copper bus duct risers will be routed from the substations to the building electrical rooms to serve distribution panel boards or distribution switchboards.

11. Non-linear loads and IT closets and server rooms will be served through high efficiency harmonic mitigating dry-type transformers and electronic grade branch circuit panel boards. Provide phase shift calculation and projected harmonic cancellation.

12. Provide power factor correction capacitors or harmonic filters at the main switchgear where inductive leads (such as low to medium pf ballasts, computer equipment, medical equipment and motors not controlled by VFD's) will be significant. Include harmonic resonance calculations in application method.

G. Emergency Power Distribution

1. In MDACC facilities, the emergency electrical power is obtained from locally installed diesel engine generator(s) at 4160 volts or 480 volts. The A/E shall evaluate generator supply voltage that is suitable for equipment being supported. The A/E shall also analyze the cost associated with emergency generator(s) at different voltages, whether at 4160 volts vs. 480 volts. Design issues such as avoiding possibilities of re-entraining exhaust into the building (or an adjacent building's) ventilation system, and unpleasant diesel exhaust odors in the building, shall be taken into consideration. Consideration should be given to the physical separation of the main feeders of the emergency electrical system from the normal wiring of the facility to prevent possible simultaneous destruction as a result of a local catastrophe.

2. Emergency generator(s) should be preferably installed on first floor (or outside at grade level) above 500-year flood plain and to allow easy access for maintenance. This will also provide the opportunities for utilizing portable load bank for routine maintenance tests, therefore eliminating the need of permanently mounted load bank in order to save the costs for initial construction and future maintenance.

3. Emergency generators shall be connected to paralleling switchgear. This switchgear will serve the emergency distribution panels in the building. Automatic transfer switches shall be utilized to connect to the emergency source based upon a pre-set priority if the normal source of power fails. Transfer switches shall be located near the normal source unit substation. ATS shall be closed transition type. A permanently mounted load bank shall be provided to allow for the required routine maintenance testing of generators, if the generator(s) is installed on a floor above the first floor and utilizing portable load bank is not feasible.

4. Emergency power shall backup UPS systems (centralized or localized) that support Life Safety, BAS system and other critical systems. A comprehensive study and design shall be initiated early in the design phase dealing with prioritization of startup sequence upon the loss of normal power. The A/E shall submit such design for Owner's review no later than the end of Design Development phase, and obtain approval from the Owner.

5. Failure of the normal source of power shall be sensed by devices in each automatic transfer switch. Upon detection of power failure a signal will be sent to the generator

switchgear, which will send a start signal to all active generators. The first generator, which achieves proper voltage and frequency, will connect to the emergency switchgear bus. The remaining generator(s) will synchronize with the first generator prior to connecting to the bus. The automatic transfer switches will connect to the emergency bus when the voltage and frequency reach the correct levels. ATS shall be closed transition type.

6. A load sensing system shall be provided such that if one generator can carry the emergency load requirement, the remaining generator(s) can be shut down. Conversely, if the switchgear senses the operating generator is becoming overloaded, a signal shall be sent to start a second generator.

7. When the normal source returns and after a preset time delay (to establish that the presence of the normal source is not temporary), the transfer switch shall connect the load to the normal source. After removal of the load from the engine generator, the unit shall continue to run for a preset cool-down time period before stopping.

H. Provide a separate panelboard for high density electrical utilization equipment spaces where the power requirements exceed 18 poles, and locate the panelboard near the entrance to and within the space.

I. Do not mount panelboards in hallways, behind doors of electrical rooms, or other public spaces, unless the project Facility Program includes specific panelboard location requirements. Do not mount panelboards in fire rated walls.

J. Do not design floor slab encased conduit runs for the branch circuitry except slab on grade. The other exception may be for the lighting grid in the parking deck areas of a parking garage.

K. Provide five (5) spare ¾ inch conduits from every flush mounted panel to an above ceiling accessible area for future use.

L. Provide as minimum, 10 percent spares and 10 percent spaces in all panels. If this causes a panel to exceed 42 spaces, add an additional panel, or install feed through lugs in panel and provide physical space for additional panel.

M. The electrical engineer is responsible for coordinating maximum transformer weights and anticipated floor loading with the project structural engineer.

N. Transformers installed in electrical rooms shall be designed and sized in coordination with architect and door dimensions. All transformers sized 225 kVA and above shall require double doors or doors in excess of standard 26 inch width. All electrical rooms with dry-type transformers of more than 112½ kVA rating will have one hour fire rating. No transformers are allowed to be wall mounted or suspended above ceilings.

O. Branch circuit panelboards shall not serve loads on more than one level of a building. Circuits from branch circuit panelboards shall not cross ‘building lines’.

P. Switchgear, floor mounted transformers and motor control centers shall be placed on a 4 inch housekeeping pad with chamfered edges.

Q. Building floor plans shall indicate location of dedicated remote annunciator panel in a 24 hour monitored location and required conduit and circuit connectivity. Connect annunciator to Building Automation System (BAS) for monitoring by MD Anderson Environmental Health and Safety.

R. Equipment and its controller shall be served from the same riser of power source. The origin of power source for the controllers shall be clearly indicated on drawing.

S. Equipment of mechanical and other building support systems should be evenly served from different risers of power sources minimizing the impact due to power interruption to a single riser.

T. The integrity of mechanical and other building systems must be satisfied for continuous support of the operation in the event of power interruption. For example the dependent exhaust and supply fans functioning as a system and their associated controllers shall be fed by the same riser of power source.

U. Wiring devices consisting of general and special purpose receptacles shall be provided where required by building program and as follows:

1. Corridors will be provided with duplex receptacles at not more than 50 feet on center and not greater than 25 feet from the end of the corridor. Electrical circuits serving these receptacles shall serve no other loads.
2. Mechanical equipment spaces within the building shall be provided with receptacles located within 25 feet of the equipment for maintenance use.
3. Mechanical equipment exterior to the building shall be provided with ground fault receptacles with weatherproof covers located within 25 feet of the equipment for maintenance use.
4. Conference and meeting rooms shall be provided with at least one receptacle per wall, and a floor box with a receptacle and phone/data connections in the middle of the room.
5. Receptacle located within 6 feet of water sources in any type of space shall be of the ground fault interrupting type.
6. Janitor’s closet shall have one GFCI receptacle.
7. Restrooms shall be provided with at least one duplex GFCI receptacle.
8. All receptacles in elevator equipment room shall be GFCI type.

V. Dedicated circuits shall be provided to the equipment indicated in the Facility Program Document and to the following equipment:

1. Refrigerators
2. Freezers
3. Copiers

4. Vending machines

5. Equipment requiring an isolated ground

6. Equipment requiring an outlet rating of 20 amps or above

7. Motors

8. Microwaves, coffee makers, ice makers, and other kitchen/break room equipment.

W. Animal Facility conduit and wiring:

1. Conduits in animal facilities shall be concealed.

2. Surface-mounted conduits in washdown areas shall be intermediate metallic conduit (IMC) or rigid galvanized steel with threaded couplings.

3. Conduits in animal facility areas shall be sealed with conduit sealer such as Duxseal at each device/junction box.

4. Surface metal boxes shall be cast metal.

5. Conduits entering or leaving device boxes, junction boxes, pull boxes, and so forth shall be sealed at each box with a non-hardening sealant such as Duxseal. An alternative is to use seal-off fittings in conduits penetrating animal facility walls. A potting compound shall be poured into the fitting after the wires are installed.

6. Surface metal raceway with snap-on covers shall not be used in an animal facility because of the requirements for washdown cleaning.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Electrical Engineer shall show equipment room layout, drawn to scale, indicating location of equipment and busway routing for interconnection.

B. Electrical Engineer shall provide, if applicable, a Coordination Study and Arc Flash Analysis of the complete electrical system. The study and analysis shall include all power distribution systems. The study shall be prepared and certified with the registration seal and signature of a registered Professional Engineer. The Engineer shall be in private practice and should not be employed by the manufacturer of the electrical equipment in order to provide a non-biased third party analysis. The Engineer shall be qualified by experience in the preparation of studies having similar requirements and magnitude.

C. The Coordination Study and Arc Flash Hazard Analysis shall be updated, when a major modification or renovation takes place. The following changes, but not limited to, shall constitute the necessity of mandatory updates.

1. A change by the utility or change of generator(s) by size or configuration

2. A change in the primary or secondary systems configuration
3. A change in the transformer size (kVA), impedance (Z%), addition or deletion
4. A change in feeder conductor lengths, sizes, or raceway type
5. A change in the motors connected to the system
6. The Coordination Study and Arc Flash Hazard Analysis shall be reviewed and updated periodically at a frequency that is required by NFPA 70E, to account for changes in the electrical distribution system.

PART 4 - PRODUCTS

4.01 GENERAL

A. High voltage switches shall be High Voltage Drawout type (HVDO) metal clad vacuum circuit breakers.

B. Secondary switchgear shall be low voltage draw out type (LVDO) solid state with adjustable trip.

C. Power distribution transformers shall be dry type, air cooled high efficiency, NEMA TP-1 transformers. Transformers serving loads with high harmonics (such as IT closets and server rooms) shall be harmonic mitigation type.

D. All products used and specified in Division 26 must be UL approved and must meet all applicable ANSI, NFPA, IEEE, EIA/TIA standards as indicated in the appropriate sections of this design standard.

E. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 F 11; 2.01 G; 2.01 L; 2.01 Q; 2.01 S 1; 2.01 V; 4.01 C & 4.01 D)	JCD
Rev. 2	03-02-10	2.01 F. 4. a. – Revised the minimum bus size for 277 lighting panel to 125A. 2.01 F. 7. – Revised the term of "transient voltage surge suppression" to "surge arrester" for substations and main switchboard. 2.01 F. 9. – Added requirement of "provided phase shift calculation and projected harmonic cancellation".	PL
Rev. 3	07-08-10	Added new paragraphs of 2.01 F. Normal Power Distribution 1, 2, and 3. Added new paragraph G. Emergency Power Distribution (including G. 1. through G. 7.) Added the requirement of "Do not mount panelboards in fire rated walls" to 2.01 I. Revised 2.01 J. to read as "Do not design floor slab encased conduit runs for the branch circuitry except slab on grade. The other exception may be for the lighting grid in the parking deck areas of a parking garage." Added new paragraphs R, S, and T. Deleted 2.01 W. of "provide power on the roof for building cleaning equipment", since this is redundantly stated in 2.01 U. 2 and 3. Added requirement of "arc flash" to 3.01 B.	JD
Rev. 4	09-16-10	Added requirement to 2.01 U. 8 – All receptacles in elevator equipment room shall be GFCI type.	JD
Rev. 5	11-23-10	Added requirement of "Consideration should be given to the physical separation of the main feeders of the emergency electrical system from the normal wiring of the facility to prevent possible simultaneous destruction as a result of a local catastrophe" to G. 1.	JD
Rev. 6	03-17-11	Added requirement to 2.01 F. 10: "Distribution equipment such as switchgears, switchboards, panelboards, and distribution boards shall be housed in dedicated electrical rooms. Electrical rooms shall be designed in such a way that meets NEC requirements of working space, headroom, dedicated spaces above electrical equipment, entrance and exit doors. The size of dedicated electrical rooms shall accommodate the initial installation of core and shell as well as anticipated final installation of build-outs." Deleted the reference of motor control center in 2.02 F12. Clarified that 1-hour fire rating for electrical rooms with "dry-type transformers of more than 112½ kVA rating."	JD

Issue	Date	Revision Description	Reviser
Rev. 7	05-17-12	Added Coordination Study and Arc Flash Hazard Analysis requirement paragraph 3.01 C.	JD
Rev. 8	01-17-13	Added requirement that ATS shall be closed transition type.	JD

END OF ELEMENT D5010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design standards and requirements for interior fixtures, lamps and accessories. This is a design standard and is not intended to be used as a Specification.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Interior Lighting

1. Perform all lighting calculations based on IES Lighting Handbook 9th Edition and the lighting power density criteria of the applicable edition of ANSI/ASHRAE/IESNA 90.1.
2. Refer to Project Facility Program document for lighting requirements.
3. Include the following information in all submitted calculations:
    a. Room Name
    b. Room Number
    c. Fixture type chosen for the room
    d. Number and type of lamps to be used in the room
    e. Required illumination level (MD Anderson or IESNA)
    f. Calculated illumination level

B. Details

1. Provide individual lighting fixture details or a lighting fixture schedule on the Drawings and not as part of the specifications. See Design Guideline Element D5022 Master Lighting Fixture Schedule for requirement.
2. Show switch and switch leg control for all fixtures.
3. Do not switch corridor fixtures on emergency power, stairwell, or exit fixtures.
4. Do not use incandescent lamps.
5. Dimming fluorescent lighting with linear or compact lamps is allowed.
6. Provide occupancy sensors to comply with ANSI/ASHRAE/IESNA 90.1 requirements.

7. Lighting fixtures in equipment rooms, telecommunication rooms, and utility rooms shall be mounted such that the fixture bottom is not less than 8 feet-6 inches above finished floor. Coordinate final location with equipment layout.

8. Electrical and mechanical rooms shall have 50 percent of the lighting fixture on emergency power. When only (2) fixtures are in a room, both may be on one switch on emergency power. All lighting fixtures in telecommunications equipment rooms shall be on emergency power. Elevator machine room lighting shall be on a dedicated circuit. Do not use occupancy sensor for lighting control in elevator equipment room, provide single pole lighting switch.

9. Lensed fluorescent fixtures shall have KSH20, 0.140 thickness acrylic lens material.

10. Under cabinet or 'task' lights shall be 120V, shall have solid fronts, shall have individual rocker type switches, and where two (2) or more are installed shall have individual switch mounted at area entry.

11. All linear fixtures shall be T-8 type with electronic ballasts, high performance lamps and lamp length of 2, 3 or 4 foot only.

12. Ballasts to be high power factor (90 percent minimum), have a total harmonic distortion less than 10 percent and have a crest factor less than 1.7.

13. For animal facilities, all animal room lighting shall be on emergency power.

14. For animal facilities, cage washing room lighting shall be approximately 50 percent on emergency power. Lighting focal points shall be on washing, loading, and unloading areas.

C. Deviations

1. Whenever deviations from MD Anderson's Standards and/or Design Guidelines occur, the Engineer shall make recommendations applicable to that specific project.

2. Request approval from Owner for the implementation of any new or improved lighting products and/or systems that are energy efficient or result in cost savings.

D. Lighting Schemes

1. At least two (2) proposed lighting schemes for special areas (visitor lobbies, cafeterias, atriums, etc.) should be provided.

2. Each layout shall vary in concept and materials such as fixture layout, fixture type, lamps, louvers, reflectors, etc. This will enable MD Anderson to select the best scheme to suit goals and budget requirements.

E. Lighting Controls

1. All lighting for animal holding and procedure rooms shall be centrally controlled with programmable lighting cycles for each room as described in the Project Program

Document. The central control shall be part of an environmental control computer located in the administrative office.

2. Provide housing and procedure rooms with a dimming system (Lutron or Edstrom compatible) with the use of automated features for ON/OFF control and scheduling.

3. Red observation lights for night shall be standard type with colored sleeves and shall be controlled with corridor timers (15 to 30 minute spring wound type).

F. Exit Fixtures

1. Provide exit light fixtures in accordance with NFPA 101, Life Safety Code.

2. Indicate double-faced fixtures and/or directional arrows on the Drawings, where required.

G. Closets or Lockers

1. Place fixtures appropriately to provide adequate lighting in closets and lockers.

H. Interstitial Spaces

1. Install lighting by fluorescent strip lights equipped with industrial reflectors. Provide with wire guard where subject to physical damage.

2. Spaces with walkways or catwalks only:

a. Locate fixtures appropriately along catwalks and walkways.

b. Emergency circuits shall be switched at entry doors.

c. Switch all non-emergency powered fixtures from all access doors to the space. Long catwalk runs should be separately switched.

I. Exterior Lighting

1. All walkways, sidewalks, and parking lots shall be illuminated to levels recommended by the Illuminating Engineering Society (IES). Typical levels shall be according to the following:

LOCATION	**ILLUMINATION AVERAGE (FC)**
Sidewalks	0.5
Entryways	1
Heavily Traveled Areas	1
Parking Lots	0.5

2. Refer to ASHRAE 90.1 - 9.4.5 for exterior lighting limits.

3. Design and location of exterior lighting shall always consider tree and landscaping locations.

4. Exterior building lighting shall be controlled with an astronomical time clock with manual bypass switch. Outside area and street lighting may be controlled with photoelectric cells or an astronomical time clock. Lighting contactors shall have provisions for connection to building automation system.

5. Refer to Design Guideline Element D5038 Security Systems for additional exterior lighting requirements.

J. All engineering calculations of lighting analysis and light level study shall be made available to the Owner upon request.

K. Lighting circuits with ceiling occupancy sensors shall also have wall mounted switches of the appropriate color.

L. Locate stairwell and exit fixtures to be accessible from a 10-foot ladder placed on a flat surface.

M. Consider lamp replacement at all fixture locations: high ceilings, above escalators, other floor openings, etc.

N. Conference rooms shall have dimmable linear and/or compact fluorescent lamps.

O. Each fixture shall have single ballast unless special switching is required.

P. All lighting control contactors shall be mechanically held. Contactors to be controlled locally. All contactors shall have a cover mounted H-O-A switch. All contactors shall have provisions for connection to building automation system.

Q. Lighting fixtures in bridges, window corridor areas, and other similar areas with high ambient outside lighting, shall have photocell area control.

R. Evaluate and make recommendations to the Owner if indirect lighting should be considered for any area in the Project.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. A/E shall perform calculations of illumination levels for the spaces being designed.

B. Building exterior and parking garages shall have point calculations provided.

C. For exterior lighting, provide pole mounting height and pole base installation detail.

PART 4 - PRODUCTS

4.01 GENERAL

A. All fixtures shall be selected from the MD Anderson Master Lighting Fixture Schedule, referenced in Design Guideline Element D5022. Any deviations from above mentioned schedule require the Owner's written approval.

B. T-8 fluorescent lamps shall have a color temperature of 4100K. Four foot T8 lamps shall be 25 watt high efficiency type with mercury content 1.7 mg or less. Philips F32T8/ADV841/XEW/ALTOII shall be the standard lamp.

C. Compact fluorescent lamps shall be 2700K, twin, double twin or triple tubes.

D. Do not specify 8-foot fluorescent lamps, or T-12 lamps of any length.

E. Do not specify low-pressure sodium or mercury vapor lamps.

F. Exit signs shall be LED type.

G. All fluorescent lamps to have a minimum CRI of 85.

H. Metal halide lamps shall be mogul or medium base. Specialty metal halide lamps may be PAR type with medium base.

I. Two, three and four foot linear and compact fluorescent and H.I.D. lamps shall be TCLP compliant with mercury content of 1.7 mg or less.

J. Lighting fixtures for animal housing and procedure rooms shall be selected such that they have minimal horizontal surfaces that may accumulate dust and dirt.

K. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements throughout document based upon TGCE's evaluation. (Paragraphs 2.01 B 11; 2.01 F 2 & 4.01 C)	JCD
Rev. 2	02-24-09	Deleted reference to 2004 version of ASHRAE 90.1. The 2007 version was adopted by the State 01/01/09. Paragraph 2.01 A. 1.	DOS
Rev. 3	03-02-10	2.01B. 4. – Eliminated incandescent lamps. 2.01 H. 1 – Added the requirement of "provide with wire guard where subject to physical damage". 2.01 I. 2. – Revised the ASHRAE 90.1 reference to 9.4.5. 4.01 B. – Added the requirement of "four foot T8 lamps shall be 25 watt high efficiency type with mercury content of 1.7 mg or less". 4.01 I. – Added the requirement of two, three and four foot lamps shall be with mercury content of 1.7 mg or less".	DC/PL/JD
Rev. 4	07-08-10	Revised 4.01 D. to read as "Do not specify 8-foot fluorescent lamps, or T-12 lamps of any length." Revised 4.01 F. to read as "Exit signs shall be LED type."	DC
Rev. 5	09-16-10	Added requirement to 2.01 B. 8 – Do not use occupancy sensor for lighting control in elevator equipment room, provide single pole lighting switch.	JD
Rev. 6	06-14-12	2.01 A. 1: Changed "latest" to "applicable". 2.01 B. 1: Changed "Z2050" to "D2050". 2.01 B. 8: Revised to require emergency power for 50 percent of the lighting in electrical and mechanical rooms, eliminating discrepancy with the requirement of Element D5090 2.04, 24. Revised to require emergency power for 100 percent of the lighting in telecommunications equipment rooms, eliminating discrepancy with the requirement of Element D501001 2.01 C. 4.01 A: Changed "Z2050" to "D2050".	BRH

END OF ELEMENT D5020

PART 1 - GENERAL

1.01 OVERVIEW

A. The following Table lists lighting fixture types, manufacturers, and models that are based on various applications at MD Anderson facilities.

B. The A/E shall use the following baseline lighting fixture schedule in developing a project specific lighting fixture schedule. The A/E shall incorporate at least (3) “equivalent to, or better than” manufacturers and associated catalog numbers per each type of fixture. The criterion for evaluation of equivalency shall include, but not limited to, photometric characteristic, material, construction, features, finishes, lenses, and cost, etc.

C. Other manufacturers for lighting fixture(s) or lamp(s) equal (or better than) in design, performance and function will be considered upon A/E’s evaluation and approval. The approved lighting fixture(s) or lamp(s) shall be incorporated into project specific lighting fixture schedule.

D. Substitution to approved project lighting fixture schedule shall follow the substitution procedure outlined in 01 31 00 - Project Administration.

PART 2 - MASTER LIGHTING FIXTURE SCHEDULE

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
FA	Lithonia 2SPGB332RWK20MVOLT1/3TUBIHPMP3875 Lightolier PRA2GRFK20332UNVH3 Cooper Lighting – Metalux 2GCRA-332-K20UNIV-HPT8	3 - 25w T8	3 lamp 2 x 4 lay-in with K20 , similar pattern K12, 3/16” Extruded virgin acrylic lens and aluminum regressed lens frame with reveal, single 3 lamp ballast	277	Exam rooms, offices, support spaces

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
FB	Lithonia 2SPGB232RWK20MVOLTTUBIHPMP3875	2 - 25w T8	2 lamp 2 x 4 lay-in with K20 acrylic lens and aluminum regressed lens frame with reveal	277	Offices, break rooms, support spaces
FC	Lithonia SPGB232RWK20MVOLTTUBIHPMP3875	2 - 25 w T8	2 lamp 1 x 4 lay-in with K20 acrylic lens and aluminum regressed lens frame with reveal	277	Support spaces, break rooms, odd shaped spaces
FD	Lithonia 2SPGB317RWK20MVOLT1/3TUBIHPMP3875	3 - 17w T8	3 lamp 2 x 2 lay-in with K20 acrylic lens and aluminum regressed lens frame with reveal	277	Inside corridors, support spaces, odd shaped rooms
FE	Lithonia 2SPGB217RWK20MVOLTTUBIHPMP3875	2 - 17w T8	2 lamp 2 x 2 lay-in with K20 acrylic lens and aluminum regressed lens frame with reveal	277	Window corridors, elevator lobbies, dressing cubicles
FF	Lithonia 2AVG317MDRMVOLT1/3TUBIHP Metalux 2RDI-317RP-UNV-TU-B332IUNVHPB-U	3 - 17w T8	3 lamp 2 x 2 lay-in direct/indirect	277	Waiting rooms, open office work station areas, imaging corridors and suites. With ADEZ suffix for conference rooms and dimming.
FF1	Lithonia 2AVG217MDRMVOLTTUBIHP Metalux 2RDI-217RP-UNV-TU-B232IUNVHPB-U	2 - 17w T8	2 lamp 2 x 2 lay-in direct/indirect	277	Open office work station areas, imaging corridors and suites. With ADEZ suffix for conference rooms and dimming.

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
FG	Lithonia 2AVG332MDRMVOLT1/3TUBIHP Metalux 2RDI-332RP-UNV-TU-B332IUNVHPB-U	3 - 25 w T8	3 lamp 2 x 4 lay-in direct/indirect	277	Open office work station areas, private office. With ADEZ suffix for conference rooms and dimming.
FG1	Lithonia 2AVG232MDRMVOLTTUBIHP Metalux 2RDI-232RP-UNV-TU-B232IUMVHPB-U	2 - 32w T8	2 lamp 2 x 4 lay-in direct/indirect	277	Open office work station areas. With ADEZ suffix for conference rooms and dimming.
FM Series	Alkco SF332ECBRSW, SF325ECBRSW, SF317ECBRSW	1 - 32w T8, 1 - 25w T8, 1 - 17w T8	1 lamp solid front tasklight with right switch. All tasklights require area occupancy sensor control or an integral (Wattstopper FS255) sensor.	120 Only	Exam rooms, kitchens, lab areas
FN	Lithonia 2SPG332K20MVOLT1/3TUBIHP	3 - 32w T8	3 lamp 2 x 4 lay-in with flat white lens frame	277	Lab areas, research area offices, inpatient areas.
FO	Lithonia 2SPG232K20MVOLTTUBIHP	2 - 32w T8	2 lamp 2 x 4 lay-in with flat white lens frame	277	Lab support areas, research area support spaces, inpatient areas.
FP	Lithonia SPG232K20MVOLTTUBIHP	2 - 32w T8	2 lamp 1 x 4 lay-in with flat white lens frame	277	Lab areas along benchtops, inpatient areas.
FR	Lithonia AF2/13DTT8AR277TRWEMB	2 - 13TT	2 lamp downlight with integral white trim ring	277	Downlight in elevator lobbies (pre-energy code)
FR1	Lithona AF1/13DTT8AR277TRWEMB	1 - 13TT	1 lamp downlight with integral white trim ring	277	Downlight in elevator lobbies (pre-energy code)

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
FR2	Lithonia AF2/13DTT8AR120TRWEMB	2 - 13TT	2 lamp downlight with integral white trim ring	120	Reading light, accent light in patient rooms (pre-energy code)
FS	Lithonia AF126TRT8ARMVOLTTRWGEB10	1 - 26TRT	1 lamp downlight with integral white trim ring	277	Special downlight applications
FS2	Lithonia AF1/26TRT8AR277TRWADEZ	1 - 26TRT	1 lamp downlight with integral white trim ring	277	Dimming downlight applications
FT	Lithonia AFV 18/26/32 TRT8AR TRW	1 – 18W/ 26W/32W TRT	1 lamp vertical lamp downlight	MVOLT	General downlighting
M1	Devine LMS500-LED-277-BLK	LED	embedded exterior	277	Step, ramp, exteriors, etc.
M2	Moldcast PERSRL250MH277DBZ	250w MH	exterior poletop	277	Sidewalk areas
M2P	Ameron Centrecon SEO-03TG412 (pole for Type M2 fixture)	Pole	octagonal, 13 foot embedded, 10 foot flange, polished green color	277	
	Lithonia KBR8100MR5277LPI	50w or 100w	42 inch bollard	277	Walkways
M3	Hydrel 4630P3035M277SPCAIHLBZ	35w MH par 30	landscape	277	Planting areas
XA	Lithonia LQMS1R120/277	LED	one side EXIT sign, black finish	120/277	Exit marking
XB	Lithonia LQMS3R120/277	LED	two side EXIT sign, black finish	120/277	Exit marking

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
XC	Lithonia LQMP1R120/277MROOMINUSE, Lithonia LQMP1R120/277MXRAYINUSE,	LED	custom room sign, black finish	120/277	Outside x-ray rooms, darkrooms, treatment rooms, etc.
Miscellaneous Fixtures (Fixture Type Not Indicated)					
	Lithonia BV2 250M R2 277 RPB04 HS with pole Lithonia RTS206-5B FINISH	250w MH	exterior poletop, 20 foot pole	277	
	Lithonia KAD 400M Rx 480SPD09 with pole Lithonia SSS30-6G-DMI-9-DDB (x - distribution to be determined)	400w MH	exterior pole top, 30 foot pole	480	South Campus
	Lithonia TWA50M277DMB	50w MH	Cut off exterior wall	277	Exterior area
	Lithonia TWA26TRTMVOLT DMB	26w TRT	Cut off Exterior wall pack	277	Egress door
	Allscape SP-0218CF-PLC-277-color	18w	exterior	277	Steps, ramps
	ALKCO WG2H2SWH	LED	Wall mounted single side or thru-wall	120/277	Night light or step light
	Lithonia DMW232MVOLTTUBIHP	2 - 32w T8	elevator pit	120 Only	Worklight
	Versailles #1105 Brushed Aluminum	2 - 9w TT	Two lamp sconce	277	Lactation rooms
	Lithonia Avante AVSP 2 13DTT MDR 277	2 - 13 DTT	Two lamp sconce	277	Corridor, special applications
	Lithonia AF10232277TUBIHPHC	2 - 32w T8	10% uplight reflector	277	Mechanical, electrical, janitor's closet
	Lithonia DMW232277TUBIHP	2 - 32w T8	2 lamp vapor tight	277	Wet locations
	Lithonia DMW3321201/3TUBIHP	3 - 32w T8	3 lamp vapor tight	120 Only	Cold rooms
	Speclight FCW4232MVOLT2/1TUBIHPSNREZ	2 – 32w T8	2 lamp wall mount with occupancy sensor and two ballasts	277	Interior stairways

Type	Manufacturer and Model	Lamps	Description	Voltage	Application
	betaLED BLD-CAN-40-PD-170-LED-B-UL-WH-43K	LED	Area or pole mounted	277	Parking garage, drive thru, poletop fixtures
	Lithonia KVE2400MSYMC277SPD09 with Lithonia SSS20-5G-DM19-DDB pole	400w MH	poletop on typical 20 foot pole	277	Parking garage rooftop
	Philips/Color Kinetics io Lighting	LED	accent specialty	120	Coves, accent, decorative
	Speclight FSW4332S2X20 AR MVOLT TUBIHP STSL	3-32WT8	3 lamp vapor tight w/ two ballasts	MVOLT	Parking garage
	Prudential WAL-8-SD-2T8-04-YGW-SC-277-WM-DM	32WT8	wall mount dimming	277	Reading rooms in Diagnostic Imaging Oncology. Lutron Hi-Lume 1% dimmer.
	Peerless Envision series	32w T8	cable direct/indirect, custom cable, custom length	277	Specialty indirect applications

A. Notes to Table; Fixture Type ‘F’:

1. 1/3 must be specified to ensure one, three-lamp ballast per fixture.
2. Substitute ADEZ for TUBI for Advance Mark X dimming ballasts.
3. Regressed lens frames with reveal, are typically used to match existing spaces and for enhanced appearance.
4. New compact fluorescent down lights shall be equipped with dual voltage electronic ballasts. Lamp sizing per application.
5. All linear fluorescent lamps shall contain no more than 1.7 mg mercury. All four foot linear lamps shall be high efficiency equivalent to or better than Philips F32T8/ADV841/XEW/ALTO2 or Sylvania FO32/25W/8410XP/SS/ECO 25 watt lamps.
6. Provide program start ballast where occupancy sensor is being specified.

PART 3 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	05-03-07	Initial Adoption of Element. Re-Numbered Element From Z5010 to D5022	DOS
Rev. 1	05-17-07	Clarification on voltage “F” fixtures; revised FS and FS2 fixture, added walkway fixture, added South Campus exterior pole fixture, added exterior wall pack fixture, changed fixture for elevator pit, added wall sconce fixtures, revised interior walkway fixture.	SAK
Rev. 2	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Part 2)	JCD
Rev. 3	03-02-10	Revisions made to type FA, FB, FC, FD, FE, FF, FF1, FG, FG1, FN, FO, FP, FT, M1, fixtures. Deleted Phoenix DL70MHDWT60-277, and Widelight RSPM-100-RSPM-100-S-277-LMP-PND-RC-F1-SA, Added Speclight FSW4332S2X20 AR MVOLT TUBIHP STSL, and Prudential WAL-8-SD-2T8-04-YGW-SC-277-WM-DM.	DC
Rev. 4	09-16-10	A. Revised 1.01 Overview to read as: B. The following Table lists lighting fixture types, manufacturers, and models that are based on various applications at MD Anderson facilities. C. The A/E shall use the following baseline lighting fixture schedule in developing a project specific lighting fixture schedule. The A/E shall incorporate at least (1) additional equivalent manufacturer(s) and associated catalog numbers per each type of fixture. The criterion for evaluation of equivalency shall include, but not limited to, photometric characteristic, material, construction, features, finishes, lenses, and cost, etc. D. Other manufacturers for lighting fixture(s) or lamp(s) equal (or better than) in design, performance and function will be considered upon A/E’s evaluation and approval. The approved lighting fixture(s) or lamp(s) shall be incorporated into project specific lighting fixture schedule. E. Substitution to approved project lighting fixture schedule shall follow the substitution procedure outlined in 01 31 00 - Project Administration.	DC, PL, JD

Issue	Date	Revision Description	Reviser
		F. Added alternate manufacturers to type FA, FF, FF1, FG, FG1 lighting fixtures. **G.** Added manufacturers for LED lighting fixtures. **H.** Revised Note 5 to read as: “All linear fluorescent lamps shall contain no more than 1.7 mg mercury. All four foot linear lamps shall be high efficiency equivalent to or better than Philips F32T8/ADV841/XEW/ALTO2 or Sylvania FO32/25W/8410XP/SS/ECO 25 watt lamps.” **I.** Added Note 6: “Provide program start ballast where occupancy sensor is being specified.”	
Rev. 5	03-17-11	Clarified that A/E shall incorporate “at least (3) equivalent or better manufacturers” for project lighting fixture schedule.	JD

END OF ELEMENT D5022

PART 1 - GENERAL

1.01 OVERVIEW

A. This Design Guideline Element includes design standards and requirements for telecommunications service and distribution. This is a design standard and is not intended to be used as a specification.

B. The institution-wide standards for structured premise wiring on low voltage cabling applications, outlined in this document, are designed to bring all of The University of Texas MD Anderson Cancer Center (MD Anderson) facilities into compliance with industry-wide standards and are based on the latest Telecommunications Industry Association/Electronics Industries Alliance (EIA/TIA) Cabling Standards for commercial buildings. Its goal is to cost effectively accommodate future generations of higher-speed networks while maintaining complete compatibility with the current data and voice technology.

C. This Design Guideline Element applies to all MD Anderson facilities and includes voice network and data network cabling.

D. The MD Anderson Information Technology and Services will be the first point of contact for questions about non-standard telecommunications cable installations and will review project drawings and specifications. All decisions will be based on MD Anderson user group's requirements and business needs.

E. Refer to Part 5 – Definitions, for an explanation of terms used throughout this document.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. While every effort has been made to ensure that the following criteria are technically accurate and provide necessary site and personal safety, local conditions may require additional professional investigations, modifications, or safeguards to meet site, equipment, environmental, safety, or region-specific requirements.

B. Design must meet international, federal, state, local, or other applicable codes, laws, or regulations.

C. Air handling distribution requirements for Telecommunications Rooms shall be per Design Guideline Elements D3001 Load Calculation Criteria and D3041 Air Handling Distribution.

D. Electrical power distribution requirements for Telecommunications Rooms shall be per Design Guideline Element D501001 Electrical System for Telecommunications Rooms.

2.02 ENTRANCE FACILITY / ENTRANCE ROOM (EF)

A. The entrance facility consists of the telecommunications service entrance to the building, including the entrance point through the building wall, and continuing to the entrance room or space. There may be more than one entrance facility depending upon the Project requirements. The entrance facility may contain the backbone pathways that link to other buildings in campus situations.

1. For new construction, MD Anderson requires diverse conduit entrances into the building especially in the case of health care facilities (e.g. hospitals, clinics).

2. Consider the locations of other utilities, such as electrical, water, gas, and sewer, in the site selection of the entrance facility.

B. In determining the total number of entrance pathways required, consider the following; type and use of building, growth, difficulty of adding pathways in the future; alternate entrance, dual redundancy and the type and size of cables likely to be installed.

1. A minimum of four 4-inch conduits from each entrance facility for Telecommunications use only. There will need to be a minimum of two 4-inch conduits from each entrance facility (EF) for Provider Services.

2. Building entrance conduits shall be planned to have a pull box immediately (within 5'-0") upon entering a building either below grade or above grade.

C. The A/E must address the following design criteria for the entrance room:

1. Entrance conduits shall be provided for all possible present and future access providers.

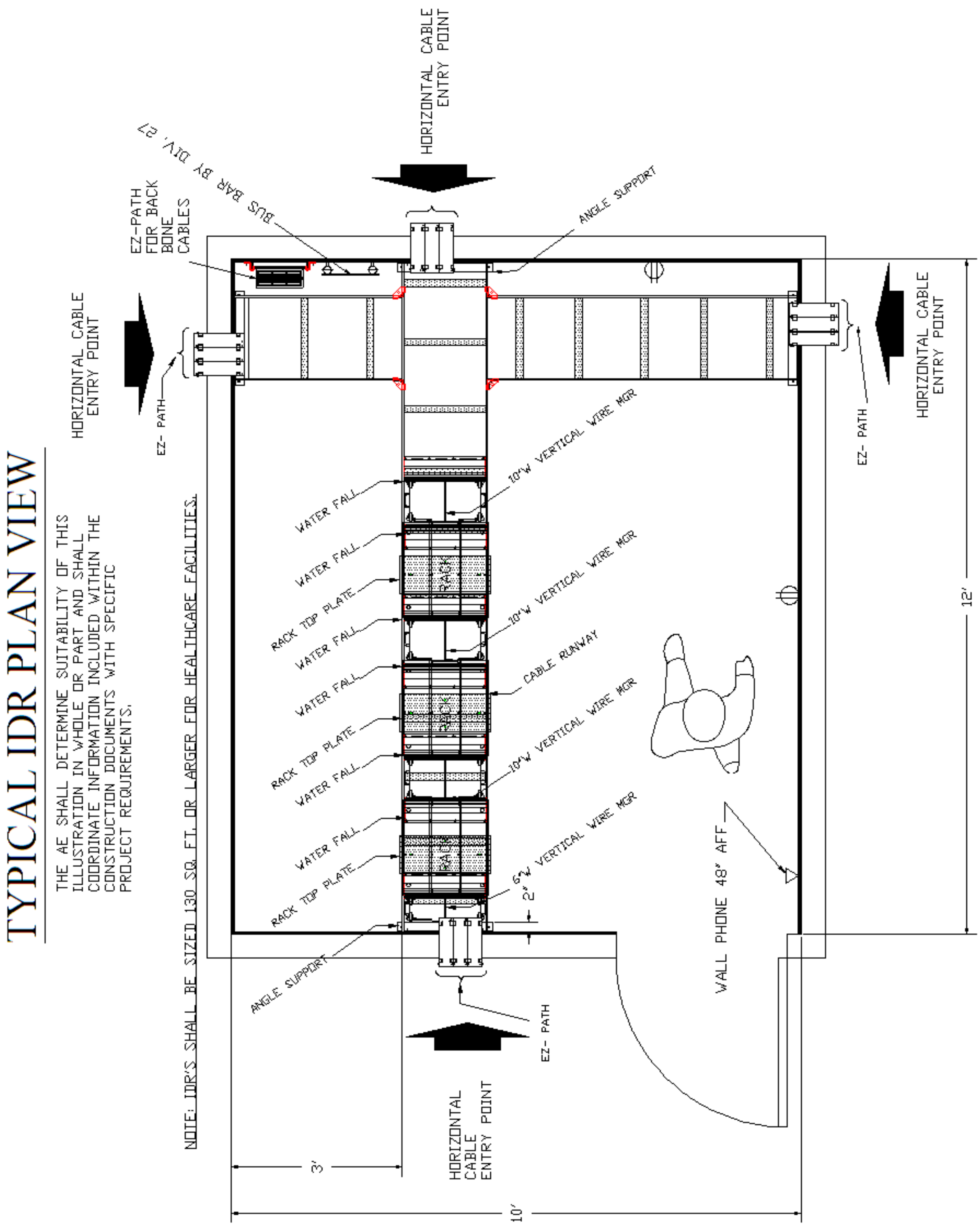
2. Adequate space shall be provided for provider owned equipment.

3. All conduits shall be stubbed up to a minimum of 3-inches above finished floor.

4. The entrance room shall be located in a dry area not subject to flooding and as close as practical to the backbone pathways.

2.03 TELECOMMUNICATIONS ROOM PLANNING

A. Telecommunication Rooms shall be sized larger for healthcare facilities than those for office or commercial buildings. The IDR's shall be sized at 130 sq. ft. or larger for healthcare facilities (ANSI/TIA-1179). For planning purposes, please refer to the following Typical IDR Floor Plan illustration:



TYPICAL IDR PLAN VIEW
THE AE SHALL DETERMINE SUITABILITY OF THIS ILLUSTRATION IN WHOLE OR PART AND SHALL COORDINATE INFORMATION INCLUDED WITHIN THE CONSTRUCTION DOCUMENTS WITH SPECIFIC PROJECT REQUIREMENTS.
NOTE: IDR'S SHALL BE SIZED 130 SQ. FT. OR LARGER FOR HEALTHCARE FACILITIES.
HORIZONTAL CABLE ENTRY POINT
HORIZONTAL CABLE ENTRY POINT
HORIZONTAL CABLE ENTRY POINT
HORIZONTAL CABLE ENTRY POINT
EZ-PATH FOR BACK BONE CABLES
BUS BAR BY DIV. 27
ANGLE SUPPORT
ANGLE SUPPORT
EZ- PATH
EZ- PATH
EZ- PATH
WATER FALL
RACK TOP PLATE
10"W VERTICAL WIRE MGR
6"W VERTICAL WIRE MGR
CABLE RUNWAY
RACK
WALL PHONE 48" AFF
2"
3'
10'
12'

B. This section addresses planning considerations for the design of Telecommunications Rooms, which include Equipment Rooms (ERs), Telecommunications rooms (TRs) & Telecommunications enclosures (TEs). Main Distribution Rooms (MDR) and Intermediate Distribution Rooms (IDR).

C. Telecommunications Rooms shall not be planned as occupied space.

D. The IDR and shall be located on the same floor as the work areas served.

E. Telecommunications Rooms do not require suspended ceilings; room shall be open to the structure above.

F. Telecommunications Rooms must be planned to accommodate future expansion on at least one side of the room. Locate rooms adjacent to “soft space”, such as conference or storage rooms to allow for expansion. In addition, MDR and IDR rooms shall be vertically stacked within a building.

G. MDR / IDR space must be planned to support multiple disciplines such as voice, data, security, building automation system (BAS), and UT Tele-health (CATV).

H. University of Texas Police Department (UTPD) equipment & racks should be provided a separate equipment room and shall not be planned on being placed in the MDRs / IDRs ,

I. Telecommunications Rooms must be located adjacent to the room for other services such as Tele-Health Services, Monitoring Services, UTPD Security, Fire and Life Safety.

J. Telecommunications Rooms must be located within a building’s central core area. The walls of communication rooms shall not be part of an exterior wall, unless the exterior wall is structural concrete, or other impermeable structural material capable of withstanding known environmental and civil hazards.

K. Do not plan Telecommunications Rooms adjacent to elevators or elevator equipment rooms.

L. Telecommunication Rooms shall be planned in a location that provides at least two (2) sides with clear accessible ceiling adjacent to it.

M. Rooms should be dedicated to telecommunications and must not be shared with custodial services or mechanical, electrical, plumbing, or air handling equipment. Plumbing and HVAC equipment and system components that do not serve the room, must not pass through Telecommunications Rooms or be allowed to be installed within the walls.

N. Telecommunications Rooms & spaces, including riser rooms, or wiring closets shall only be used to house IS / IT equipment & cable. At no time shall other owner or vendor services or equipment be planned to be in the Telecommunications Rooms or spaces.

O. Lighting should be minimum 50 foot-candles at the lowest point of termination.

1. Avoid placing lights over Equipment Racks or over ladder / cable trays.

2. Lights should be placed over isles only with clearance above cable trays for workers.

P. Floor Layout and Loading

1. The layout of telecommunications and data equipment must allow for the opening of cabinet doors, drawers, trays, entry doors, passage doors, etc. without the need to remove, temporarily displace, or impair access to other equipment in the room.

2. At a minimum, mounting racks must be installed at least 36 inches in the front and 60 inches in the rear, from any surrounding wall or obstruction, to permit installation, removal, and systems support from the back of the equipment. This distance is measured from the wall to the edges of the back of the rack, not the rack support base (bolting foot plate). Cable trays must be directly above and/or perpendicular to the mounting racks.

3. Equipment racks and server cabinets shall have provisions to allow adequate physical separation of telecommunication cables and power cables.

4. Plan for installation (on all four walls) of a plywood backboard that is fire-retardant treated on both sides, 3/4 x 48 x 96 inches in size. Plywood shall be type AC, with the A side facing inside the room. Plywood shall be painted white or light color with fire-retardant paint.

5. Floor loading of equipment cabinets varies from 50 to 250 lbs/sf. Because of this range and to accommodate the widest variety of equipment over the life of the building, the floor rating under distributed loading must be greater than 100 lbs/sf. and the rating for concentrated loading must be greater than 2000 lbs/sf. in areas that will support telecommunications equipment. These requirements apply to any physical surface on which the equipment is placed.

6. All equipment racks having voice or network equipment:

   a. Data network rack each switch requires 1 NEMA L6-30R on Utility Power, and 1 Nema L630R on Emergency Power (Generator).

   b. Voice equipment racks require 2 NEMA 5-15R quad receptacles on Utility Power.

   c. Equipment racks for miscellaneous equipment require 1 NEMA 5-15R quad receptacle on Utility Power

7. Overhead Ladder tray in MDR/IDR's shall be "Teleco" Style. It shall be provided in a "two-level" configuration. The lower level for routing horizontal cable intended to remain on that floor from where it enters the MDR/IDR to it's termination point. The upper level is intended for Copper and Fiber Backbone cable routing so that is does not cross paths with horizontal cable. The two levels of cable shall be separated by 18" vertically.

Q. Security

1. Access to the room must be through secured doors with keyed entry and UTPD security card readers that allow the passage of wide equipment. Automatic closer and self-latching locks should also be provided.

2. The room must be secured at all times by a locking mechanism whose key is made available only to appropriate personnel. Telecommunications Rooms shall have keyed entry and a UTPD security card reader installed at the entrance door(s).

3. For convenience of use during work performed in the Telecommunications Room, as well as for security reasons, an analog single line telephone, capable of outgoing public network calling, shall be installed within the room. This telephone must work during PBX, and power outages.

R. Working Clearances

1. Provide a minimum of:

a. 3 feet of working space between the equipment and the termination field.

b. 3 feet wide, 3 feet deep and 7 feet high for each equipment rack or cabinet.

c. 3 feet for an aisle in front and in back of each equipment rack or cabinet in reference to the edge of the rack base.

2.04 MAIN DISTRIBUTION ROOM (MDR)

A. The MDR is the centralized space to support structured cable equipment and the distribution point for the building's structured cabling system. The MDR is an enclosed room where the service entrance for the building is located.

B. The room(s) shall be designed to a minimum of 20-feet by 20-feet for multi-level buildings. The minimum clear deck height should be at 8 feet, 6 inches above finished floor (AFF).

C. The room(s) shall be provided clear of structural obstructions, such as Columns or low Beams encroaching in the space that would not allow complete use and access to the space.

D. A growth factor of 100% shall be considered when planning for Healthcare Facilities (TIA-1179).

E. The MDR's should have their own electrical panels supporting only equipment in the MDR:

1. Provide / coordinate wall space for electrical panels in MDR.

2. MDR size may have to be increased due to clearances required by electrical panels. The space that is required by code for electrical clearances should be deducted from the space that is considered usable in the MDR.

3. Electrical Transformers shall not be placed on the floor in the MDR / IDR.

4. Electrical panel board for normal power.

5. Building Emergency / Generator and building UPS electrical panel.

6. UPS power will be provided for 15-minutes or until generator power kicks in; whichever is longer.

F. The Telecommunications Services Provider communications tie cable from the Demarc to the riser rack must be shielded.

G. The door(s) shall be a minimum of 48 inches wide x 90 inches high, must open outward, and be placed to maximize usable floor and wall space (e.g. place the door in the corner of a room, not the middle).

H. The MDR shall be provided with a 6” fiber duct separate from the ladder trays overhead for the placement of fiber patch cords between fiber panels and other equipment racks.

2.05 INTERMEDIATE DISTRIBUTION ROOM (IDR)

A. For multi-level buildings, provisions shall be made for each floor to have its own IDR to serve workstations on that floor. Depending on the floorplate size, more than one IDR room may be required per floor.

B. Facilities planned at off-site locations that are smaller in scale, may combine the functions of the MDR with the IDR.

C. The IDR shall be designed to a minimum of 10-feet x 12-feet with a minimum ceiling height of 8 feet, 6 inches above finished floor (AFF).

D. Consideration for larger IDR’s should be considered for Healthcare Facilities (TIA-1179).

E. The room(s) shall be provided clear of structural obstructions, such as Columns or low Beams encroaching in the space that would not allow complete use and access to the space.

F. The door(s) shall be a minimum of 48 inches wide x 90 inches high, must open outward, and be placed to maximize usable floor and wall space (e.g. place the door in the corner of a room, not the middle).

2.06 PLANNING FOR TELECOMMUNICATIONS OUTLETS AND PATHWAYS

A. Category 6a cable (UTP CAT6a) and Cat 6a Patch Panels shall be used for all data connectivity in MD Anderson-owned facilities. It is recommended that all normal accessories be installed and used, such as “Lacing Bars” regardless of installer’s preference.

B. MD Anderson leased facilities will be UTP CAT6.

C. Structured cable shall be pulled directly from the jack to the patch panel. Zone cabling and consolidation points shall not be allowed.

D. Rack mounted wire managers shall be used (along with patch panels) to help support the cable while allowing easy access for adds and changes. Installer shall ensure that both vertical and horizontal wire managers are of the same depth, front and rear.

E. The maximum distance on any one UTP / Category 6a / 6 / 5E cable (excluding patch cables) shall not exceed 270 feet .

F. In an office or cubicle environment with a raised floor, do not provide jacks under the floor. Network cabling jacks shall be provided in the walls, cubicle wire ways, or flush mount floor boxes.

G. Faceplates or Wall Boxes

1. Jacks that serve the same work area may be combined into one dual-gang faceplate.

2. The faceplate or wall box must provide adequate space for labeling.

3. Installer must provide adequate cable management both horizontally and vertically for the wiring, sized appropriately for Cat 6A UTP cable.

4. In an open office environment (partitions), the faceplate/wall box must be installed along the center spine of the partition row (Modular Furniture).

5. Outlet faceplates must be labeled with the jack numbers or patch panel ports as appropriate. All jacks must be flush with the faceplate (Flat or Angled).

6. Wall boxes and all surface mounted boxes should be permanently attached with screws.

7. All data drop/jacks must maintain a minimum 12 inch separation between electrical drop/jacks to reduce any EMI.

8. Administrative Only Type Buildings (no patient care): Conduit is not required for structured cable drops; however, an outlet box is required. Plaster rings and caddy clips are not allowed.

9. Administrative / Office Type Buildings (no patient care): Conduit shall be placed for structured cable drops when the wall has either thermal or sound insulation planned.

10. Patient Care Areas (clinics/hospital areas): Structured cable drops must follow the cable tray all the way to the outlet or conduit must be run from within 12” of the cable tray all the way to the outlet.

11. Structured Cable outlet boxes shall be a minimum size of 4 11/16” W X 4 11/16” H X 3” D, to allow for the required working clearance of Cat 6A UTP cable. Outlet boxes shall be provided with either a single or double gang device ring ½” deep.

12. For Office Type Buildings, each work area shall be provided with a minimum of 4 data cables. .

13. For Health Care type Facilities, work area cable density should be considered with the following (TIA-1179);

    a. Low density – 2 to 6 outlets in each area

    b. Medium density – 6 to 14 outlets in each area

    c. High density – Greater than 14 outlets in each area

14. Device boxes should be mounted on wireways. This prevents the jacks from being installed directly in the cable path of the wireway. Installing the faceplate and additional cable could interfere with the jack termination if flush mount brackets are used.

2.07 OUTSIDE FIBER PATHWAYS

A. All spare conduits will have mule-tape or a pull string provided for future use.

B. All spare conduits must be labeled as “Spare” for future reference.

C. All unused conduits in outdoor pull boxes will be properly plugged with removable watertight plugs.

D. All OSP work will be properly documented and the AutoCAD information including cable burial depths and accurate routing will be provided in electronic form to MD Anderson Information Technology and Services. Accurate measurements shall be provided on OSP conduit and cable taken from Face of Curb or Center of Road, or other permanent features to center or top of conduit.

E. All underground conduit / pathways shall have a detectable marker tape place along the entire route 1’-0” above the conduit or cable.

F. Fiber network pathways shall be provided to new buildings connected to existing IT main Hub(s), location of which will be determined by owner.

2.08 OUTDOOR PULL POINTS

A. Pull points shall be strategically designed and placed to permit the installation of fiber cables within the manufacturer specifications. Pull points shall be placed based on planned reel length and manufacturer pulling tension requirements. Pull points will be no further than 400 feet apart for fiber cable and 500 feet apart for copper cable.

B. Where a pathway enters a building above ground, consider planning a minimum 24-inch x 24-inch x 24-inch, weather-proof junction box to accommodate the transition and provide pulling access.

2.09 CONDUITS FOR COPPER & FIBER OPTIC CABLES

A. At no place along the pathway should the Copper or fiber cable be exposed.

B. All building OSP conduits should be piped directly to the MDR.

2.10 INSIDE COPPER & FIBER PATHWAYS

A. All pathways will consist of cable tray, conduit or a combination of both.

B. Cables shall be rated according to TIA Standards and NEC codes for the environment in which they are installed.

C. Conduit shall not be longer than 100 Feet without a pull point.

D. Conduit shall not have more than the equivalent of two 90 degree bends between pull points.

2.11 INDOOR PULL-POINTS

A. Pull points shall be installed or used at intervals not to exceed the manufacturer's specifications for the cable being placed.

B. Reference D5030-2.10 for additional requirements.

2.12 PATHWAYS, CABLE TRAYS, WIREWAYS AND CONDUIT

A. General:

1. Basket style cable trays are the preferred method of installation. Telecommunications cable shall be installed in "Saddle bags" type of pathways from the point of departing from main cable trays.

2. Cable trays shall be supported Trapeze style, not center hung.

3. Cable pathways shall be so configured to avoid EMF and RFI interference. All cable runs must be installed a minimum of 12-inches from all fluorescent lighting fixtures and EMF sources.

4. Cascade transitions (waterfalls) shall be used if height variations occur between the cable tray equipment and the ladder rack and must be located directly above the vertical wire manager channel between the 19-inch racks.

B. Ladder Trays

1. Inside of the MDR or IDR Rooms, 18-inch to 24-inch ladder tray is to be used for wire management. This tray is designated for structured cabling, fiber patch cords, and voice switch tails. Any implementation of this tray will include spill brackets / posts at all inside corners.

2. Inside the MDR and IDR rooms, 18-inch ladder racks should be used for horizontal wire management above the 19-inch racks.

C. Cable Trays

1. Cable tray / basket tray shall be designed to be installed parallel to and 6 to 12 inches away from them. Cable trays, routed throughout the building, must have a continuous path for all cables to run in. The cable tray should terminate at the wall penetration into the IDR/MDR to allow for clearance between it and the fire stop system to be placed in the wall of the MDR/IDR. The interior ladder rack inside the MDR/IDR should be routed properly to deliver the riser, station/horizontal, and fiber to the end destination (i.e., rack, wall field, or BET).

2. Cable tray location shall be planned to be above corridors / walkways.

3. Cable tray pathways / locations shall be coordinated with MEP designers / plans to avoid obstructions and installation problems latter on.

4. Vertical cable trays shall run and tie into the horizontal tray. In addition, the vertical cable trays should be mounted on fire rated plywood or solidly anchored to the wall so as not to pull loose.

5. Floor and ceiling penetrations for all riser cabling (fiber and/or copper) will have a vertical tray installed to support all telecommunications cabling. The vertical, ladder-type cable tray to be a minimum of 18 inches wide. All vertical riser cabling is to be secured to relieve stress (minimum of 3 each per floor). It is preferred to have the vertical penetrations lined up through the floors for a continuous vertical cable tray path, especially in new building design. Otherwise, the concrete penetrations must have an acceptable form of protection installed to avoid cable contact with the concrete.

6. All cables shall be secured when exiting or leaving the cable tray and will have proper support at all times. Use cable drop out waterfalls if needed to secure continues support.

7. Cable tray located above the ceiling must meet the following recommendations:

   a. A minimum of 6 inches of vertical clearance is to be maintained above suspended ceiling tiles and T-bars.

   b. A minimum of 12 inches of vertical clearance is to be maintained above high voltage conduits and exposed cables(when parallel).

   c. A minimum of 12 inches of clear vertical clearance is to be maintained above cable trays, for working clearance at least within 6 feet horizontally of any point.

8. Any floor penetration shall be provided with a 6” high concrete curb and appropriate fire rating per A/E requirements.

D. Cable Management Rings or Hook-and-Loops

1. Cable management precautions that should be observed include the elimination of cable stress as caused by tension in suspended cable runs not located in cable tray or conduit. In addition, the maximum distance on any suspended cable run will not exceed 5 feet (1.5 meters).

2. Hook-and-loop or cable management rings are to be spaced no greater than 5 feet (1.5 meters) apart. They are not to support more than 50 single 4-pair cables. Routing network cable through bar-joists is not acceptable.

E. Conduit

1. Minimum requirements for installed conduit are covered in Division 26. No continuous section of conduit to be longer than 100 feet without pull boxes and contain no more than two 90 degree bends (or the equivalent sum of 180 degrees) per every 100 feet. Note: If a conduit exceeds 100 feet (30m) in a continuous run, a junction box must be installed every 100 feet.

2. If a conduit requires more than two 90-degree bends, then a junction box must be provided between the sections.

3. If a conduit requires a reverse bend (between 100 degree and 180 degree), then a pull box must be provided at each bend having an angle from 100 degree to 180 degree.

4. If a conduit requires a third 90 degree bend (between pull points or junction boxes) and one of the following is true, then an additional junction box will have to be installed:

    a. The total run is no longer than 33 feet

    b. The conduit is increased by one trade size

    c. One of the bends is located within 12 inch of the cable feed end.

Trade Size	Number of Cables	Trade Size	Number of Cables
1"	3	1-1/4"	4
1-1/2"	6	2"	12
21/2"	14	3"	17
4"	30		

5. Conduit Fill Chart Cat6a (0.34in) - Electrical Trade Size and Number of Cables (per TIA-569).

6. Conduit to be run in the most direct route possible along building lines or perpendicular to building lines.

7. The inside radius of a bend in conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 2 inches (50mm), the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend shall always be at least 10 times the internal diameter of the conduit.

8. A nylon, fish tape pull cord (rated at 200 lbs and with increments marked every foot) shall be placed in the installed conduit and replaced when cable is pulled through the conduit.

9. OSP Conduit

    a. All conduits between buildings will be a minimum of 4-inch diameter in size.

    b. All OSP conduits shall have a minimum of two (2) 4-inch Maxcell sleeves installed.

    c. All OSP conduits shall be marked with locatable marking tape buried 12” above conduits or duct bank.

10. Pull Boxes

    a. Where required, install pull boxes in easily accessible locations and immediately above suspended ceilings. They must be rated for the space in which they are located and clearly labeled. Pull boxes are not to be used in lieu of a bend. All pulls through a pull box are to be straight with no turns. Align conduits that enter the pull box from opposite ends with each other. (Refer to Division 26)

b. Pull boxes for pulling and looping cables with an outside diameter greater than 2 inches are not allowed in ceiling spaces and must be located on a wall or column. The length of a pull box is to be a minimum of 12 times the diameter of the largest conduit.

2.13 FIRE PROTECTION

A. All penetrations through fire-rated walls and floors must be properly sealed with Owner approved materials or devices to block the spread of fire, smoke, toxic gases, and fluids in accordance with applicable building codes and architectural specifications (Refer to Division 07 and AHJ).

B. The Telecommunications Rooms shall be designed with an National Fire Protection Association (NFPA) fire-extinguishing system and alarm system approved for electrical fires.

C. All MDR and IDR's shall be protected with a dry, pre-action type, fire suppression system.

2.14 NOISE AND ELECTROMAGNETIC INTERFERENCE (EMI)

A. All telecommunications cables and related equipment should be placed at least four (4) feet away from equipment such as elevator motors, air conditioning units, large electronic office machines, copiers, and transformers that could interfere with the electrical signal and cause electromagnetic radiation.

B. Telecommunications cables and pathways should provide a clearance of at least one foot from fluorescent lighting and conduit or cables for power distribution.

C. Pathways should cross perpendicular to fluorescent lighting and electrical power cables or conduit. Installation shall be in compliance with ANSI/TIA-568-B.

2.15 TELECOMMUNICATIONS ROOM BONDING

A. All metal racks, frames, cabinets, and miscellaneous equipment enclosure shall be bonded together using green, insulated copper wire (low smoke, plenum rated, 6 AWG, 600V, UL Listed) so that all equipment, structured cable racks are at the same ground potential. A VOM measurement between any two points on metal racks and equipment enclosure in the Telecommunications Room shall be less than 1.25 volts dc or ac potential.

1. All approved grounds used must be bonded together to form a single grounding electrode system as required in Article 250 of the National Electrical Code.

2. Grounding and bonding shall comply with ANSI/TIA J-STD-607-A (BISCI TDMM, Chapter 10 – Grounding, Bonding, and Electrical Protection).

3. The surface must be prepared to provide a proper path to ground. Any surface that is to be grounded must be free of paint or other coating that might prevent an effective grounding. Paint should be scraped or filed away until a metallic surface has been exposed before the attachment of grounding or bonding wire.

4. All system components (i.e. ladder-style cable raceway, basket trays, equipment racks, etc.) shall be bonded to the TMGB with at least a 6 AWG solid or stranded copper wire with a green insulation jacket.

5. No daisy chaining of equipment bonding conductors. All components shall be connected directly to the buss bar.

2.16 LIGHTNING PROTECTION

A. In general, lightning protection shall be per ANSI/NFPA 780, Owner's Master Construction Specification Section 26 41 00, and Design Guideline Element D5090 Other Electrical Systems.

B. A coupled bonding conductor is tie-wrapped to all trunks. The coupled bonding conductor can be any one of the following:

1. 10 AWG ground wire

2. Continuous cable sheath

C. The coupled bonding conductor connects the cabinet single-point ground block and runs all the way to the approved ground located nearest the telephone company-owned protector block at the building entrance facility.

D. When an auxiliary cabinet is provided with multi-carrier cabinet system, a 6 AWG ground wire connects the system cabinet single-point ground block to the auxiliary cabinet ground block. It is recommended that the ground wire be routed as close as possible to the cables connecting the system cabinet and the auxiliary cabinet.

E. If auxiliary equipment is not mounted in the auxiliary cabinet, then the power supply for this equipment must be plugged into one of the two convenience outlets located on the back of the multi-carrier cabinet to preserve ground integrity. The convenience outlet is fused at 5 amps. The dedicated terminal should be plugged into the other convenience outlet.

F. Building Entrance Terminals:

1. Building entrance terminals house the Surge Protection Modules that protect the building wiring and circuit packs from "foreign potential" by providing a current interruption capability (Required by NEC).

2. Surge protection modules (Sneak fuses) are to be installed on the switch side of the network interface. All incoming and outgoing trunks and off-premises station lines pass through the sneak fuses.

3. Surge protection modules shall be industry standard 5-pin module style.

4. Surge protection modules shall be provided that provide Sneak Current protection.

5. Building Entrance terminals shall be provided with 110 termination, internal fusible link protection and be wall mounted near the Entrance Facility / OSP conduit entrance.

6. Building Entrance terminals shall be properly bonded to the TGMB.

2.17 WIRELESS OVERVIEW

A. The wireless infrastructure at MD Anderson facilities is based on IEEE 802.11a/b/g/n access points powered by power over Ethernet (IEEE 802.11af). Access points are attached to the access layer switches in the areas they are installed.

B. Wireless design must support VOIP, RFID, DAS, and Health Device Communications (IEEE 11073).

C. All RF technology's, regardless of the type construction, renovation, or upgrade, must be submitted and approved by MDACC IT&S Division.

D. All wireless surveys are done to the 802.11a/n radios to provide extra coverage on the larger 802.11B footprint. The 802.11B radios are used for mobility. Redundant pairs of Wireless Controllers are used to manage mobility. Mobility is defined as the ability to roam from one area of the institution to another while maintaining wireless connectivity. The 802.11A radios are not used for mobility. The Wireless Controllers are used to manage the wireless access points and end devices.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Carefully coordinate design and layout of telecommunications rooms, cable trays, and other telecommunications system components with other building systems, including HVAC piping, ductwork and terminal units; electrical lighting and power distribution, and plumbing and fire suppression system piping.

B. Specify that abandoned telecommunications cable shall be removed per NFPA 70 Article 800 requirements.

C. If flexible conduit is used in lieu of a specified non-flexible conduit, MD Anderson Network Services and Telecommunication Services Engineering must be consulted prior to design. Flexible conduit shall be planned to be one conduit size larger as a replacement to regular conduit.

D. Plan for the total length of a conduit run kept to 150 feet or less (including sections through pull boxes). Any installation requiring a longer distance must be approved prior to installation by MD Anderson Network Services and Telecommunication Services Engineering.

E. Note on the drawings that all vertical chase openings must be properly finished and shall have a 6" high concrete curb around the slab opening to prevent water migration between floors.

F. The following information should be noted on the Construction Drawings for future fiber-optic cable pulls:

1. Conduits shall have 200 lb test pull rope/mule tape (not Jetline) placed and secured with the length of the conduit run attached. Also note the location of the other end.

2. Conduits running to equipment enter from the bottom (if possible) if on raised floor or floor other than ground floor. This may mean at least two or more phases on conduit run.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Do not specify cabling hardware that is of a lower category than the cable being used.

C. Basic wiring materials must comply with requirements of Division 26 Basic Electrical Materials and Methods sections, "Raceways" and "Electrical Boxes and Fittings"; types to be selected by Contractor.

D. Horizontal cable tray systems must be able to support a minimum of 100 lbs of cable per lineal foot.

E. All ladder trays in Telecommunications Rooms must have spill brackets at each inside corner.

F. MD Anderson specifications require all conduits to be no less than 1-inch in diameter.

G. All conduit used for fiber, must have MaxCell type inner duct installed prior to fiber cable being installed. Inner duct should have a 200lb test pull rope/mule tape (not Jetline) placed and secured with the length of the inner duct run attached. Recommended sizes:

Conduit Size	Size of Pull Box			Increase Width for Each Additional Conduit
	Width	Length	Depth	
¾"	4"	12"	3"	2"
1"	4"	16"	3"	2"
1 1/4"	6"	20"	3"	3"
1 1/2"	8"	27"	4"	4"
2"	8"	36"	4"	5"
2 1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
3 1/2"	12"	54"	6"	6"
4"	15"	60"	8"	8"

PART 5 - DEFINITIONS

5.01 DEFINITIONS FOR TELECOMMUNICATIONS DOCUMENTS

A. Attenuation: The loss of signal power between two points. Attenuation is a ratio of input power vs. output power, measured in decibels per unit length db/km.

B. Backbone Cabling: That portion of the telecommunications cabling systems that provides interconnections between MDR, IDR, and entrance facilities (EFs), access provider (AP) spaces, service provider (SP) spaces, equipment rooms (ERs) telecommunications rooms (TRs) and telecommunications enclosures (TEs). As such, the backbone cabling shall meet the requirements of ANSI/TIA-568-C.0 Cabling Subsystem 2 and Cabling Subsystem 3. Backbone cabling consists of the backbone cables, intermediate and main cross-connects (ICs and MCs), mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection. ER

C. Bandwidth: A range of frequencies, usually the difference between the upper and lower limits of the range, typically expressed in megahertz (MHz). It is used to describe the information-carrying capacity of a medium. In copper and optical fibers, the bandwidth decreases with increasing length. Optical fiber bandwidth is specified in megahertz kilometers (MHz-km).

D. Bonding: The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.

E. Bundled Cable: An assembly of two or more cables continuously bound together to form a single unit prior to installation (sometimes referred to as loomed, speed-wrap or whip cable constructions).

F. Cable Pathway: An MD Anderson approved routing path for low voltage cables designed by MD Anderson engineers that must be followed during installation.

G. Cat6a Cable (Augmented Cat6): 4 pair 23 AWG copper cable manufactured in accordance to TIA 568-B.2-10. Supports 10BASE-T through 10GBASE-T.

H. Channel: The end-to-end transmission path connecting any two points at which application specific equipment is connected. Equipment and work area cables are included in the channel.

I. Optical Class: optical fiber links are characterized from 10 MHz and above.

J. Coaxial Cable: Self-shielded cable used for transmission of telecommunications signals, such as those for television, telephone, or computer networks.

K. Cross-connect: A facility enabling the termination of cables as well as their interconnection or cross-connection with other cabling or equipment. Also known as a distributor.

L. Cross-connection: A connection scheme between cabling runs, subsystems and equipment using patch cords or jumpers that attach to connecting hardware on each end.

M. Crosstalk: Noise or interference caused by electromagnetic coupling from one signal path to another. Crosstalk performance is generally expressed in decibels.

N. Electromagnetic Interference (EMI): The interference in signal transmission or reception caused by the radiation of electrical and magnetic fields.

O. Entrance Facility (EF): An entrance to a building for both public and private network service cables (including wireless), including the entrance point at the building wall and continuing to the entrance room or space. Entrance facilities are often used to house electrical protection equipment and connecting hardware for the transition between outdoor and indoor cable.

P. Entrance Point, Telecommunications: The point of emergence of telecommunications conductors through an exterior wall, a concrete floor slab, or from a rigid metal conduit or intermediate metal conduit.

Q. Main Distribution Room (MDR): An MDR may alternatively provide any or all of the functions of a MDR or IDR. The main cross-connect (MC; Distributor C) of a facility is located in an MDR. Intermediate cross-connects (ICs; Distributor B), horizontal cross-connects (HCs; Distributor A), or both, of a facility may also be located in an MDR. When additional telecommunications equipment that is outside the scope of what is listed in this document is present in the MDR, the size of the space should be increased accordingly.

R. Fiber Optic Cable: Light transmission through optical fibers for communication or signaling.

S. Firestop: A material, device, or assembly of parts installed in a cable pathway at a fire-rated wall or floor to prevent passage of flame, smoke or gases through the rated barrier (e.g., between cubicles or separated rooms or spaces).

T. Ground: A conducting connection, whether intentional or accidental, between an electrical circuit (telecommunications) or equipment and earth, or to some conducting body that serves in place of the earth.

U. Home-run Cabling: A distribution method in which individual cables are run directly from the horizontal cross-connect to each telecommunications outlet. This configuration is also known as star topology.

V. Horizontal Cabling: The cabling between and including the telecommunications outlet and the horizontal cross-connect.

W. Horizontal Wiring: All cables installed from a work-area wall plate or network connection to the MDR and the IDR. The outlets, cable, and cross-connects in the closet are all part of the horizontal wiring.

X. Local Area Network (LAN): A geographically limited data telecommunications system for a specific user group consisting of a group of interconnected computers, sharing applications, data and peripheral devices such as printers and CD-ROM drives intended for the local transport of data, video, and voice.

Y. OSP: Outside plant. All of the telecommunications apparatus and cable systems outside (i.e., not housed in buildings) such as central offices or customer premises. OSP includes all the components of cable systems such as the aerial, buried, and underground cables, amplifiers and repeaters, cross-connect boxes, and remote neighborhood nodes, some of which may be located in vaults or sheds.

Z. Patch Cord: A length of cable with connectors on one or both ends used to join telecommunications links at a cross-connect.

AA. Patch Panel: Connecting hardware that typically provides means to connect horizontal or backbone cables to an arrangement of fixed connectors that may be accessed using patch cords or equipment cords to form cross-connections or interconnections.

BB. Pathway: A facility (i.e., conduit) for the placement and protection of telecommunications cables. Same as raceway or ducting.

CC. Plenum Cable: Structured cabling made of fire retardant materials that generate little smoke. These cables are installed in plenum air ducts, vertical shafts, etc.

DD. Private Branch Exchange (PBX): A private switching system usually serving an organization, such as a business, located on the customer's premises. It switches calls both inside a building or premises and outside to the telephone network and can sometimes provide access to a computer from a data terminal.

EE. Pathway: A facility for the placement of telecommunications cables.

FF. Riser: The pathway for indoor cables to pass between floors.

GG. Telecommunications: Any transmission, emission or reception of signs, signals, writings, images, sounds or information of any nature by cable, radio, visual, optical or other electromagnetic systems not explicitly covered in any other Design Guideline Element.

HH. Intermediate Distribution Rooms (IDR) & Telecommunications Enclosures (TE): Provide a common access point for pathways, backbone cabling and horizontal cabling. IDRs and TEs may also contain cabling used for cross-connection. The horizontal cross-connect (HC; Distributor A) is located in a MDR or IDR. The intermediate cross-connects (IC; Distributor B) may also be located in a IDR.

II. Wireless Access Point: In computer networking, a wireless access point (WAP or AP) is a device that connects wireless communication devices together to form a wireless network.

JJ. Work Area: The area where horizontal cabling is connected to the work area equipment by means of a telecommunication outlet. A station/desk which is served by a telecommunications outlet. Sometimes this is referred to as a work station.

PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	05-03-07	Revised Format and Made Revisions per IS: changed to 6a cable, rack solution	CLD
Rev. 2	11-01-07	General Revisions	CLD
Rev. 3	05-08-08	Revised WAP Installation, Rack Layout and Power Requirements	MT
Rev. 4	03-19-09	Deleted content and provided Owner's contact information to allow evaluation and revision of Element.	MDJ
Rev. 5	03-02-10	Archived and replaced original Element D5030 - Fire Alarm, Communications and Security with content from Element - Z2045 IS Network Services and Telecommunications Premises Distribution System Standards. Removed content related to products, materials, and installation.	HR
Rev. 6	07-08-10	General revisions to Sections 2.02, 2.03, 2.04, 2.07, 2.08, 2.12 F regarding number of cables, and 2.17 regarding wireless design.	HR/DG
Rev. 7	10-14-10	Revisions to include references to Healthcare Facility Telecommunications Infrastructure Standard TIA 1179 July 2010, general revisions to sections 2.02, 2.03, 2.04, 2.05, 2.06, 2.07, 2.08, 2.09, 2.10, 2.11, 2.12, 2.15, 2.16, 3.01, 5.01.	HR/DG
Rev. 8	04-19-11	Revised 2.12 A. 1. to require, "Telecommunications cable shall be installed in "Saddle bags" type of pathways from the point of departing from main cable trays."	JD
Rev. 9	09-15-11	Added section 2.17.C: All RF technology's, regardless of the type construction, renovation, or upgrade, must be submitted and approved by MDACC IT&S Division.	JCD

END OF ELEMENT D5030

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design criteria for developing technical specifications on nurse call / communication systems.

B. The general purpose of this Design Guideline Element to provide minimum criteria for nurse call / communication systems design at MD Anderson facilities regarding application for in-patient, diagnostic imaging, outpatient clinics, and surgery areas that are code compliant and uniform.

PART 2 - GENERAL DESIGN CRITERIA

2.01 GENERAL

A. To protect the health and safety of patients, visitors, students, faculty and staff, all installation must be in accordance with:

1. NFPA 99, Standard for Health Care Facilities
2. NFPA 101 Life Safety Code
3. Hospital Licensing State Regulations and Facility Guidelines Institute (FGI) 2010 Edition - Guidelines for Design and Construction of Health Care Facilities
4. Texas Administrative Code Chapter 133, Hospital Licensing
5. UL 1069 Hospital Signaling and Nurse Call Equipment compliant and Electronics Institute of America (EIA) Standards.

B. Power for the nurse call/communication systems shall be provided from the critical branch of the electrical emergency system, which is connected to alternate power sources by one or more automatic transfer switches during interruption of normal power.

C. There shall be no interconnection between the nurse call / communication systems and the fire alarm system.

D. Public toilet rooms (those that are labeled as such or those not labeled as patient toilet rooms) shall not have bathroom pull stations. There are some exceptions, which must be determined in writing by the operating department and Clinical Engineering, in advance.

E. All LAN cable runs shall comply with Master Construction Specification Sections 27 13 00 and 27 15 00 for communications cabling.

F. Code does not require general care outpatient Clinics to have nurse call / communications systems, therefore each area must be evaluated for patient procedures / safety needs.

PART 3 - DESIGN CRITERIA FOR OUTPATIENT AND SURGERY AREAS

3.01 GENERAL

A. Effectiveness of Alarms:

1. In areas where the nursing staff is unable to see the zone light or hear the audible alarm, consideration must be made to add audible annunciators at each of the zone lights. This consideration must be reviewed with the Manager / Director that is responsible for the department.

3.02 NURSE REGULAR CALL SYSTEM (PATIENT STATION)

A. A nurse regular call system is intended for routine communication between each patient and the nursing staff. Activation of the system at a patient's station will sound a repeating (every 20 seconds) audible signal at the nurse station, indicate type and location of call on the system monitor, and activate a distinct visual signal in the dome light outside the patient room door.

B. In multi-corridor nursing units, additional zone lights shall be installed at corridor intersections.

C. The audible signal shall be canceled and two-way voice communication between the patient room and the nursing staff shall be established at the unit's nursing station when the nursing staff answers the call. The visual signal(s) in the corridor shall be canceled upon termination of the call. An alarm shall activate at the nurses' station when the call cable or pillow speaker is unplugged, where installed.

D. Nurse regular call stations will be provided at:

1. All patient bed locations.

2. Some examination / treatment rooms, as required by the Project Facility program or Pre-Design Report.

E. Nurse call “Cancelation” buttons will be placed at the entrance of each patient room in Alkek and Lutheran In-Patient rooms, in addition to the “Cancellation” button on the patient station on the headwall.

3.03 NURSE EMERGENCY CALL SYSTEM (PULL / BATH / LAVATORY STATION)

A. A nurse emergency call system is intended for patients to summon nursing staff in an emergency. Activation of the system shall sound a repeating (every 5 seconds) audible signal at the nurse station, indicate type and location of call on the system monitor, and activate a distinct visual signal in the dome light outside the patient room door.

B. In multi-corridor nursing units, additional zone lights shall be installed at corridor intersections. The visual and audible signals shall be cancelable only at the patient call station

C. Activation of the system shall also activate distinct visual signals (Duty Station) in the clean workroom, in the soiled workroom, medication, charting, clean linen storage, nourishment, and equipment storage except outpatient areas.

D. A nurse emergency call system shall include an anti-microbial pull cord extending to within six inches of the floor accessible to a collapsed patient lying on the floor.

E. Nurse emergency call stations will be provided at:

1. All lavatories designated for patients (excluding public waiting areas, unless Nursing identifies a specific patient risk).

2. All showers designated for patients (must be within reach of a 5 foot tall person to cancel the call).

3.04 STAFF EMERGENCY ASSISTANCE CALL SYSTEM (CODE BLUE STATION)

A. A staff emergency assistance call system (code blue) is intended to be used by staff to summon additional help in an emergency. In open suites, an emergency assistant call system device shall be located at the head of each bed and in each individual room.

B. Activation of the system will sound an audible signal at the nursing unit's nurse's station, indicate type and location of call on the system monitor and activate a distinct visual signal in the dome light outside the patient room door.

C. In multi-corridor nursing units, additional zone lights shall be installed at corridor intersections.

D. Activation of the system shall also activate visual and audible signals in the clean workroom, in the soiled workroom, medication, charting, clean linen storage, nourishment, equipment storage, and examination/treatment room(s) with back up to a continuously staffed area (other than the nurse station or an administrative center) from which assistance can be summoned

E. In critical care units, recovery and preoperative areas, the call system shall include provisions for an emergency code resuscitation alarm to summon assistance from outside the unit.

F. The system shall have voice communication capabilities so that the type of emergency or help required may be specified.

G. Staff emergency assistance call stations will be provided at:

1. All patient bed locations.

2. Each recovery, emergency examination and/or treatment area, critical care unit, special procedure room, cardiac catheterization room, angiography room, stress-test area, triage, and outpatient surgery, admission and discharge area.

3. Each imaging suite procedure room.

4. Each nuclear medicine suite treatment, diagnostic, observation, and secondary recovery room.

5. Each outpatient suite treatment, diagnostic, observation, and secondary recovery room.

3.05 COMMISSIONING / ACCEPTANCE TESTING

A. Testing will be conducted by Clinical Engineering prior to the first patient use.

B. The Commissioning sheet is available from Clinical Engineering upon request, which shows more specific details which are not provided within this document.

PART 4 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

4.01 SYSTEM APPLICATION

A. If there are no specific requirements regarding nurse call / communication systems defined within the Project Facility Program or Pre-Design Report, the A/E shall request a list of examination, treatment, or other rooms to be provided with nurse call / communication systems. This request shall be submitted in writing through the Owner's Project Manager to MD Anderson Patient Care Facilities and Prevention Facilities - Clinical Engineering.

B. Refer to Attachments A through H at the end of this Design Guideline Element for application of nurse call / communication systems devices and components required for various room types within MD Anderson facilities and tables of system components required by each product manufacturer.

PART 5 - PRODUCTS

5.01 MANUFACTURERS

A. Approved nurse call / communication systems for MD Anderson are as follows:

1. In-Patient care areas and Diagnostic Imaging (G3) in Alkek / Lutheran Main Campus buildings:

   a. Ascom (formally known as General Electric) C600 Standard daisy chain configuration head end (server located on G2.3410), compatible with existing Ascom (formally known as General Electric Telligence systems).

2. Outpatient Clinics, Diagnostic Imaging (R3), Regional Care Centers and Surgery locations:

   a. Rauland-Borg Responder 5, head end (server location on G6.3710) which connects to and serves the G5 Surgical area.

B. The nurse call / communication systems must provide notification to the communications center, bed interface, television interface, auxiliary alarm interface and lighting interface for the following areas:

1. Alkek In-Patient rooms

2. Lutheran In-Patient rooms

3. Love Clinic(s) Apheresis treatment rooms on R8

4. Love Clinic(s) ATC treatment rooms on R2 / R10

5. Love Clinic(s) CTRCC treatment rooms on R1

6. Mays Clinic ATC treatment rooms on ACB8

5.02 PRODUCT DATA AND RECORD DOCUMENTS

A. Technical data on each product, including finishes.

B. Description of system operation.

C. Riser / LAN wiring diagrams and system data.

1. Identify electronic cabinet / switches / server room designation locations.

D. Equipment design considerations for future expansion when indicated.

E. Electronic cabinets must be wall mounted and accessible <u>without</u> a ladder, to allow for updates and maintenance of the system by the Clinical Engineering department. Any deviation must be approved by the Clinical Engineering Director.

F. Materials list and back box schedule (including unique back boxes).

G. Operation and Maintenance Data:

1. Factory-prepared operation and service manual for each system.

2. Include operation details, schematics, wiring diagrams, color coding, associated server and LAN interface layouts back to core server and report generator hardware interface.

3. IP addresses and applicable server information with associated database elements.

H. The patient room numbers shall be 5 alpha-numeric characters as follows;

1. Character 1, building color designation, such as P(urple), G(reen), R(ose) etc.

2. Character 2 & 3, floor designation, such as 01, 02, 11, 12, etc.

3. Character 4 & 5, room designation, such as 01, 02, 11, 12, 21, etc. (a combination of eight numbers and / or programmable alpha characters for room and bed designations).

I. The non-patient room numbers shall be 7 alpha-numeric characters, duplicating institution room signage as follows;

1. Building color designation, such as P(urple), G(reen), R(ose) etc.

2. Floor designation, such as 01, 02, 11, 12, etc.

3. Room designation, such as 1143 (a combination of eight numbers and / or programmable alpha characters for room and bed designations).

J. Sonifi Solutions (formally known as LodgeNet) Pillow speaker will be obtained from Curbell (4^{th} generation) and provided as part of the installation for each respective manufacturer.

K. 37 Pin Hill Rom bed interface cable, TV Nurse Call control interface cable and associated light control relays will be provided as part of the nurse call / communication for in-patient areas and functional on the bedside panel or Pillow Speaker controls for light / volume / channel selection features.

L. CAT 5e shield or CAT 6 LAN cable will be used for system wiring.

M. A second Nurse Call “Cancel” button will be placed at the entrance of each patient room, for all Alkek and Lutheran in-patient areas.

N. When an installation of one of a nurse call / communication system(s) replaces an existing system(s) the following will be required for the job to be considered complete (or) done:

1. Removal of all old devices / panels / hardware in existing area and holes covered per building code.

2. Removal of all dome lights and new ceiling tiles installed, to meet building code.

3. Old wiring left in place will be cut back and labeled as to what it was, for future identification.

4. Main head end electronic cabinets and associated hardware(s) will be removed.

5. All General Electric (formally known as Dukane) ProCare 6000 devices will be salvaged and viable devices will be returned to Clinical Engineering in B1.4522 as areas are renovated.

PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-02-10	Renumbered Element from D503001	SAK
Rev. 2	06-28-12	Element re-titled; reformatted sections to include: General Design Criteria, Design Criteria for Outpatient and Surgery Areas; revised Special Contract Document Requirements; expanded and revised Products section – updated manufacturers and product data.	TJL
Rev. 3	07-19-12	Section 5.02: added requirements for electronic cabinets, switches, and server rooms.	TJL
Rev. 4	12-13-12	General Electric now reflects Ascom as C600 Nurse Call system provider due to buy out of product line by Ascom. Attachment “A” - added P12 under Telligence System.	TJL
Rev. 5	06-11-13	Added Section 3.05 Commissioning/Acceptance Testing; Added 5.02 I – non-patient room numbers; Attachment “A” - updated “In-Patient (Lutheran and Alkek)” section in full, reflect Ascom C600 (Simple) system in full and Pavilion Project Nurse Call system updates. Split Attachment “A” into “B”/“C” /“D” to reflect Diagnostic Imaging / Clinics / Surgery areas high level definitions respectively.	TJL
Rev. 6	12/19/13	Updated Attachment A thru H which incorporated device photos and part numbers.	TJL
Rev. 7	02/10/14	Updated Attachment A and E incorporating G3 Call Cord Patient Station for DI G3 Pavilion project and correcting part number for patient stations for in patient areas.	TJL
Rev. 8	06/05/14	Updated LodgeNet name to Sonifi Solutions in Attachment A & F. Also, Attachment A to reflect dual “Aux” Alarm Interface unit for In Patient areas.	TJL
Rev. 9			
Rev. 10			

END OF ELEMENT D5034

Attachment "A"
In-Patient (Alkek / Lutheran)

Ascom C600 Simple System
System Overview / Options

Rev 7		Alkek & Lutheran					
		Ascom C600 (Simple)					
(possible components)	Considerations / Comments	Basic Tone	Basic Audio	Full System	Other?	Photos	12/12
Dome (#HC-CL4)	No audible	X	X	X	LAN & 2 wire, 2 wide		~$235 list
Supervisory Dome Light (#HC-CL4-SUPV)	Audible sounder	X	X	X	LAN & 2 wire, 2 wide		~$350 list
Bathroom / Emergency / **Red** Label (push button, #HC-PB2-EMERG)	No Comm, ***Not installed in Staff Bathrooms!***	X	X	X	2 wire, 1 wide		~$200 list
Code / **Blue** Label (push button, #HC-PB2-CODE)	No Comm, **Should not be in the Diag Img areas, tjl**	X	X	X	2 wire, 1 wide		~$200 list
Staff Assist (or) Emergency / **Green** Label (push button, #HC-PB2-CALLIN)	No Comm	X	X	X	2 wire, 1 wide		~$250 list
Bathroom / Emergency / **Red** Label (push button / pull cord, #HC-PP2-LAV)	No Comm, ***Not installed in Staff Bathrooms!***	X	X	X	2 wire, 1 wide		~$200 list
Code / **Blue** Label (push button / pull cord, #HC-PP2-LAV)	No Comm, **Should not be in the Diag Img areas, tjl**	X	X	X	2 wire, 1 wide, chg insert		~$200 list
Staff Assist (or) Emergency / **Green** Label (push button / pull cord, #HC-PP2-LAV)	No Comm	X	X	X	2 wire, 1 wide, chg insert		~$200 list
Call Cord Station (#HC-CCSTN)	No Comm	X	X	X	2 wire, 1 wide		~$250 list
Staff / Duty Station (#HC-DUTY	Dedicated point to point only, limited comm *{Should not be used inside MRI rooms due to comm noise generated}*		X	X	LAN, 3 wide		~$700 list
Staff Console (#HC-CONSOLE-E	Can make calls to anywhere and receive calls from anywhere per programming parameters, with handset		?	X	LAN, 1 wide receptacle		~$3.7k list
Call Cord Patient Station (#HC-PSTN1)	Dedicated point to point only, limited comm. Allows for (2) Aux Alarm input, labled "AUX/VENT" left to right. *{Should not be used inside MRI rooms due to comm noise generated}*		?	X	LAN, 3 wide		~$1k list
Annunciator Panel (#HC-ANNUN	Can make calls to anywhere and receive calls from anywhere per programming parameters, no handset *{Should not be used inside MRI rooms due to comm noise generated}*		?	?	LAN, 3 wide		~$3.2k list
Bed Interface (#HC-BID-SS37 or 9A2137A + 438-537B?)				X	_, 1 wide		
Dual Auxilliary Input Station (HC-AUX2-3K)	Allows for (2) Aux Alarm input, labled "AUX/VENT" left to right.			X	2 wire, 1 wide		
TV Interface (Sonifi Solutions, aka LodgeNet)				X	_, 1 wide		
Pillow Speaker Patient, 4G370E-01-04268 Visitor, D0208-AOZ-OL100 (Curbell 4th Gen Sonifi Solutions, aka LodgeNet)				X		 	~$180 list
Staff Registration ( )		TBD	TBD	TBD			

Attachment “B”
In-Patient (Alkek / Lutheran)

Ascom C600 Simple System
Staff Duty Station Overview

Required by Code
Not Required by Code

	Ascom C600 (Simple) (G1, 4->12)	Ascom C600 (Simple) (G15 ->19)	Ascom C600 (Simple) (G5 / PACU only)	Ascom C600 (Simple) (P1 ->12)
Clean / Linen Rm	A	A	A	A
Meds	A	A	A	
Nourishment	A	A	A	
Soiled Linen (or Holding *)	A	A	A	A
Storage	A	A	A	
Conference Rm	A	A	A	A
ETV			A	
Housekeeping			A	
Locker Rm				A
Meeting Rm			A & PP	
Nutrition	A	A	A	
Staff Lounge		A	A	A
Supply				A
Team Rm		A		
Trash			A	
Waiting Rm / Family Lounge	PP		PP	PP
Waiting Room Lavatory			PP	

*On Alkek Expansion drawings, Duty Stations are shown in the 'Soiled Holding' rooms but not in "Soiled Linen" rooms. Both types of rooms exist in the Alkek Expansion. A Duty Station in one room but not the other may or may not suffice.

LEGEND
A = Alarm (Duty Station)
PP = Patient Pull (Call Station "Call" designation)

Attachment "C"
In-Patient (Lutheran / Alkek)

Ascom C600 Simple System Component Details

	Ascom C600 Nurse Call System			
	Component Details			
PART #	**DESCRIPTION**	**LOCATION**	**CABLING RQ.**	**MOUNTING RQ.**
HC-TELL-BRIDGE	Telligence Bridge	IDF Room	n/a	n/a
HC-IPSWITCH8	Telligence PowerSwitch	IDF Room	CAT6a	19" Rack Mountable
HC-GTWY1	Telligence Gateway	IDF Room	CAT5e Shield	19" Rack Mountable
	24-Port Patch Panel - CAT6	IDF Room	n/a	19" Rack Mountable
	Standing Rack	IDF Room	n/a	n/a
	Two-In-One UPS	IDF Room	n/a	19" Rack Mountable
	Rack Mount AC Power Strip	IDF Room	n/a	19" Rack Mountable
GSHELF3	Shelf for Server	IDF Room	n/a	19" Rack Mountable
HC-CONSOLE	Staff Console	Nurse Station	CAT5e Shield	Single Gang Receptacle
	Telligence Server (Dell, RAID 10)	IDF Room	n/a	19" Rack Mountable
	17" LCD Display Monitor	IDF Room	n/a	19" Rack Mountable
HC-DUTY	Staff/Duty Station	Patient Room	CAT5e Shield	3-Gang Back Box
HC-PSTN1	Single Patient Station	Patient Room	CAT5e Shield	3-Gang Back Box
9A2137A	Dual 37-Pin Bed Interface Station	Patient Room	438-537B Cable Kit	Single Gang Masonry Back Box
HC-PB2-CALLIN	Lavatory Pull Station w/ Relay	Patient Room	16awg	Single Gang Back Box
HC-PP2-LAV	Lavatory Pull Station	Patient Room	16awg	Single Gang Back Box
HC-RPLMT-CLCD-W	Pull Cord (10 Pack)	n/a	n/a	n/a
HC-PB2-CODE	Code Blue Station	Patient Room	16awg	Single Gang Back Box
HC-CL4	Door Light - 4 Lamp	Patient Room	CAT5e Shield	2-Gang Back Box
HC-CL4	Zone Light - 4 Lamp	Corridors	CAT5e Shield	2-Gang Back Box
HC-CL4-SUPV	Supervised Dome Light w/ Buzzer	Nurse Station	CAT5e Shield	2-Gang Back Box
	Digital Pillow Speaker	Patient Room	n/a	n/a
200-1272	Call Cord	Patient Room	n/a	n/a
438-537B	Cable Kit for Bed Interface	Patient Room	n/a	n/a
HC-AUX2	Auxiliary Input Station	Patient Room	16awg	Single Gang Back Box
	Patch Cords - 3ft. CAT6	IDF Room	n/a	n/a
	Patch Cords - 7ft. CAT6	IDF Room	n/a	n/a
	CAT6 Plates	Nurse Station	n/a	Single Gang Back Box
	CAT6 Inserts	Nurse Station	n/a	n/a
	Horizontal Wire Management	IDF Room	n/a	19" Rack Mountable
	Vertical Wire Management	IDF Room	n/a	Rack Mountable
	RJ45 Connectors - CAT6	Patient Room	n/a	n/a
4BRT32	Bridle Rings	Above Ceiling	n/a	n/a
BC200	Beam Clamps	Above Ceiling	n/a	n/a
512HD	Bracket for Door Light	Above Ceiling	n/a	n/a
ELECTRICAL REQUIREMENTS				
Two (2) 20 amp circuits on 'critical branch' are required for each head-end closet / rack.				
One (1) additional 20 amp circuit on 'critical branch' is required for each head-end closet with a server.				

Attachment "D"
In-Patient (Lutheran / Alkek)

Ascom C600 Simple System
Acceptance / Commissioning Sheet

Date: ____________ Nurse Call Acceptance

UTMDACC Unit: ____________ Staff Console Asset #: ____________ S/N: ____________

Technicians: ____________

Wilson Fire Equipment & Service Company, Inc. "Protecting People and Property since 1916" 7303 Empire Central Drive Houston, Texas 77040 Telephone: (713) 896-4747 Fax: (713) 896-4778 www.wilsonfire.com

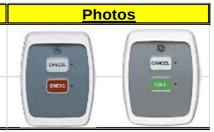
System Type: Ascom C600 Simple Nurse Call System (formally known as GE Telligence) {rev5, 2013_12}

Call Type =>		Voice (Page)	Normal Call	Staff Emerg	Code Blue 2	Staff Assist	Cord Out 3	Lav Call 2	Aux 2 Left Side (Blnk Wht Lbl)	Aux Vent Right Side (Verify Vent Lbl)	Bed Exit 2	Pillow Spk Controls All	Cancel Call	Comments
Light Color => (all are in "Flash" mode)except NormCall/Staffassist		Voice path between Staff Console & Device works	White (Pos 2)	Red (Pos 1)	Blue (All 4)	Green (Pos 2)	Amber/ Yellow (Pos2)	Red (Pos 1)	Amber/ Yellow (Pos 1)	Amber/ Yellow (Pos 2)	Amber/ Yellow (Pos 2)	- Nurse Call - TV	Extinguish Light	Pillow Spk Controls All denotes; Call Button, volume up/down, Key Pad Numberic buttons, On/Off, Menu, Order, Exit, Back, Mute, Closed Captions, Select/play/pause, and arrow (up, down, left, right). Verify light 1 and or 2 if enabled.
Priority / Tone # =>			NORM	EMG	CODE	EMG	NORM	EMG	NORM	Pulse Tone 6	NORM			
Room #		Room Name / Patient rooms (character) => (1) building "P/G/R", (2-3) floor # with leading 0's, (4-5) room # with leading 0's Room Name / Staff Console (character) => (1-2) floor # with leading 0's, (3-6) signage room #, (7-8) Console location by Pod; NE, SE, NW, SW, A->F/W Room Name / Other rooms (character) => (1) building "P/G/R", (2-3) floor # with leading 0's, (4-7) room #												
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	9													
	10													
	11													
	12													
	13													
	14													
	15													
	16													

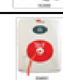
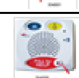
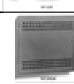
Device	Location	Asset #	Mac Address
Staff Console	West Reception		
Staff Console	South West Pod		
Staff Console	North West Pod		
Staff Console	East Reception		
Staff Console	South East Pod		
Staff Console	North East Pod		

Attachment "E"
Diagnostic Imaging Main Campus

Ascom C600 Simple System, for Alkek G3 areas
System Overview / Options

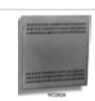
Rev 2	Part No. reference	Photos
Bathroom / Emergency / Red Label (push button)	HC-PB2-EMERG	
Staff Assist (or) Emergency / Green Label (push button)	HC-PB2-CALLIN	
Bathroom / Emergency / Red Label (push button / pull cord)	HC-PP2-LAV	
Staff Assist (or) Emergency / Green Label (push button / pull cord)	HC-PP2-LAV	
Call Cord Station	HC-CCSTN	
Call Cord Patient Station (#HC-CCPSTN	Dedicated point to point only, limited comm *{Should not be used inside MRI rooms due to comm noise generated}*	
Annunciator Panel {Can make calls to anywhere and receive calls from anywhere per programming parameters, no handset}	HC-ANNUN	
Staff Console {Can make calls to anywhere and receive calls from anywhere per programming parameters, with handset}	HC-CONSOLE-E	
Dome Light (No audible)	HC-CL4	
Supervisory Dome Light (Audible sounder)	HC-CL4-SUPV	

Rauland Responder 5, for R3 areas
System Overview / Options

Rev 5	Diag Img R3				
	Rauland Responder 5				Photos
(possible components)	General	Basic Tone	Basic Audio	Full System	
Dome / Zone Light (352000)		X	X	X	
Pull Cord Call (354001)		X	X	X	
Audio / Pull Cord Call (354000)		(or) X	X	X	
Duty Station (353100)			X	X	
Nurse Console (351200)			?	X	
Nurse Call Cabinet (NC2828)	TBD	TBD	TBD	TBD	

Attachment "F"
All Clinics and Regional Care Center(s)

Rauland Responder 5
System Overview / Options

Rev 6	Clinics and RCC's				
	Rauland Responder 5				Photos
(possible components)	*General*	*Basic Tone*	*Basic Audio*	*Full System*	
Dome / Zone Light (352000)		X	X	X	
Pull Cord Call (354001)		X	X	X	
Audio / Pull Cord Call (354000)		(or) X	X	X	
Duty Station (353100)			X	X	
Nurse Console (351200)			?	X	
Patient Station (353001)			(or) X	X	
Bed Interface (Dual 37-Pin, NCBED5)				X	
TV Interface (LodgeNet)				X	
Pillow Speaker (350202) (Curbell 4th Gen Sonifi Solutions, aka LodgeNet, #41414U-101043A)				X	
Staff Terminal (351300), G5 - Surgery use only (Clinical Engineerng will need to be contacted for the program for these units, it is custom)					
Nurse Call Cabinet (NC2828)	TBD	TBD	TBD	TBD	
Staff Registration (354017)	TBD	TBD	TBD	TBD	

Attachment “G”
All Clinics and Regional Care Center(s)

Rauland Responder 5
Acceptance / Commissioning Sheet

Date: ____________ Nurse Call Acceptance

UTMDACC Unit: __________________ Staff Console Asset #: ______________________ S/N: ____________________

Technicians: ____

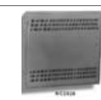
System Type: Rauland Responder 5 Nurse Call System {rev4, 2013_12}

Call Type		Voice (Page)	Normal Call	Staff Emerg	Code Blue	Staff Assist	Cord Out	Lav Call	Aux (Verify Lbl)	Water / Pain / Toilet (Verify Lbl)	Bed Exit	Pillow Spk Functions	Cancel Call	Comments
Light Color => (all are in "Flash" mode)		Voice path between Staff Console & Device works	White (All 4) (rate ? secs)	Red (Pos 1) (rate ? secs)	Blue (All 4) (rate ? Secs)	Green (Pos 1) (rate ? secs)	Yellow (All 4) (rate ? secs)	Red (Pos 3,4) (rate ? secs)	White (Pos 1) (rate ? secs)	White (Pos1, 2) Green (Pos 3, 4) (rate ? secs)	Yellow (Pos ?) (rate ? secs)	- Nurse Call - TV	Extinguish Light	Pillow Spk Controls All denotes; Call Button, volume up/down, Key Pad Numberic buttons, On/Off, Menu, Order, Exit, Back, Mute, Closed Captions, Select/play/pause, and arrow (up, down, left, right). Verify light 1 and or 2 if enabled.
Tone # =>			1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	1 (rate ? secs)	
Room #		Room Name / Patient rooms (character) => (1) building "P/G/R", (2-3) floor # with leading 0's, (4-5) room # with leading 0's Room Name / Staff Console (character) => (1-2) floor # with leading 0's, (3-6) signage room #, (7-8) Console location by Pod; NE, SE, NW, SW, A->F/W Room Name / Other rooms (character) => (1) building "P/G/R", (2-3) floor # with leading 0's, (4-7) room #												
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	9													
	10													
	11													
	12													
	13													
	14													
	15													
	16													

Device	Location	Asset #	Mac Address
Staff Console	West Reception		
Staff Console	South West Pod		
Staff Console	North West Pod		
Staff Console	East Reception		
Staff Console	South East Pod		
Staff Console	North East Pod		

Attachment “H”
Alkek Surgery G5 (Main Campus only)

Rauland Responder 5
System Overview / Options

Rev 5	**Alkek G5 Surgery** (Main Campus)				
	Rauland Responder 5				**Photos**
(possible components)	*General*	*Basic Tone*	*Basic Audio*	*Full System*	
Dome / Zone Light (352000)		X	X	X	
Duty Station (353100)			X	X	
Nurse Console (351200)			?	X	
Staff Terminal (351300), (Clinical Engineerng will need to be contacted for the program for these units, it is custom)					
Nurse Call Cabinet (NC2828)	TBD	TBD	TBD	TBD	

END OF ATTACHMENTS TO ELEMENT D5034

Element D Services

Electrical — D5037 Fire Alarm and Smoke Detector Systems

PART 1 - GENERAL

1.01 OVERVIEW

A. As design guideline for MD Anderson Cancer Center (MDACC), this document shall be applied to new construction as well as renovation and with Environmental Health and Safety department (EH&S) implications from the very first planning and design stages through actual construction and facilities maintenance and management. This is necessary to negate the need for potentially costly retrofits. The information included contains recommended actions, materials to be used or design standards that the EH&S staff have found to be appropriate to assure the quality desired at the Institution now and through the future maintenance of these facilities. Facilities management staff, as well as outside architects, consultants and contractors shall become familiar with these standards.

B. The term “Owner” shall include a representative from EH&S of MDACC, but is not limited to represent the Owner exclusively. EH&S of MDACC is the local Authority Having Jurisdiction (AHJ) for fire alarm and smoke detection systems equipment, materials, installation and applicable Code interpretations. Coordinate all activities to include all of the Owner’s representatives.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Refer to Design Guideline Element Z2005 for Codes and Applicable Regulatory Agencies.

B. The A/E and the Fire Alarm Contractor are required to make themselves aware of all applicable codes and ordinances and assure that design and installation are in compliance with code requirements thereto.

C. Where provisions for building expansion are required, system equipment capacity, power supply, and other arrangement shall accommodate proposed demand.

2.02 FIRE ALARM AND SMOKE DETECTOR SYSTEMS

A. Fire alarm and smoke detector systems shall be designed to the latest version of the NFPA code adopted by the Texas State Fire Marshal's Office as applicable to properties owned by the State of Texas. Beyond the code required design, detection circuits may be extended to exit access corridor coverage, but in general shall not extend to "full detection coverage", except by specific recommendation by the Owner’s Project Management and EH&S.

1. As specified, notification circuits shall be arranged to be capable of producing live or recorded announcements by virtue of the installation of speakers or speaker/visual appliances and appropriate circuitry to support the feature. Actual execution of the feature shall not be required in certain off-site facilities that will be evacuated upon

general alarm as determined by the Owner's Project Management. The implication is then that on such Owner approved systems the fire alarm CPU need not actually be programmed to deliver the voice messaging, however the wiring and amplification infrastructure needs to be installed. These types of installations will then be programmed to chime.

2. There are two different fire alarm networks at MD Anderson; one Simplex brand, the other Edwards Systems Technology (EST) brand. Any fire alarm systems installed must be of the same manufacture as one of these two systems to make fully compatible, fully functional alarm systems.

B. The approximate locations and quantity of fire alarm devices are indicated on original drawings provided by the A/E. Drawings provided by the A/E shall conspicuously state "Fire alarm and smoke detector devices shown on the drawings are diagrammatic in nature and shall be furnished and installed per code."

C. The fire alarm systems Contractor (referred to Contractor thereafter) shall promptly report to the Owner and to the A/E, in writing, the discovery of any apparent error, omission or inconsistency in the Contract Documents prior to the execution of the work. The Contractor shall ascertain final Construction Documents and installation are in compliance with applicable lows, building codes or regulations. When performing as a Construction Manager-at-Risk, the Contractor has a shared responsibility for discovery and resolution of discrepancies, errors, and omissions in the Contract Documents. When performing as a Design-Build firm, the Contractor has sole responsibility for discrepancies, errors, and omissions in the drawings and specifications. The Contractor shall check the layout as provided in the construction documents and augment the design on their submittals and record drawings in compliance with all applicable codes. The final Construction Documents shall be sealed by a Texas licensed fire protection engineer or licensed fire alarm planner representing the Contractor.

PART 3 - SPECIAL REQUIREMENTS FOR RENOVATION AND EXPANSION

3.01 GENERAL

A. Where renovations and expansions occur in a building, the entire alarm system for that building shall be of one manufacturer and fully integrated with existing fire alarm network.

B. Where a building's fire alarm system is being added to or modified, the wiring method shall match the building's predominant existing wiring method. Device mounting height shall be code compliance and match existing to avoid an uneven appearance.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. System design and components specified for renovation of existing facilities shall be compatible with existing installation.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	02-04-10	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT D5037

D5038 Security Systems

<u>NOTE TO READER:</u> BELOW YOU WILL FIND AN OUTLINE ONLY OF THE ITEMS THAT ARE DETAILED IN THE FULL VERSION OF THE ELEMENT D5038 SECURITY SYSTEMS. SECURITY DESIGN GUIDELINES ARE CONFIDENTIAL AND PROPRIETARY AND ARE CAREFULLY DISTRIBUTED TO THOSE WITH A BUSINESS NEED TO KNOW. IF YOU ARE A PROJECT MANAGER, CONSULTANT, OR OTHER WITH A BUSINESS NEED TO HAVE ACCESS TO THE FULL VERSION OF THE SECURITY DESIGN GUIDELINES BRIEFLY OUTLINED BELOW, PLEASE CONTACT UNIVERSITY OF TEXAS POLICE HOUSTON – RISK MITIGATION AND DESIGN GROUP.

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Manager, Security Risk Mitigation
University of Texas Police at Houston
(713) 794-5733 lloswalt@mdanderson.org

PART 1 - GENERAL

1.01 OVERVIEW

1.02 SECURITY SYSTEM DESIGN PROCESS

PART 2 - DESIGN CRITERIA

2.01 GENERAL

2.02 ELECTRONIC ACCESS CONTROL

2.03 ALARM SYSTEMS

2.04 VIDEO RECORDING

2.05 SECURITY INFRASTRUCTURE AND SPACE REQUIREMENTS

2.06 RADIO COMMUNICATION

2.07 LIGHTING

2.08 EMERGENCY PANIC DEVICES

2.09 EMERGENCY TELEPHONES

2.10 TELEPHONE INTERFACE

2.11 ELECTRIFIED DOOR HARDWAREEXTERIOR DOORS

2.12 INTERIOR ENTRANCES

2.13 GENERAL FLOOR SURVEILLANCE

2.14 ELEVATORS

2.15 TELECOMMUNICATIONS ROOMS

<u>NOTE TO READER:</u> BELOW YOU WILL FIND AN OUTLINE ONLY OF THE ITEMS THAT ARE DETAILED IN THE FULL VERSION OF THE ELEMENT D5038 SECURITY SYSTEMS. SECURITY DESIGN GUIDELINES ARE CONFIDENTIAL AND PROPRIETARY AND ARE CAREFULLY DISTRIBUTED TO THOSE WITH A BUSINESS NEED TO KNOW. IF YOU ARE A PROJECT MANAGER, CONSULTANT, OR OTHER WITH A BUSINESS NEED TO HAVE ACCESS TO THE FULL VERSION OF THE SECURITY DESIGN GUIDELINES BRIEFLY OUTLINED BELOW, PLEASE CONTACT UNIVERSITY OF TEXAS POLICE HOUSTON – RISK MITIGATION AND DESIGN GROUP.

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2.16 EQUIPMENT ROOMS

2.17 VENDING AND AUTOMATED TELLER MACHINES

2.18 BICYCLE PROTECTION

2.19 STAFF LOCKERS

2.20 WORKING MOTHERS ROOMS

2.21 SHELL SPACE

2.22 OTHER AREAS?

2.23 CAFETERIAS

2.24 FIRE COMMAND ROOMS

PART 3 - DESIGN CRITERIA FOR PATIENT CARE AREAS

3.01 OVERVIEW

3.02 OPERATING ROOMS

3.03 INTENSIVE CARE ROOMS

3.04 NURSING STATIONS

3.05 BREAK ROOMS

3.06 PHARMACEUTICAL AREAS

3.07 IRRADITORS

3.08 OFFICE SPACE

3.09 WAITING AREAS

3.10 PATIENT RECORDS (HIPPA)

NOTE TO READER: BELOW YOU WILL FIND AN OUTLINE ONLY OF THE ITEMS THAT ARE DETAILED IN THE FULL VERSION OF THE ELEMENT D5038 SECURITY SYSTEMS. SECURITY DESIGN GUIDELINES ARE CONFIDENTIAL AND PROPRIETARY AND ARE CAREFULLY DISTRIBUTED TO THOSE WITH A BUSINESS NEED TO KNOW. IF YOU ARE A PROJECT MANAGER, CONSULTANT, OR OTHER WITH A BUSINESS NEED TO HAVE ACCESS TO THE FULL VERSION OF THE SECURITY DESIGN GUIDELINES BRIEFLY OUTLINED BELOW, PLEASE CONTACT UNIVERSITY OF TEXAS POLICE HOUSTON – RISK MITIGATION AND DESIGN GROUP.

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PART 4 - DESIGN CRITERIA FOR RESEARCH AREAS

4.01 OVERVIEW

4.02 LABORATORIES

4.03 VIVARIUM AREAS

4.04 IRRADIATORS

4.05 RADIOISOTOPE STORAGE AREAS

4.06 CONTROLLED SUBSTANCE AND HAZARDOUS MATERIALS STORAGE AREAS

4.07 SENSITIVE INFORMATION AREAS

PART 5 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

5.01 GENERAL

5.02 ACCESS CONTROL HARDWARE ON DOORS IN MEANS OF EGRESS

A. Identify on a security drawing equipment schedule, the hardware and lock type at each door

PART 6 - PRODUCTS

6.01 GENERAL

PART 7 - DOCUMENT REVISION HISTORY

END OF ELEMENT D5038

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes design standards and requirements for other electrical systems. This is a design standard and is not intended to be used as a Specification.

PART 2 - DESIGN CRITERIA

2.01 EMERGENCY POWER DISTRIBUTION

A. The emergency distribution panel boards, dry type transformers and branch circuit panel boards will be similar to those described for the normal power distribution system.

B. As a minimum, and if applicable, emergency power will be provided for, but not limited to:

1. Stairwell Pressurization Fans
2. Egress and Security Lights
3. Fire Alarm System
4. Security System
5. Elevators, one per bank minimum
6. Fire Pumps
7. Sump Pumps (Storm and Sewage)
8. Communications Equipment
9. Building Automation System
10. Energy Management and Control System
11. Automatically Operated Doors
12. General Exhaust System
13. Centralized UPS
14. Operating Rooms
15. CCTV Cameras and Equipment

C. Animal Holding Facilities:

1. For animal holding facilities, emergency power shall be provided for HVAC system equipment so that normal operations can be continued in the event of normal power failure. Emergency power shall be provided by a generator sized to maintain operation of

animal room lighting, air supply, air exhaust, and data gathering system and primary major equipment.

2. The capacity of the generator fuel supply shall be discussed with Animal Facility Director to determine an appropriate time level of the electrical backup.

3. Lighting and alarms associated with the life safety requirements will be provided with emergency power by the same generator.

4. Each animal room shall be supplied by emergency power as per project Facility Program document.

5. At least one of each type of equipment (e.g., tunnel washer, cage/rack washer, bulk autoclave) shall be connected to the emergency power system.

6. All electrical outlets for ventilated cage racks need to have emergency power supply.

D. As a minimum, and when applicable, the following demand factors of emergency power for various systems are to be used to calculate the total emergency power requirements for the building:

1. Lighting: 25% of total lighting load.

2. General Power: 10% of total general power.

3. Lab Power: 25% of total lab power.

4. Fire Alarm & Security: 100% of total fire alarm & security power.

5. UPS: 100% of the total UPS capacity.

6. Specialized Lab and Medical Equipment: Emergency power will be provided for the following applicable loads: chemical fume hoods, ducted (type B1 & B2) bio-safety cabinets, freezers, CO2 incubators, LN2 room O2 monitoring systems, cryovent heaters and environmental rooms. The need of emergency power for following equipment is to be determined on case-by-case basis: water purification, glass wash, electric boiler, autoclave, and other user-provided lab equipment.

7. HVAC Equipment: Emergency power will be provided for the following applicable loads (only critical system HVAC equipment is required to be on emergency power): chilled water pumps, heating hot water pumps, process cooling water pumps, condenser water pumps, boiler circulating pumps, boilers, boiler feed water pumps, condensate pumps, fuel oil pumps, chillers, air-cooled condensers, cooling towers, air-cooled chillers, Computer Room Air Conditioning (CRAC) units, building automation system, laboratory tracking systems & room air pressurization monitors and related controls, control air compressors, air dryers, AHUs, FCUs, HEPA filter units, exhaust fans, stair pressurization fans, (only critical system) air terminal units, lab air valve, critical isolation room, etc.

8. Plumbing Equipment: Emergency power will be provided for the following applicable loads: all AC-powered faucets/flush valves in critical areas, elevator pit sump pumps, storm and sewage sump pumps, fire pumps, medical/lab vacuum pumps, medical/lab air

compressors, medical/lab gas/vacuum alarm panels and switches, medical/lab cylinder manifolds, fire protection system flow switches, domestic/fire water surge tank level controls and alarms, and other critical equipment identified by other project documents.

E. Evaluate and make recommendations to the Owner if a centralized UPS system should be considered for this Project.

F. For additional emergency power requirements, refer to the project's Facility Program document and individual mechanical and plumbing Design Guideline Elements.

G. Emergency power shall be provided for one elevator in each bank of elevators in high-rise buildings as defined by the National Fire Codes. A keyed selector switch shall be located on the ground floor allowing rescue personnel to select any elevator in the bank.

2.02 ESSENTIAL ELECTRICAL SYSTEMS

A. The Essential Electrical systems for hospitals shall comply with the Type 1 system as defined in NFPA 99 and shall consist of the emergency system and the equipment system.

B. The emergency system shall consist of two separate branches – The Life Safety Branch and Critical Branch, which shall provide power to the selected functions listed in NFPA 70 and 99.

2.03 LIFE SAFETY BRANCH

A. If applicable to the Project, the life safety branch shall supply power for the following devices:

1. Alarm and Alerting Systems such as Fire Alarm and Medical Gas Systems.

2. Automatic Doors: Used for building egress.

3. Communication Systems: If used during emergency conditions, they shall include:

    a. Disaster Control or Emergency Communication Centers, i.e. communication equipment, selected receptacles and task illumination.

    b. Public Address System (PA).

4. Elevators: Cab lighting, controls, intercom, signal systems, and elevator machine room lighting.

5. Exit Signs.

6. Generator Set Location: Task illumination, battery charger for emergency battery-powered lighting units and selected receptacles

7. Illumination of Means of Egress including corridors, stairwells, and building exits.

    a. Refer to NFPA 101 for definition of Means of Egress.

B. Storage rooms, electrical rooms, mechanical rooms, and other areas not part of the defined Means of Egress are not allowed to be connected to the Life Safety Branch. When emergency lighting is required for these areas, they are to be connected to Critical Branch.

2.04 CRITICAL BRANCH

A. If applicable to the Project, the critical branch shall supply power for task illumination, fixed equipment, selected receptacles, and special power circuits serving the following areas and functions related to patient care:

1. Acute Nursing: Task illumination and selected receptacles.
2. Anesthetizing Locations: Task illumination, selected receptacles and fixed equipment; task illumination includes battery back-up.
3. Angiographic Laboratories: Task illumination, selected receptacles and selected power circuits including Angio x-ray unit.
4. Blood, Bone, Eye and Tissue Banks: Task illumination, selected receptacles and refrigerators.
5. Cardiac Catheterization Laboratories and Rooms: Task illumination, isolated power units, and Cath X-ray unit.
6. Coronary Care Unit: Task illumination and Prefabricated Bedside Patient Unit (PBPUs).
7. Emergency Room Treatment Areas and Life Support Rooms: Task illumination and PBPUs including two receptacles.
8. General Patient Bedrooms: Night lights, an alcove or a lavatory mirror light, two receptacles per bedwall, preferably in the PBPU, if available and a bathroom light.
9. Hemodialysis Rooms: Task illumination and one receptacle for each dialysis unit PBPU.
10. Human Physiology Labs: Task illumination, selected receptacles and selected circuits.
11. Intensive Care Units: Task illumination and PBPUs.
12. Isolated Power Systems in special environments.
13. Medication Rooms and Medication Preparation Areas: Task illumination, selected receptacles and refrigerators.
14. Minor Operating Rooms: Task illumination, selected receptacles and isolated power units (if provided).
15. Nurse Call System: Equipment.
16. Nurses' Stations: Task illumination and selected receptacles.
17. Pharmacy Dispensing Area (including Satellite Pharmacies): Power files, laminar flow hoods, refrigerators, electrostatic copier (i.e., Telautograph) for transmittal of physicians' orders, task illumination and selected receptacles.
18. Psychiatric Bedrooms: Task illumination (ceiling only).

19. Surgical Operating Rooms: Task illumination (50 percent of the general fluorescent fixtures above the surgery table including battery backup within two of these fixtures), each isolated power unit, each X-ray unit and one film processor per suite.

20. Surgical Recovery Rooms: Lighting fixture over each bed, two (one on dedicated circuit) receptacles for each bed (or PBPU), night lights for each bed (or PBPU) and emergency alarm circuits.

21. For telephone and equipment rooms and telecommunications closets, see MD Anderson “Communications and Computer Services Premises Distribution System Standard” referenced within Design Guideline Element Z, General Design Requirements.

22. Ward Treatment Rooms: Task illumination and two (2) receptacles per bed location.

23. Dental Suites: Each ceiling track operatory surgical light, each dental operating unit, one (1) duplex receptacle in each treatment area and a storage refrigerator.

24. Electrical Rooms and Closets: 50 per cent of lighting and 50 per cent of receptacles. Also, provide additional self charging auxiliary battery operating lights in the main Electrical Switchboard Room.

25. Engineering Control Center and Mechanical Equipment Rooms: Task illumination and selected receptacles for operating and controlling internal auxiliary power, data gathering panels, control air compressors, dryers and any electric control for heating, ventilating and air-conditioning (HVAC) systems; and provisions for additional self charging auxiliary battery operating lights.

26. Laboratory Service: Task illumination, selected receptacles in areas used to continue essential functions or critical experiments in the event of power failure, fume hoods, exhaust fans and refrigerators.

27. Pharmacy Delivery Systems and Delivery Areas: Task illumination, selected receptacles

28. Respiratory Care Beds: PBPUs; when PBPU is not provided, task illumination and two (2) receptacles for each bed.

29. Security Station: Monitoring security alarm systems, task illumination, one receptacle, intrusion alarms at agent cashier, pharmacy, drug storage room in warehouse, office, retail store room and storage.

30. Special Procedure Rooms (Radiology): Task illumination, isolated power panels and X-ray unit.

2.05 EQUIPMENT SYSTEM

A. The equipment system shall supply power to major electrical equipment, necessary for patient care, listed in NFPA 70 and 99.

2.06 NON-DELAYED AUTOMATIC CONNECTION

A. If applicable to the Project, arrange the following generator accessories for non-delayed automatic connection to the alternate power source:

1. Electrically operated louvers.
2. Other generator accessories essential for generator operation.
3. Transfer fuel pump.
4. Dumbwaiter.
5. Pneumatic tube.

2.07 DELAYED-AUTOMATIC CONNECTION

A. If applicable to the Project, arrange the following equipment for delayed-automatic connection to the automatic connection to the alternate power source:

1. Central Suction Systems: Vacuum pumps and oral evacuation pumps serving medical and surgical functions including control
2. Sump pumps, sewage pumps, and other equipment required to operate for the safety of major apparatus, including associated control systems and alarms
3. Compressed Air System: Medical and dental air compressors, serving medical and surgical functions including controls
    a. Systems noted as “1” through “3” above may be connected to the critical branch. Discuss this with the Chief Engineer at the facility.
4. Smoke control and stair pressurization.
5. Kitchen Hood Supply and/or Exhaust Systems: If required to operate during a fire in or under the kitchen hood.
6. Elevators.
7. Heating Equipment:
    a. Operating Suites, Recovery, Intensive Care, Coronary Care, Infection and/or Isolation Rooms, Emergency Treatment Spaces and General Patient Rooms.
    b. Under certain conditions, NFPA 99 may not require heating of General Patient Rooms and Infection Isolation Rooms.
8. Equipment and Control Systems for each Bank of Elevators: Design control systems to operate at least one elevator at a time and designate one elevator to serve the Surgical Suite during emergencies.
9. Jockey pump or make-up pump for water-based fire protection systems.
10. HVAC for Surgical Suites, Intensive Care, Coronary Care and Emergency Treatment Spaces.
11. Supply, return and exhaust ventilating systems for Infection Isolation Rooms, Protective Environment Rooms and exhaust fans for laboratory fume hoods, nuclear medicine

areas where radioactive material is used, ethylene oxide evacuation, and anesthesia evacuation. These systems are permitted on delayed automatic system only and shall not be served via manual system. Some systems may be placed on Critical Branch. Coordinate with MD Anderson.

12. Hyperbaric facilities.

13. Hypobaric facilities.

14. Automatic operated doors not used for building egress.

15. Autoclaving equipment.

16. Controls for equipment listed in this article.

17. Administrative Areas: Task illumination and selected receptacles in the hospital Director's, Engineering, and Security and Communications Suites.

18. Closed-loop water chilling equipment for linear accelerator.

19. Domestic Water Pumps: Equipment, control system, light fixture and receptacle near the pump.

20. Electric tape for heat tracing of chilled water and condenser water piping exposed to weather requiring freeze protection.

21. Exhaust fans serving Autopsy Rooms, reagent grade Water Treatment Rooms, Orthotic Laboratory special exhaust systems, battery charging areas, flammable Storage Rooms and Illustration Rooms (Medical Media).

22. Fire pump equipment control system, light fixture and receptacle near the pump. See requirements in NFPA 20. Fire pump connection shall meet the requirements of NFPA-70.

23. Heating, ventilating and air-conditioning (HVAC) systems:

    a. Air-conditioning equipment, lubricating oil pumps for centrifugal compressors, control air compressors, air dryer and absorption machine refrigerant pump to draw down lithium chloride before crystallization (omit for machines accomplishing this manually).

    b. Chillers, chilled water circulating pumps, fans, and controls for surgical suites, recovery rooms, intensive care, and coronary care units.

    c. HVAC equipment for Bone Marrow Transplant (BMT) areas.

    d. HVAC equipment for Magnetic Resonance Imaging (MRI) Suites and Computerized Topographic (CT) Scanners.

    e. HVAC equipment serving emergency areas in outpatient clinics.

f. Back-up HVAC equipment for Telephone Equipment Rooms and Telecommunications Closets.

g. Computer Room HVAC Systems.

24. Hot Water Circulatory and Steam Condensate Return Pumps: Equipment, controls, and light fixture and receptacle near the pumps.

25. Hot Water Generator: Equipment, controls, and light fixture and receptacle near the generator.

26. Kitchen Area: Task illumination, minimum equipment to feed patients during extended outage as defined by MD Anderson, frozen storage lockers and food refrigerators.

27. Laboratory Air Compressors and Vacuum Pumps: Equipment, controls, and light fixture and receptacle near the compressors and pumps.

28. Mortuary Refrigerator or Cold Room: Refrigeration Equipment and task illumination.

29. Radiology Suite: Task illumination, one automatic X ray film processor, and one X ray unit.

30. Refrigerated Medical Storage: Refrigeration Equipment.

31. Sewage Pumps: Equipment, controls, and light fixture and receptacle near the pumps.

32. Supply, Processing, and Distribution (SPD):

a. Task illumination and selected receptacles in the following areas: core, sterile storage, non-sterile storage, preparation, and decontamination.

b. One (1) ultrasonic cleaner.

c. One (1) steam sterilizer.

d. One (1) washer sterilizer.

e. One (1) gas generator.

f. Equipment in warehouse areas needed to preserve subsistence drugs and X-ray film materials that may be subjected to damage from infestation, humidity, or temperature.

33. Ventilation and control equipment for electrical equipment rooms.

34. Ventilation, cooling and control equipment for elevator machine rooms.

2.08 ALTERNATE SOURCES OF POWER

A. The alternate source of power shall be one or more diesel-engine-driven generator sets.

2.09 DISTRIBUTION EQUIPMENT

A. Do not locate the first level of distribution of the Essential Electrical System, such as the generators and distribution panels, in the same room with other power systems.

B. Transfer switches shall be limited to 800 amperes maximum size and located to provide the highest practicable reliability in service to the load. This generally means minimizing the switch to load distance.

1. All emergency feeders to transfer switches must have two hour fire protection.

C. All transfer switches shall include the maintenance-bypass option; and an exercising control panel shall be incorporated so as to allow testing of each remotely located transfer switch from a central location, such as the generator room.

2.10 GROUNDING

A. If changes to the existing grounding system are needed, they shall be done in accordance with MD Anderson standards, as described in Master Construction Specification 26 05 26, Grounding.

B. The building grounding system will be designed and tested in accordance with Sec. 9.03 of IEEE 81 to have a resistance less than 10 ohms.

C. An equipment ground system will be provided consisting of separate ground conductor run with all electrical feeders and branch circuits. This ground system will be connected to the structural ground system.

2.11 LIGHTNING PROTECTION SYSTEM

A. Roof Lightning protection shall be provided in accordance with MD Anderson requirements, Lightning Protection Institute Standard LP1-175, National Fire Protection Association Code NFPA 780, and Underwriters Laboratories Standard UL 96A and UL 96.

B. Provide intermediate-level potential equalization for reinforced concrete structure building, interconnecting the lightning protection system down conductors and other grounded media with a loop conductor at intermediate levels not exceeding 200 ft per NFPA 780.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. All equipment must be listed and approved by a testing laboratory that has been approved by the Texas State Fire Marshal's Office. This listing is to be for all functions required by this standard.

C. All animal room outlets on emergency power shall be standard type with waterproof covers to allow for cleaning.

D. All animal room light fixtures on emergency power shall be sealed to prevent the access of vermin to the room, and all fixtures shall be watertight units to resist wet cleaning of the room.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-09-08	Included sustainability requirements based upon TGCE's evaluation. (Paragraph 2.07 A 22)	JCD
Rev. 2	08-06-09	Added 2.01 D. to identify lab systems that need to be fed from emergency power, and demand factors of emergency power for various systems in calculating/sizing generator per John Pham.	JD
Rev. 3	07-08-10	Added 2.11 B. requiring "Provide intermediate-level potential equalization for reinforced concrete structure building, interconnecting the lightning protection system down conductors and other grounded media with a loop conductor at intermediate levels not exceeding 200 ft per NFPA 780."	JD
Rev. 4			
Rev. 5			

END OF ELEMENT D5090

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes medical, clinical and laboratory equipment, and biological safety cabinets.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Clinical and Laboratory Equipment:

1. Provide complete information on each piece of equipment including weight, dimensions, ceiling height requirements, heat output, power, ventilation and other building services requirements, shielding requirements, sensitivity to external EMF interference, sensitivity to vibration, etc.

B. Biological Safety Cabinets as required:

1. Provide Baker or Nuaire products.
2. Class II, Type A2 – recirculated air.
3. Class II, Type B1 – 70 percent exhausted air, can be manifolded with general laboratory exhaust system.
4. Class II, Type B2 – 100 percent exhausted air, can be manifolded with radioisotope exhaust or dedicated exhaust system.
5. Provide cabinets with one electrical, gas, and vacuum outlet on each side jamb.
6. Provide special cabinets as required.

C. Medical equipment will be provided by Owner.

D. Coordinate location of conduits, backboxes, mounting plates, and related infrastructure with Owner's representative.

E. Automated External Defibrillators (AED's)

1. Provide AED's at a centrally located building elevator lobby, on every other floor of non-patient care facilities owned and operated by MD Anderson, starting with the first occupied floor of the building. Additional AED's may be required on other floors, depending on the building occupancy requirements; confirm additional locations with the Owner's Project Manager.
2. AED cabinet shall be Contractor-furnished and installed; AED device shall be Owner-furnished and Owner-installed unless otherwise confirmed by Owner's Project Manager.

3. Mount AED cabinet recessed in wall, with top of cabinet at 48-inches above finished floor. Mount bottom of identification sign 6-inches above top of cabinet. Sign shall be mounted as recommended by manufacturer to project from wall. Maximum projection from face of wall shall be 4-1/2 inches. Refer to Part 4 Products for information on cabinet and sign.

4. Provide blocking for mounting of cabinet in both new and existing walls.

5. Provide a monitoring circuit for notification at the University of Texas Police Department (UTPD) Dispatch Center when cabinet door is opened and alarm is activated.

6. When locating the recessed cabinet in new or existing fire resistance rated walls, ensure that the fire rating is maintained by construction behind the penetration.

7. Where the cabinet must be installed surface mounted such that the cabinet projects more than 4-1/2 inches from the face of the wall, provide a matching metal skirt on the bottom of the cabinet that extends to within 27-inches of the floor to ensure accessibility compliance.

8. Provide a wall-mounted phone to be installed adjacent to the AED cabinet. The phone is intended for use in contacting local emergency responders, not for personal use.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Require that product data submittals be provided for all Contractor-furnished AED products.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Automated External Defibrillator (AED):

1. Specify products as manufactured by ZOLL Medical Corporation for the AED components as a basis of design. Products of other manufacturers which are comparable in manufacture, operation, and performance will be acceptable, subject to approval by the Architect and Owner.

   a. Opening the cabinet door shall activate a local, audible alarm.

   b. The cabinet shall also be furnished with an auxiliary tamper switch and monitoring circuit back to UTPD. Tamper switch shall be activated upon opening of the cabinet door.

2. AED Device: ZOLL AED Plus with ZOLL Lithium Battery #8000-0807-01.

3. AED Cabinet:

   a. Flush Wall Mounting Cabinet with Alarm; ZOLL #8000-0811; specify where space in wall allows this preferred type of mounting.

   b. Recessed Wall Mounting Cabinet with Alarm; ZOLL #8000-0814; specify when flush-mounting is not possible.

   c. Surface Wall Mounting Cabinet with Alarm; ZOLL #8000-0817; specify where no recessing of cabinet is possible.

4. AED Signage:

   a. Specify ZOLL #9310-0738 identification sign for mounting directly above AED cabinet.

   b. Additional signage that will be required in the vicinity of the AED cabinet for greater visibility to building occupants will be Owner furnished and Owner installed. Coordinate location of additional signage with Owner's Project Manager.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-08-11	Added 2.01 E, 3.01 A, and 4.01 B, all as related to AED's.	JRC
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT E1020

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes window shades, auditorium fixed seating, and banquettes.

PART 2 - DESIGN CRITERIA

2.01 WINDOW SHADES

A. The need for mounting of operable shades at exterior window heads shall be anticipated in the project design. Owner preference is for a design which conceals the shade enclosure from view, by use of ceiling offset, recessed pocket, or other means.

B. Selection of window shade fabric type and light transmittance shall be based on associated window glass performance characteristics, as well as coordination with Owner. Confirm detailed shade performance requirements with Owner's Project Manager.

C. The width of individual shades shall be limited to the distance between adjacent vertical curtain wall mullions. Owner approval is required for designs where shade width exceeds one mullion bay.

D. Confirm location of switches for motorized shades with Owner's Project Manager.

E. Typical Locations: Manual; single shade with woven vinyl fabric, sized to overlap window mullions. Size to fit within mullions where overlap is not possible or appropriate.

F. Patient Rooms: Manual; dual shade with woven vinyl fabric, and fiberglass coated fabric blackout shade.

G. Conference Rooms: Motor operated with wall switch; dual shade with woven vinyl fabric, and fiberglass coated fabric blackout shade.

H. Research Laboratory Areas: Manual, single shade with woven vinyl fabric; sized to overlap window mullions. Where overlap is not possible, installation of vertical channels along mullions may be required to prevent glare from excessive sunlight.

I. Specialty Rooms: (Flex Rooms, Dark Rooms, Procedure Rooms): Manual fiberglass coated fabric blackout shade on applicable windows and/or door lites.

2.02 AUDITORIUM FIXED SEATING

A. Refer to Interior Finishes Standards on the Owner's Design Guidelines website for details of this type of seating.

2.03 BANQUETTES

A. Banquettes shall be designed such that back and seat panels are independently removable. Front upholstery at seat shall extend down no nearer than 6 inches from the floor. All seams shall be reinforced with an additional layer of interface type material.

B. Selection of foam density/compressibility will be confirmed through Owner review of a mock-up of banquette. Foam shall be fire retardant, high resilient, and mildew resistant.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, include provisions described within this Element in the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. For renovation projects, refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	04/17/07	Added Design Criteria for Public Toilet Room Vanities; note #1, item f.	SAK
Rev. 2	08-14-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	JC, LN, DB
Rev. 3	12-04-08	Deleted sections on plastic laminate casework, headwalls, steel laboratory casework, laboratory fume hoods, and heavy duty equipment racks; revised sections 2.01A, 3.01 and 4.01.	JC
Rev. 4	07-08-10	Added 2.01 D and E.	KB
Rev. 5	02-26-13	Added 2.01 A, B, C, and D, and moved previous paragraphs A-E to end of 2.01 section; Added 2.03 Banquettes.	JC

END OF ELEMENT E2010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes shielding and vibration protection.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Provide shielding systems for magnetic field and electro-magnetic fields as required by equipment manufacturers to protect building occupants and equipment.

B. Radiation shielding design:

1. Shielding for radiation therapy shall be designed by a medical physicist licensed in therapeutic radiological physics or medical health physics.

2. Shielding for imaging shielding shall be designed by a medial physicist licensed in diagnostic radiological physics or medical health physics.

3. Shielding for nuclear medicine shall be designed by a medical physicist licensed in medical nuclear physics or medical health physics.

4. The physicist(s) of record for all shielding shall be licensed in Texas.

C. All shielding designs will be reviewed by Owner’s physicists.

D. Magnetic and electromagnetic shielding shall be designed by equipment and/or shielding vendor.

E. Provide vibration isolation tables or other devices as required.

F. Where rooms requiring shielding share a common wall, provide wall construction consisting of a double row of studs with shielding located in the center, between rows. Provide in-wall utilities separately to each room, without penetrating the shielding layer.

G. All penetrations into the RF cage shall be routed through a filter panel and filters developed in conjunction with the RF cage manufacturer. All RF cage penetrations, whether by Owner or Contractor, shall be addressed and approved by the cage manufacturer.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-01-09	Renumbered and renamed Element from F1030 Special Construction Systems	SAK
Rev. 2	04-17-12	Added 2.01 F and 2.01 G.	JRC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT F1032

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes concrete roadway, as applicable to the Project.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Roadway pavement will be minimum 9-inch thick reinforced portland cement concrete in accordance with TxDOT Item 360, placed over minimum 8 inch lime-fly ash stabilized subgrade.

B. New roadway work will consist of access to public entrance and dock/loading areas.

C. Pavement and subgrade preparation must be consistent with recommendations in the geotechnical investigation report prepared for the Project.

D. Provide a concrete sealer at drop-off points and dock areas. A/E shall take into consideration the need to use less maintenance intensive configurations of the paving systems at the drop-off points and dock areas including surface conditions and color shading, and types of surface repellants and sealers.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Project Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	07-08-10	Revised required thickness of roadway pavement.	JP
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G2010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes sidewalks, steps/platforms, and ramps.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Construct at-grade sidewalks of reinforced, 3,000 psi normal weight concrete, with a minimum 4-½ inch thickness, over 6 inches of compacted subgrade. Provide a light broom finish.

B. Construct elevated building entrance platforms/landings of structurally engineered concrete over compacted select fill. For buildings with precast exterior walls, exterior sides of elevated ramps and platforms will be faced with architectural precast concrete panels to match that used on the building exterior.

C. Pavement and subgrade preparation must be consistent with recommendations in the geotechnical investigation report prepared for the Project.

D. Provide concrete sealer.

E. Where pedestrian platforms are provided at roofs, they shall be designed for proper drainage, ease of removal, and so as not to collect debris. Design/system selected shall be approved by Owners Project Manager. Raised exterior pedestal-supported platform systems shall not be used without the expressed written consent of the Chief Engineer, Administrative Facilities and Campus Operations.

F. Avoid heavily textured or raised pattern finishes where patients in wheelchairs and with IV poles will be present.

G. Provide low profile identifying markers at top edge of sidewalks at locations where below grade irrigation sleeves are present.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Where required by Code, building exits and entries shall be provided with TAS and ADA compliant pedestrian paving and ramps. Provide detectable warnings in accordance with TAS and ADA requirements at curb ramps, and where walks and adjoining vehicular ways are not separated by a curb, railing, or other element. Owner preference is for walks, ramps, and other elements of accessible paths to be designed with a built-in construction tolerance, instead of the typical design to limits allowed by Code.

B. A service ramp and steps shall be provided at loading docks.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	09-16-10	Edited 2.01 B; Added 2.01 E; Edited and expanded 3.01 A	JRC
Rev. 2	04-17-12	Revised pedestrian platform design requirements in 2.01E; Added 2.01 F and 2.01 G; Added construction tolerance in 3.01 A.	JRC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G2030

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes Site preparation and improvements outside the building pad.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Provide bollards at vehicular drop off areas, as well as at building and canopy areas subject to damage from car/truck traffic.

B. Provide decorative metal fencing as applicable to the Project, for building security and screening at loading dock areas.

C. Provide sleeves under pavement for Owner's security and telecommunications utilities, as applicable to the Project.

D. Provide electrical power and plumbing stub-outs from the building and sleeves under paving for future exterior use. Coordinate with Owner.

E. Line selected landscape areas with an 8-inchx8-inch reinforced concrete edge strip.

F. Provide post-mounted metal signage indicating passenger drop offs, fire lanes, deliveries, etc.

G. Paint curbs and drives to indicate fire lanes, crosswalks and special traffic related information.

H. Provide painted decorative steel pipe handrails and guardrails at ramps, steps, and elevated walk areas.

I. Provide painted metal waste cans and benches at selected locations, as directed by Owner.

J. When bicycle parking is not provided within the building, locate racks in areas where high traffic is expected to provide natural security surveillance. Bicycle racks shall be galvanized metal ribbon type that facilitates the use of high security locks. The University of Texas Police Department and MD Anderson Human Resources Health and Fitness Coordinator will assist in the selection of appropriate bicycle racks.

K. Provide electrical power for Owner-provided building identification signage on the Site.

L. For building expansion and renovation projects, protect existing Site utilities throughout project construction. Site utilities include domestic water, sanitary sewer, storm sewer, storm water detention vaults, steam piping, chilled water piping, and selected Site lighting.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Project Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-02-10	2.01, Note J: updated requirements for bicycle parking and racks.	CS
Rev. 2	07-08-10	Revised requirements relating to bicycles.	JP/JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G2040

PART 1 - GENERAL

1.01 OVERVIEW

A. Includes fabricated flagpoles and associated base structure and lighting.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The typical design for flagpoles at MDACC facilities shall be a single ground-mounted pole equipped to accommodate a 5'x8' National flag as well as a 5'x8' State flag.

B. Flagpoles shall typically be 35' tall (exposed nominal height) and of tapered seamless aluminum tube design, with anodized gold finial at top, internal halyard system, and clear anodic finish. Confirm requirements with Owner's Project Manager if a height greater than 35' is proposed due to atypical project requirements.

C. Flagpole design (with flags attached) shall be based on the NAAMM FP 1001 "Guide Specifications for Design of Metal Flagpoles", latest edition. In no case shall flagpoles (with flags attached) located on MDACC campuses in the Houston area be designed for less than a basic wind speed of 120 mph, 3 second gust, at 33 feet above ground.

D. Flagpoles shall be installed plumb, and in a hot dipped galvanized foundation system utilizing a steel tube and wedges. The pole/foundation joint shall be sealed and covered with a flashing collar having the same finish and material as the pole.

E. The internal halyard system shall allow flags to be set at any height. Internal cabling and accessories shall be stainless steel. The counterweight shall be clad in neoprene or other material designed to leave the pole free of marks or visible wear at contact point. The system shall include a stainless steel winch accessed through a lockable flush mounted door.

F. A lightning protection system which includes a ground spike shall be provided.

G. Ground mounted illumination of the flagpole shall be provided. The light fixture(s) shall be Hydrel model 7100 100CM SP KM SMSA18 ISS GS DDB. Light fixture(s) shall be oriented at an angle to reduce glare and minimize light pollution, and shall be located such that the building behind the flagpole is also partially illuminated. In no case shall light fixture(s) be oriented to cast a beam of light straight up into the sky. Lighting fixture(s) shall be controlled by a timing device to allow operation during selected night time hours.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, include provisions described within this Element in the Project Contract Documents.

B. Drawings shall indicate dimensions which locate flagpole, associated lighting, and any adjacent pedestrian pavement on the site.

PART 4 - PRODUCTS

4.01 NOT APPLICABLE

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	10-15-09	Initial Adoption of Element	
Rev. 1	07-08-10	Revised requirements for light operation.	JP/JC
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G2048

G2050 Landscaping and Irrigation

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes Landscaping and Irrigation to be provided within the scope of work.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Protect selected existing trees from damage during construction.

B. All disturbed earthen areas of the Site will be finish graded. Additional portions of the Site will be finish graded, as required, to provide positive drainage to catch basins.

C. An automatic irrigation system designed by a Texas Licensed Irrigator will be provided for coverage of all landscaped areas. Sleeves under pavement will be provided as needed. Potable water protection shall be as per local code requirements.

D. Landscape development will consist of trees, turf, and shrubs around the building. Generally, plant material should repeat the existing campus palette. Where possible, the use of native, water conserving plant material is encouraged.

E. With the exception of high visibility garden areas, avoid use of plant material with excessive maintenance requirements.

F. Hold planting three (3) feet from the building.

G. Owner will furnish applicable landscape, irrigation and maintenance standards and specifications to the A/E at no later than commencement of the Design Development Phase.

H. For facilities constructed within The Texas Medical Center, all landscaping shall be in harmony with the Texas Medical Center Landscape Development Plan and Guidelines as most recently adopted.

I. Landscaping should not adversely impact visibility to pedestrians, The University of Texas at Houston Police Department patrols, or video surveillance cameras.

J. Provide a separate water meter for the irrigation system and site water features.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Irrigation system design shall include reserve capacity to accommodate landscaping and water feature additions. Additional sleeves under pavement shall be provided to serve such additions.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-02-10	Added Note I, Section 2.01 on landscaping for security.	CS
Rev. 2	07-08-10	General revisions throughout document; Added 2.01 Note J; changed name of Element to add “Irrigation”.	AW/JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G2050

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes Domestic, Fire Protection and Site Irrigation Water services from the municipal or existing Site supply to within five feet of the building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Water services shall be brought to the site from Municipal system. Domestic, fire protection, and lawn irrigation water supply systems shall be metered and isolated from the municipal water supply in accordance with City of Houston and Texas Medical Center requirements.

B. Provide fire hydrants as required by City of Houston Fire Marshal. Maximum spacing between hydrants should not exceed 300 feet. Locate such that any portion of the exterior of any building shall be within 300 feet of a hydrant, with consideration given to accessibility and obstructions. Nominal distance between a fire hydrant and the building fire department connection should not exceed 100 feet.

C. Locate and identify all existing utilities within project boundaries prior to any excavation and take all necessary precautions to ensure that no damage to utilities or resultant loss of service is encountered.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Indicate on Contract Documents, the material, location, size, design pressure, design flow, and applicable construction requirements of all piping, valves, and appurtenances.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Specify products as required by referenced standards and codes.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G3010

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes Sanitary Sewer services from the Municipal system to within five feet of the building perimeter

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Sanitary Sewer services shall be brought to the site from the Municipal system. Provide sanitary drainage system to serve the Site and structures.

B. All sanitary sewer lines and structures shall be constructed according to City of Houston standards or those of the governing authority at the site location. Special requirements of the Texas Medical Center may also apply to utility construction depending on the Project Site location.

C. System design shall prevent site sanitary waste water from flowing into the building piping systems. Provide backwater valves manufactured by Tideflex on inlet piping of manholes, area inlets or junction boxes directly receiving discharge from building systems.

D. Wastes which are likely to damage or increase maintenance costs on the sanitary sewer system, detrimentally affect sewage treatment, or contaminate surface or subsurface waters, shall be pretreated to render them innocuous prior to discharge into a drainage system. Provide detailed plans and specifications of the pretreatment facilities to the City of Houston when the Municipal Authority determines that such plans and specifications will aid in enforcing the provisions of the Municipality's Codes, Laws or Ordinances. Piping conveying wastes from their point of origin to sewer connected pretreatment facilities shall be of such material and design as to adequately perform its intended function to the satisfaction of the Administrative Authority. Drainage discharge piping from pretreatment facilities or interceptors shall conform to standard drainage installation procedure.

E. Provide interceptors for all drainage that may contain grease. Interceptors shall be precast concrete with two-compartments (construction and size based on the City of Houston Plumbing Code or requirements of the governing authority at the site location). Each compartment shall be provided with two gas and water tight 24 inch minimum diameter manholes for access. Interceptors shall be properly vented to atmosphere and located outside the building footprint convenient to vehicular access for servicing. Provide waste sampling well immediately downstream of interceptor per City of Houston requirements or those of the governing authority at the site location.

F. Provide chemical waste treatment basins when effluent is expected to have a pH less than 6 or more than 10 before discharging into municipal sewer systems. Basins shall be provided with gas and water tight cover of adequate size for servicing. Basins shall be properly vented to atmosphere and located outside the building footprint convenient to vehicular access for servicing. Provide waste sampling well immediately downstream of basin per City of Houston requirements.

G. Effluent having a temperature above 113 degrees F shall not be discharged to the municipal drainage system.

H. Sanitary and storm drainage systems shall be entirely separate. Care shall be taken in co-location of storm and sanitary manholes to preclude cross contamination.

I. Locate and identify all existing utilities within Project boundaries prior to excavation and take all necessary precautions to ensure that no damage to utilities or resultant loss of service is encountered.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Indicate on Contract Documents, the materials, location, size, elevations, slopes, design flows, and applicable construction requirements of all piping.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Project Construction Specifications.

B. Specify products as required by referenced standards and codes.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	07-08-10	Revised sections 2.01 B and H.	JP
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G3020

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section includes Storm Sewer services from the Municipal system to within five feet of the building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Storm Sewer services shall be brought to the Site from the Municipal system. Provide storm drainage system to serve site and structures.

B. All storm sewer lines and structures shall be constructed according to City of Houston standards or those of the site governing authority. City of Houston standards shall be the minimum requirement for all construction on MD Anderson projects. Special requirements of the Texas Medical Center may also apply to utility construction, depending on the Project Site location.

C. Provide on-site detention as required by the City of Houston or governing authority at the site location. Ensure that oil-water-grit separators are installed as applicable to address surface and roadway runoff entering the storm water system prior to exiting MD Anderson property.

D. System design shall prevent site storm water from flowing into the building piping systems. Provide backwater valves manufactured by Tideflex on inlet piping of manholes, area inlets or junction boxes directly receiving discharge from building systems.

E. Storm and sanitary drainage systems shall be entirely separate.

F. Locate and identify all existing utilities within Project boundaries prior to excavation and take all necessary precautions to ensure that no damage to utilities or resultant loss of service is encountered.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Indicate on Contract Documents, the materials, location, size, elevations, slopes, design flows, and applicable construction requirements of all piping.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Project Construction Specifications.

B. Specify products as required by referenced standards and codes.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	07-08-10	Revised 2.01 B and C.	JP
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G3030

PART 1 - GENERAL

1.01 OVERVIEW

A. This Section addresses Natural Gas services from the local gas utility to within five (5) feet of the building perimeter.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Natural gas service shall be brought to the site from the Local Gas Supplier's System. Coordinate with Gas Company for service line easement and meter placement requirements. Coordinate routing of gas service with other Site utilities.

B. All Site natural gas lines and structures shall be constructed according to NFPA 54 and the Gas Company's standards. Special requirements of the Texas Medical Center may also apply to utility construction, depending on Project site location.

C. A/E shall investigate natural gas availability, service location, available service pressure, and any restrictions on the use of the natural gas. Interruptible and non-interruptible gas services shall be evaluated regarding program requirements. Ownership and maintenance of proposed gas service shall be determined. Include an "allowance" in the Project equal to the estimated costs (quote) of the utility company as a separate item in design phase estimates.

D. Unless otherwise approved by the Owner, the A/E shall include all costs associated with the installation of gas service (including materials, labor, procurement, scheduling, etc.) in the bid documents as the Contractor's responsibility, both during bidding and construction.

E. Where natural gas service piping, meters, regulators, and other appurtenances are provided by the utility company, and the construction costs are assessed to Owner, the A/E shall obtain from the utility company a written Scope of Work, quote, contact person, and any scheduling requirements.

F. Finished Site Work, such as concrete/asphalt paving, seeding, directly related to the natural gas line installation, or other miscellaneous Work associated with the natural gas service installation shall be determined and defined in the bidding documents as the responsibility of the contractor, rather than the utility company.

G. Natural gas pressures shall not exceed five pounds per square inch gauge on customer side of the meter.

H. Locate and identify all existing utilities within Project boundaries prior to excavation and take all necessary precautions to ensure that no damage to utilities or resultant loss of service is encountered.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Indicate on Contract Documents, the materials, location, size, elevations, slopes, design flows, and applicable construction requirements of all piping.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

B. Specify products as required by referenced standards and codes.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT G3060

Z10 Additional Owner Furnished Standards and Documents

PART 1 - INTRODUCTION

1.01 OVERVIEW

A. This Section references additional standards and documents to be used for preparation of Contract Documents.

B. The A/E shall obtain all Owner furnished standards and documents applicable to the Project and incorporate all pertinent information within the Contract Documents. The A/E shall coordinate with Owner's Project Manager to verify relevancy and applicable version of all standards and documents prior to inclusion.

C. Some of the additional Owner furnished standards and documents are available for download via the Internet. Others must be obtained from the Owner's Project Manager. Part 2 below identifies this information and how it each can be obtained.

PART 2 - GENERAL REQUIREMENTS

2.01 ADDITIONAL OWNER-FURNISHED STANDARDS AND DOCUMENTS

A. Items listed below that are underlined are available on the Internet. If you are viewing an electronic version of this document and are connected to the Internet, simply click on the underlined text to access the information. If you are viewing a hard copy of this document, type the web address noted below each item into a web browser to access the information. Items listed below that are not underlined must be obtained from the Owner's Project Manager.

1. Facility Program or Pre-Design Report, as applicable to the Project
   (***Obtain from the Owner's Project Manager***)

2. Owner's Master Construction Specifications
   http://www2.mdanderson.org/depts/cpm/standards/specs.html

3. Owner's Computer Aided Design (AutoCAD) Standards
   http://www2.mdanderson.org/depts/cpm/standards/acad.html

4. Owner's Standard Installation Details
   http://www2.mdanderson.org/depts/cpm/standards/details/detail%20index.pdf

5. Owner's HVAC Control Contract Document Requirements including Standard Control Diagrams for Sequences of Operation
   http://www2.mdanderson.org/depts/cpm/standards/bas.html

6. Owner's Integrated Space and Furniture Planning Standards Guidelines
   (***Obtain from the Owner's Project Manager***)

7. Owner's Typical Office Layouts including Mechanical and Electrical Control Location Guidelines (***Obtain from the Owner's Project Manager***)

8. Texas Medical Center Architectural Standards
http://www2.mdanderson.org/depts/cpm/standards/supp_stds/TMC%20Architectural%20and%20Landscape%20Stds%20Mar%2006.pdf

9. Texas Medical Center Stormwater Management Design Guidelines
http://www.texmedctr.tmc.edu/NR/rdonlyres/292FF18E-4D72-4B80-881F-6CD027251F52/0/StormwaterMasterPlan2005.pdf

10. Owner's Interior Finishes Standards
http://www2.mdanderson.org/depts/cpm/standards/interiors.html

11. Owner's Main Campus Elevator Standards
(***Obtain from the Owner's Project Manager***)

12. Small Animal (Rodent) Vivarium Design Guidelines
http://www2.mdanderson.org/depts/cpm/standards/supp_stds/ARSAC%20Design%20Standards.pdf

PART 3 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-18-07	Added Reference to Small Animal Vivarium Standards (2.01, L.)	AG
Rev. 2	01-27-09	Added instructions for obtaining the various additional Owner Furnished Standards and Documents. Added hyperlinks where applicable.	DOS
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z10

Z2005 Codes and Applicable Regulatory Agencies

PART 1 - INTRODUCTION

1.01 OVERVIEW

A. This Section addresses minimum codes, guidelines, regulations and standards that must be appropriately applied in designing facility systems and components.

B. Design MD Anderson construction projects to comply with all applicable codes, guidelines, and standards referenced herein and those not referenced herein that are pertinent based upon Project Scope.

C. The date Owner authorizes the A/E to proceed with the Construction Document Phase of the Project shall determine the applicable edition of an adopted code, regulation, standard, amendment and/or addendum.

D. The A/E shall obtain and become familiar with requirements of Owner's insurance underwriter, and incorporate all applicable provisions into the Contract Documents for compliance.

E. The A/E shall thoroughly and clearly document all project related communications with code and regulatory agents and expediently forward communication documentation to the Owner’s Project Manager.

F. Where the A/E considers that compliance is not possible, the A/E shall communicate such concerns in writing to the Owner’s Project Manager and resolve all non-compliance issues in sufficient time during the design phase of the Project to meet contract schedule obligations.

PART 2 - GENERAL REQUIREMENTS

2.01 CODES AND STANDARDS ANALYSIS

A. The A/E shall prepare a written codes and standards analysis, “Building Code Analysis”, for each Project and submit for review by Owner. Refer to Exhibit 1 “Building Code Analysis Template” (attached).

B. The Building Code Analysis shall provide a side-by-side comparison of listed codes and standards requirements and an indication of which code requirement is being applied to the Project.

C. In the presence of a specific non-life safety conflict between codes, the default is to design to the more stringent or robust code. In the presence of a life safety conflict, follow requirements in 2.03 Life Safety Compliance. These code discussions are to be Project specific and on a point-by-point basis within the codes.

2.02 AUTHORITY HAVING JURISDICTION

A. The State Fire Marshal is the code authority having jurisdiction for all issues pertaining to NFPA 101 Life Safety Codes.

B. The Environmental Health and Safety (EH&S) department of MD Anderson is the local code authority having jurisdiction for all issues pertaining to ADA, TAS, NFPA, and NEC. EH&S will relay any changes in code requirements as mandated by the State Fire Marshal specifically relating to NFPA 101.

C. If local code interpretation for any aspect of the Project is needed, the A/E shall inform Owner of the need for an interpretation and Owner will establish requirements for resolution.

2.03 LIFE SAFETY CODE COMPLIANCE

A. Conflicts between NFPA 101 and other codes shall be resolved according to the following:

1. NFPA 101 supersedes all other codes on fire and life safety issues.

2. If NFPA is silent on the conflict, the issue is to be brought to the Project Management team and EHS, as local AHJ and liaison with the State Fire Marshal's Office for direction on resolution.

B. The Project Architect/Engineer acknowledges that construction projects for the University of Texas MD Anderson Cancer Center must, at a minimum, be designed in accordance with the requirements of National Fire Protection Association (NFPA) 101-2012, Life Safety Code, as currently adopted by the State Fire Marshall, Texas Government Code sec. 417.008(e).

C. Therefore, Project Architect/Engineer affirms that, to the best of his/her professional judgment, knowledge, and belief, the design of this project satisfies the requirements of NFPA 101, Life Safety Code, as well as any other codes or standards made applicable to the project by the professional services agreement.

2.04 APPLICABLE CODES, GUIDELINES, AND STANDARDS

A. Determine applicability of the codes, guidelines, and standards listed herein and identify any and all other pertinent ordinances and assure compliance thereto. As per the A/E's "Building Code Analysis", design and construction shall meet the minimum standards prescribed in all applicable codes and standards, including, but not limited to, the following:

1. 2009 International Building Code

2. 2009 International Mechanical Code

3. 2009 International Plumbing Code

4. 2009 International Fuel Gas Code

5. National Fire Protection Association National Fire Codes, with emphasis on NFPA 101 Life Safety Codes, and all mandatory referenced standards. Attention shall be paid to editions of NFPA codes or standards referenced in other NFPA documents. See Exhibit 2 for further details (attached).

   a. NFPA 101, Life Safety Code, 2012 edition

   b. NFPA 10, Standard for Portable Fire Extinguishers, 2010 edition.

c. NFPA 12, Standard on Carbon Dioxide Extinguishing Systems, 2011 edition.

d. NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems, 2009 edition.

e. NFPA 13, Standard for the Installation of Sprinkler Systems, 2010 edition.

f. NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 2010 edition.

g. NFPA 17, Standard for Dry Chemical Extinguishing Systems, 2009 edition.

h. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, 2013 edition

i. NFPA 17A, Standard for Wet Chemical Extinguishing Systems, 2009 edition.

j. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, 2013 edition.

k. NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2011 edition.

l. NFPA 30, Flammable and Combustible Liquids Code, 2012 edition.

m. NFPA 30B, Code for the Manufacture and Storage of Aerosol Products, 2011 edition.

n. NFPA 31, Standard for the Installation of Oil-Burning Equipment, 2011 edition.

o. NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals, 2011 edition.

p. NFPA 54, National Fuel Gas Code, 2012 edition.

q. NFPA 58, Liquefied Petroleum Gas Code, 2011 edition.

r. NFPA 70, National Electrical Code®, 2011 edition.

s. NFPA 70E, Standard for Electrical Safety in the Workplace, 2009 edition.

t. NFPA 72, National Fire Alarm and Signaling Code®, 2010 edition.

u. NFPA 80, Standard for Fire Doors and Other Opening Protectives, 2010 edition.

v. NFPA 82, Standard on Incinerators and Waste and Linen Handling Systems and Equipment, 2009 edition.

w. NFPA 88A, Standard for Parking Structures, 2011 edition.

x. NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems, 2012 edition.

y. NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems, 2012 edition.

z. NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids, 2010 edition.

aa. NFPA 92, Standard for Smoke Control Systems, 2012 edition.

bb. NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, 2011 edition.

cc. NFPA 99, Health Care Facilities Code, 2012 edition.

dd. NFPA 101A, Guide on Alternative Approaches to Life Safety, 2010 edition.

ee. NFPA 105, Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, 2010 edition.

ff. NFPA 110, Standard for Emergency and Standby Power Systems, 2010 edition.

gg. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems, 2010 edition.

hh. NFPA 170, Standard for Fire Safety and Emergency Symbols, 2009 edition.

ii. NFPA 220, Standard on Types of Building Construction, 2012 edition.

jj. NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls, 2012 edition.

kk. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2009 edition.

ll. NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems, 2012 edition.

6. 2012 Texas Accessibility Standards (TAS), Elimination of Architectural Barriers, Texas Government Code, Chapter 469

7. 2010 ADA Standards for Accessible Design

8. Facility Guidelines Institute (FGI) 2010 Edition of the Guidelines for Design and Construction of Health Care Facilities

9. Title 25 Texas Administrative Code, Chapter 133, Hospital Licensing Rules, (Applicable for all issues not addressed within AIA Guidelines)

10. Title 25 Texas Administrative Code, Chapter 135, Ambulatory Surgical Centers Licensing Rules (Applicable for all issues not addressed within AIA Guidelines)

11. Texas Department of Licensing and Regulation, Elevator Safety and Licensing Health and Safety Code

12. ANSI/ASME A17.1 Safety Code for Elevators and Escalators

13. Texas Natural Resource Conservation Commission Standards

14. ACI - 318, building code requirements for reinforced concrete
15. AISC, Specification for the Design, Fabrication and Erection of Structural Steel
16. SMACNA Sheet Metal Standards
17. ASHRAE Guidelines and Standards
18. Associated Air Balancing Council Standards (AABC)
19. Lightning Protection Institute Standard LP1-175
20. Underwriters' Laboratories Standards
21. Illuminating Engineering Society Standards
22. TIA Telecommunication Industry Association
23. Texas Health and Safety Code, Chapter 372, Environmental Performance Standards for Plumbing Fixtures
24. 10CFR20.1302 Compliance with dose limits for individual members of the public – Gaseous and Liquid Effluent Monitoring
25. City of Houston Codes for connections to municipal domestic water, storm sewer, and sanitary sewer systems
26. Local Utility Regulations (CenterPoint Energy, etc.)
27. Minimum Safety Standards for Natural Gas, Code of Federal Regulations (CFR) Part 192, as required by Title 16 of the Texas Administrative Code
28. Water Conditioning Foundation
29. ANSI/ASHRAE/IESNA 90.1 – 2010
30. Texas Government Code Chapter 447, State Energy Conservation Office (SECO), Section 447.004 Design Standards
31. Water Conservation Standards: Water Efficiency Standards for State Buildings and Institutions of Higher Education Facilities

B. Additional Industrial Hygiene Requirements:

1. Texas Administrative Code Title 25 Part 1 Chapter 297 Subchapter A
2. ASHRAE/ASHE Standard 170, Ventilation of Health Care Facilities
3. ANSI/AIHA Z9.5-2012, American National Standard: Laboratory Ventilation
4. Guidelines for Environmental Infection Control in Health Care Facilities (Center for Disease Control)

C. Additional Environmental Requirements:

1. EMERGENCY GENERATORS, 40 CFR §89.112(a), Table 1
2. Fuel Gas Code (40 CFR 280, 281)
3. SPCC Regulation (40 CFR 112)
4. Regulations of the Department of Health for Dining Service Area (FDA Standards & 25 TAC 229)
5. Water Quality & Service (30 CFR 131, 141, 142 and 30 TAC 290)
6. SWPPP Regulation (40 CFR 122 & TPDES TXR150000)
7. NIOSH, Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks
8. BOILERS, Title 30 of the Texas Administrative Code (30 TAC) § 117.206(c)(1), and all other applicable regulations under 30 TAC § 117.206.
9. SURFACE COATING BOOTHS (for application of surface coatings such as paint or adhesives), Texas Administrative Code (Title 30) 106.433 (6)(A) – (6)(C) and all other applicable regulations under 30 TAC 106.433 or 30 TAC, Chapter 115.
10. ETHYLENE OXIDE (EO) STERILIZATION UNITS, Texas Administrative Code (Title 30) 106.417

D. The Joint Commission:

1. NIOSH, Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks
2. Joint Commission Accreditation Manual for Hospitals, Environment of Care Standards

E. Additional Laboratory Design Requirements:

1. Centers for Disease Control/National Institutes of Health (CDC/NIH) Biosafety in Microbiological and Biomedical Laboratories (BMBL)
2. ANSI Z358.1, Safety Shower and Eyewash Stations
3. ANSI/AIHA Z9.5, Lab Ventilation Requirements
4. ASHRAE 110, Chemical Fume Hood Testing
5. ASHRAE HVAC Applications Handbook, Exhaust Requirements
6. Scientific Equipment and Furniture Association (SEFA) 1.2, Fume Hood Design
7. Scientific Equipment and Furniture Association (SEFA) 2.3, Installation of Scientific Laboratory Furniture and Equipment

8. ACGIH Industrial Ventilation Manual, 21st Edition
9. Safety in Academic Chemistry Laboratories, American Chemical Society, (suggestion for design and use)
10. NIH, National Institutes of Health; Design Policy and Guidelines for Laboratories and Vivariums
11. NIH Guidelines for the Laboratory Use of Chemical Carcinogens, (US DHHS)
12. CDC-NIH Biosafety in Microbiological and Biomedical Laboratories, (US DHHS)
13. Standard Number 49, Class (II) (Laminar Flow) Biohazard Cabinetry. National Sanitation Foundation for Biological Safety Cabinets Standards
14. Prudent Practices for Handling Hazardous Chemicals in Laboratories. National Research Council. National Academy Press.
15. AAALAC, American Association for Accreditation of Laboratory Animal Care
16. ASHRAE Laboratory Design Guide
17. USDA, United States Department of Agriculture, Animal Welfare Act and Amendments
18. National Research Council (NRC) Guide for the Care and Use of Laboratory Animals
19. National Research Council (NRC) Occupational Health and Safety in the Care and Use of Research Animals

F. Regulatory Reference for Radiation Shielding Standards:

1. Shielding for ionizing radiation shall meet requirements as stated in 25 Texas Administrative Code (TAC) 289 and in particular, as applicable, in 25 TAC 289.202, 227, 228, 229, 230, 231, and 232.
2. Shielding calculations shall be performed by or reviewed and approved by a medical physicist licensed by the Texas Board of Licensure for Professional Medical Physicists with a specialty in Medical Health Physics or the applicable specialty of Diagnostic Radiological Physics, Therapeutic Radiological Physics, or Medical Nuclear Physics.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. The final approved Building Code Analysis shall be placed within the Contract Drawings for future reference.

B. The A/E shall familiarize themselves with the codes, guidelines, and standards and incorporate all applicable requirements within Contract Drawings and Specifications.

C. Note that Owner takes various exceptions to the International Plumbing Code and has adopted the more stringent requirements that are included within these Elements and MD

Anderson Master Construction Specifications. These exceptions shall be indicated within the Contract Documents.

D. The A/E shall be required to provide an affirmation statement that the Project is designed in compliance with applicable codes and standards. The following statement shall be located on the Drawing index page or adjacent the Project building code summary:

   1. "Life Safety Code Compliance: The Project Architect/Engineer acknowledges that construction projects for the University of Texas M.D. Anderson Cancer Center must, at a minimum, be designed in accordance with the requirements of National Fire Protection Association (NFPA) 101-2012, Life Safety Code, as currently adopted by the State Fire Marshall, Texas Government Code sec. 417.008(e). Therefore, Project Architect/Engineer affirms that, to the best of his/her professional judgment, knowledge, and belief, the design of this project satisfies the requirements of NFPA 101-2012, Life Safety Code, as well as any other codes or standards made applicable to the project by the professional services agreement.

E. Owner requires the A/E to comply with certain provisions of the local fire department that provides fire protection services for the Institution. These provisions may include locations and dimensions for fire fighting access, including fire lanes; locations and specifications for standpipes, fire hose cabinets, fire control room, and fire hose connections; elevator requirements; and other similar matters.

F. Specific consideration must be given to ANSI/ASHRAE/IESNA Standard 90.1. The Engineer of Record will be required to sign and seal certification that stipulates that the design complies with the requirements of this standard. This written certification with backup documentation must be submitted to Owner at the time of completion of the Construction Documents. Refer to Design Guideline Element Z2010 Design Submittal Requirements, for specific requirements.

G. The A/E must provide a flood elevation certificate and a flood proofing certificate (if applicable) as a deliverable to Owner at the time of Project Substantial Completion.

PART 4 - CODE COMPLIANCE CONFIRMATION REVIEW

4.01 GENERAL

A. Owner will directly contract with an independent, third-party code consultant to perform, document, and submit a Project design "Code Compliance Confirmation Review" at Schematic Design and Design Development phases to ensure compliance with all applicable codes as they apply to a specific Project.

B. This Code Compliance Confirmation Review does not relieve the A/E from complying with all relevant codes and standards for the Project.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 1 – changed the word ‘apply’ to ‘applied’. Part 3 – deleted reference to the Uniform Plumbing Code.	DOS
Rev. 2	12-01-09	Paragraphs 2.03 A & B and 3.01 D.1 - Changed NFPA Life Safety Code edition reference from 2006 to 2009. Deleted exception to Chapter 43 of the 2006 edition of NFPA 101. Paragraphs 2.04 A. 1-4 – Changed International Code edition reference from 2006 to 2009. Paragraph 2.04 A. 5 - Changed National Electric Code edition reference from 2005 to 2008.	DOS
Rev. 3	12-22-09	Paragraph 2.04 A. 6. – Added reference to the 2009 Edition of the Standard for Electrical Safety in the Workplace, NFPA 70E	JD
Rev. 4	02-04-10	2.04 B. 2. Added reference to ASHRAE / ASHE Standard 170	PDN
Rev. 5	03-02-10	1.01 D – Deleted the insurance reference of FM Global. 2.04 A 31 – Added the reference of ANSI/ASHRAE/IESNA 90.1 – 2007.	AGD/DC
Rev. 6	07-08-10	Revised 2.04 A.10: FGI Guidelines replace AIA Health Care Guidelines.	SAK
Rev. 7	08-18-11	2.01 F. – Revised ASHRAE table reference number.	PDN
Rev. 8	09-15-11	2.04 A. - Added references to applicable NFPA Standards.	BG
Rev. 9	01-19-12	2.04 A. – Added SECO and State of Texas reference standards for design.	SAK
Rev. 10	03-15-12	Changed “Building Code Analysis” to “Life Safety Code Analysis” throughout document. Clarified code conflict resolution, paragraph 2.01 C. Added Exhibits 2 and 3.	JM/BG
Rev. 11	03-27-12	Changed “Life Safety Code Analysis” to “Building Code Analysis” throughout document. Clarified code conflict resolution, paragraphs 2.01 C., 2.03 A. and 2.05 A. 5. Deleted the NFPA vs. IBC Code Conflict Resolution Process Flow Exhibit.	JM/BG
Rev. 12	05-17-12	Revised references to TAS and ADA Standards. Paragraphs 2.04 A. 6 & 7.	JC
Rev. 13	11-06-12	Changed NFPA 101 Life Safety Code edition reference from 2009 to 2012 and updated editions of other NFPA codes referenced by NFPA 101. This change affected various paragraphs throughout the document.	DOS
Rev. 14	01-31-13	Added reference to NFPA 20. Paragraph 2.04 5. h.	DOS
Rev. 15	02-26-13	Updated titles of various NFPA documents. Paragraphs 2.04 A. t, aa, cc and ii.	DOS
Rev. 16	08-01-13	Paragraph 2.03 C. - Deleted edition reference for NFPA 101 Life Safety Code.	DOS

END OF ELEMENT Z2005

Exhibit 1

Building Code Analysis [Template]

Project Name:
Institution: The University of Texas MD Anderson Cancer Center
Project Number:

Code/Standards Analysis
Date:
Project Phase:

Applicable Codes:
1. NFPA 101 Life Safety – 2012 Edition
2. International Building Code – 2009 Edition
3. Texas Accessibility Standard
4. etc.

Note: The code requirements selected as the basis for design are bolded.

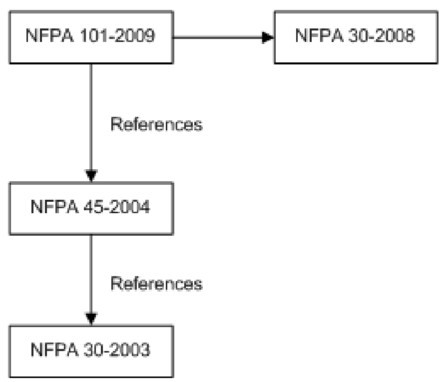
	Code Issue	NFPA 101	IBC
1	Occupancy Classification		
	1. Offices and college classrooms with less than 50 occupants	Business 6.1.2.2	Group B 304
2	Construction Classification		
	1. Main Building	Not addressed	Type IIA 403.3.1
3	Stairwell Pressurization	Not required	1005.3.2.5
4	Distance between exits	250 feet if sprinklered	250 feet if sprinklered
5	Etc.		

Exhibit 2

Referenced Codes within NFPA

In effort to keep NFPA codes and standards within a reasonable size, NFPA uses Chapter 2 of many of its publication to reference other regulatory publication including other NFPA documents. When referencing these publications the user must pay particular attention to the publication edition referenced in the document they are currently reviewing.

For Example:



The above graph illustrates the following: A code trace beginning in NFPA 101 that leads you to NFPA 45-2004 which then would references NFPA 30-2003 out of NFPA 45-2004. While a code trace from NFPA 101-2009 directing you to NFPA 30 would be the 2008 edition of NFPA 30 not the 2003 edition of NFPA 30.

PART 1 - GENERAL

1.01 OVERVIEW

A. The Table identified in Part 2 of this document summarizes A/E deliverables and minimum level of information to be depicted on construction documents at 100 percent submission of Schematic Design, Design Development, and Construction Document phases of design. Information is organized by building system or component. Each submission shall be accompanied by a sign-off from the consulting firm(s) indicating the organization has performed an in-house review of the submission.

B. Design Development and Construction Document Phase deliverables noted in the Table are in addition to items in previous stages of design (which are to be further developed during the indicated Design Phase). Depending on project requirements, Construction Document Phase deliverables may require interim reviews as directed by the Owner.

C. Each Design Phase or progress submittal is a continuation of design.

D. Written responses to all previous design review comments shall be made in sufficient detail for verification purposes, such as locations of revised details, specification sections, and updated drawing numbers. Generic responses such as “will comply”, “will add” or “will incorporate” are not acceptable.

1.02 DESIGN/BUILD AND CONSTRUCTION MANAGER-AT-RISK DELIVERY

A. Owner may elect to stage or “fast-track” portions of the work. If the Owner elects to implement the Project in stages, the A/E will submit the design for Owner review in several procurement packages that may encompass multiple building components.

B. Design Phase deliverables for each procurement package will be identified within the A/E Work Plan.

PART 2 - TABLE: DESIGN PHASE DELIVERABLES

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
GENERAL REQUIREMENTS THAT APPLY TO ALL SYSTEMS	1. Complete Design Intent Document. 2. Written statement of review of Owner's Design Guidelines and list of potential non-compliance issues. 3. Pending Issues Report. 4. Studies and technical evaluations. 5. Energy code requirements. 6. Value engineering suggestions and resolution. 7. Description of construction phasing with supporting work scope.	1. Updated Design Intent Document. 2. Written response to Schematic Design Submittal comments. 3. Written statement of additional information required from Owner. 4. Updated Pending Issues Report. 5. Updated description of construction phasing. 6. Description of any proposed occupancy within construction area. 7. Room data sheets in electronic format for each unique room or space to include at a minimum: a. Room layout. b. Equipment. c. Furniture. d. Finishes. e. Lighting layout. f. MEP devices. g. Telecommunications devices. 8. Upon request, manufacturer's data on proposed systems and/or materials.	1. Updated Design Intent Document. 2. Written response to Design Development Submittal comments. 3. Written statement of additional information required from Owner. 4. Updated Pending Issues Report. 5. If multiple bid packages, clear indication of scope of each release. 6. Identification of construction phasing, including temporary requirements during each phase. 7. Address complete scope of work with regard to construction methods and details, quantities, materials, and performance. 8. All room names and numbers. 9. Equipment designated with unique identifier per Design Guideline Element Z2011. 10. A/E professional licensing seals on Drawings and Specifications with date and signature. 11. Energy Design Compliance Certification Forms for SECO.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
LIFE SAFETY	1. Building Code Analysis: separate report submitted to Owner's Environmental Health and Safety department and with Schematic Design Submittal. 2. Include applicable codes, construction types, occupancy types, travel and dead-end corridor limits, etc. 3. Show an item-by-item comparison between NFPA 101 and IBC.	1. Building Code Analysis integrated into Design Development drawings as a separate sheet. 2. Life Safety Plans: one plan for each floor at Core/Shell and Interior Build-out Phase. 3. Show fire walls, smoke walls, smoke compartments and size, exits, horizontal exits, exit passageways, required occupancy separations (if not using mixed occupancies), occupant loads, and comparison to exit capacities. 4. Interim Life Safety Plans: floor plan drawings showing life safety features during construction, including but not limited to: temporary construction walls, ratings of walls (fire/smoke), sprinkler response, how exiting will be affected inside and outside the construction site. 5. UL design numbers for floors, roofs, walls, columns, beams, joints at head and base of walls, etc. Some reinforced concrete installations may require excerpts from IBC equivalency tables to show hourly rating.	1. Building Code Analysis updated if necessary and submitted with the Construction Documents as a separate drawing. 2. Updated Life Safety Plans. 3. Updated Interim Life Safety Plans. 4. Reproductions of all UL design drawings used on the Project. Including those for penetrations of floors, walls and roofs, as well as for joints within walls and at head/base of walls.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
PROJECT SPECIFICATIONS MANUAL - APPLIES TO ALL SYSTEMS	1. Table of Contents for proposed specification sections. 2. Identify specification sections that are to be created by A/E.	1. Specifications for all systems materials and equipment complete in final mark-up form. Specification sections created by the A/E and changes to Owner's Master Construction Specifications by A/E in electronic red-lined format (tracked changes). 2. Final editing can be delayed until construction document submittal. Refer to Design Guideline Element 2010 - Instructions for the Preparation of Project Manuals.	1. Complete project specifications including front end documents to be printed in accordance with project delivery method.
STRUCTURAL	1. Drawings indicating proposed foundation design and structural framing system. 2. Synopsis of design parameters. 3. Soil retention work, if needed.	1. Foundation plan, typical floor framing plan, and roof plans. 2. Show main structural members, preliminary sizes, and approximate reinforcing quantities. 3. Indicate recessed areas in slabs, major openings, elevator and sump pits. 4. Indicate subsurface drainage system if required. Coordinate with civil and plumbing engineers. 5. Provide typical details including; pier layout, lateral bracing and framing details.	1. Definition of control joints. 2. Beam, column and slab schedules. 3. Mechanical and electrical concrete housekeeping pads. 4. Foundation details. 5. Structural details. 6. Structural notes. 7. Calculations per Design Intent Document requirements. 8. Plan load maps indicating live loads and dead loads that require special consideration. 9. Post-construction penetration guidelines where structural penetrations are allowed.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
STRUCTURAL (Cont'd)		6. Show locations and heights of soil retention systems. 7. Provide preliminary structural demolition drawings if required. 8. Framing plan(s) at unique features. 9. Structural sections.	
BUILDING EXTERIOR ENVELOPE	1. Site plan indicating project location, building footprint, adjacent structures, access, and proposed site improvements. 2. Fenestration layout. 3. Material designations. 4. Overall building cross-sections. 5. Roof layout. 6. Exterior elevations, building profile section showing floor-to-floor dimensions, ground floor topographic elevation. 7. Renderings in color or a model if authorized.	1. Complete code review: Occupancy Classification; Construction Type; Fire Protection Systems. 2. Site conditions and constraints, survey, sub-surface conditions, existing structures and improvements, demolition. 3. Special design criteria such as acoustics, environmental, transportation, security. 4. All building elevations with dimensional heights and materials indicated. 5. Typical exterior wall sections. 6. Parapet and coping details. 7. Roof and drainage plan; with storm drains and roof slopes. 8. Description of water and vapor characteristics of roof and exterior walls. 9. Details of unique features. 10. Expansion joint locations. 11. Large scale building cross-	1. Roof-mounted equipment. 2. Roof details for Owner approval. 3. Exterior details. 4. Exterior door details. 5. Typical window details. 6. Flashing details. 7. Control joint definition and details.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
BUILDING EXTERIOR ENVELOPE (Cont'd)		sections. 12. Deviations from underwriter's standards for Owner approval. 13. Proposed basement waterproofing system.	
BUILDING INTERIOR	1. Typical floor plans (minimum 1/8" scale) with legends. 2. Selected critical areas (identified by Owner) to be shown in a larger scale. 3. Demolition. 4. Area use identification and area in square feet. 5. Mechanical, electrical and other service closets and rooms. 6. Circulation paths. 7. Area tabulations compared to program requirements. 8. Show flexibility for expansion and alterations. 9. Preliminary layout of major spaces with fixed equipment.	1. All floor plans (minimum 1/8" scale) with room names. Owner will assign room numbers. 2. Enlarged plans at stairs and elevators. 3. Enlarged plans at toilet rooms. 4. Reflected ceiling plans indicating light fixtures and devices that impact design and coordination. 5. Wall types, fire ratings, smoke control zones. 6. Interior wall sections. 7. Plan to address existing hazardous materials, if applicable. 8. Fixed seating. (Indicate compliance with Program and room-type space requirements). 9. Defined seating, serving, and kitchen facilities. 10. Moveable equipment and furniture layouts meeting final Program requirements. 11. Important interior elevations. 12. Details of unique features.	1. Dimensioned floor plans. 2. Enlarged plans. 3. Partition details. 4. Interior details. 5. Interior elevations; include mounting height of casework or equipment where necessary. 6. Finish schedules. 7. Door and hardware schedules. 8. Room signage. 9. Schedule of proposed movable equipment that is not indicated on documents (for reference). 10. Schedule of lab fixtures (turrets, etc.), if applicable. 11. Dimensioned installation details of firestopping for wall and floor penetrations. 12. Dimensioned installation details of watertight for floor penetrations.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
BUILDING INTERIOR (Cont'd)		13. Details of fixed equipment. 14. Preliminary finish schedule. 15. Preliminary door schedule. 16. Color selections for specified materials. A/E's recommendations for color selections shall be reviewed with and approved by Owner's Planner/Designer assigned to the Project. 17. Preliminary overlays of ceiling and wall devices for coordination with furniture layout, including but not limited to: light fixtures, strobes, fire alarms, telecommunications, temperature sensors, electrical outlets, etc.	
CONVEYING	1. Elevator location(s). 2. Equipment room location(s). 3. Elevator study to confirm quantity, capacity, size, and speed of elevators.	1. Elevator shaft section. 2. Equipment description.	1. Dimensioned plans. 2. Sections and details of hydraulic cylinder, if applicable. 3. Description of shaft sump pit(s). 4. Elevator car and equipment support details. 5. Description of controls and fixtures. 6. Door and frame details. 7. Interior details including lighting.
FIRE SUPPRESSION		1. Drawings: Refer to Elements D – Services, for Special Contract Document Requirements for	1. Completed Design Intent Document. 2. Completed piping schematics and riser diagrams.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
FIRE SUPPRESSION (Cont'd)		each system. Submit preliminary piping schematics and riser diagrams to illustrate system design intent. 2. Upon request, manufacturer's data on proposed systems, materials, and/or equipment.	3. Installation details. 4. Completed plans. 5. Completed equipment schedules.
PLUMBING	1. Identify all systems. 2. Floor plans showing location of major equipment and risers. 3. Exterior equipment locations.	1. Descriptive Literature: Provide catalog data cut-sheets for all proposed fixtures and equipment. 2. Drawings: Refer to Elements D – Services, for Special Contract Document Requirements for each system. Submit preliminary piping schematics and riser diagrams to illustrate system design intent.	1. Completed Design Intent Document. 2. Completed piping schematics and riser diagrams. 3. Installation details. 4. Completed plans. 5. Completed fixture and equipment schedules.
HVAC	1. Identify all systems. 2. HVAC floor plans showing location of major equipment and risers. 3. Exterior equipment locations. 4. Location of utility sources and characteristics. 5. Air intake and discharge locations. 6. Special occupancy	1. Material and equipment legend, symbols, abbreviations. 2. One-line diagrams and other materials as required describing the fundamental design concept for all HVAC systems. 3. Indication of the amount of redundancy for all major pieces of mechanical equipment, e.g. "two pumps 100 percent capacity each". 4. Overall building air flow diagram indicating air handlers, exhaust	1. HVAC systems drawn to scale including all ductwork in double-line format with fittings. 2. One-line flow diagrams for applicable systems: chilled water, heating hot water, steam, condensate, etc. 3. Floor plans with all components and required service access areas drawn to scale. On the plans, indicate duct sizes and air flow quantities relative to each room, including CFM in and out of all doors. Indicate location of control panels.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
HVAC (Cont'd)	zones. 7. Preliminary flow diagrams.	fans, duct risers, and duct mains. 5. Location, size of fume hoods and assumed VAV diversity; BSC types and count. 6. Plans indicating chase and riser locations. 7. Equipment schedules for major equipment. 8. Installation details, but not necessarily complete. 9. Equipment layout and locations with enlarged quarter scale mechanical plan(s). Indicate service clearances for all equipment, including coil pull space for air handling units. 10. Plans shall indicate egress route for large equipment, including height requirements. 11. Main supply/return ductwork shown in double line format, location of terminal units, temperature sensors. Show major taps and splits, duct sizes. 12. Ductwork downstream of terminal units shown in single or double line format, not sized 13. Air devices shown but not sized. 14. Single line duct riser diagrams for each HVAC system; show all	4. Location, size of fume hoods and assumed VAV diversity; BSC types and count. 5. Laboratory air valves; provide a schedule that indicates the control sequence that applies to each room (room number, room descriptor, control sequence number). 6. Detailed floor plans of mechanical rooms with all components and required service access areas drawn to scale. 7. Cross-sections through mechanical rooms and areas where there are installation/coordination issues (tight space, zoning of utilities). Indicate required service access areas. 8. Denote all valves requiring chain operators. 9. In common mechanical space, indication of space zoning by system. 10. Equipment schedules complete with performance characteristics. 11. Equipment details, including structural support requirements. 12. Penetration details. 13. Installation details. 14. Duct construction schedule (on the Drawings), indicating materials and pressure class for each duct system. 15. HVAC load calculations and economic

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
HVAC (Cont'd)		associated equipment, duct sizes, CFM quantities in each branch take-off, volume dampers, control, isolation dampers and fire/smoke dampers. 15. Flow diagrams for each piping system; show all associated equipment, valves, direction of flow, pipe sizes and gpm flow rates. 16. Show cross-section of ceiling plenum, space required for special laboratory services, piping, ductwork, etc.	evaluations in electronic format.
INTEGRATED AUTOMATION	1. Preliminary written sequences of operation for fire suppression, plumbing and lab/medical gas systems, HVAC, and electrical systems.	1. Sequence and Control Diagrams for all systems. 2. Description of major sequences of operation on the Drawings. 3. Smoke control scheme.	1. Final controls drawings, including clear differentiation of trade responsibility for control, fire, and control power wiring. 2. Points list on the Drawings. 3. Detailed sequences of operation on the Drawings.
ELECTRICAL POWER DISTRIBUTION	1. Electrical room locations. 2. Electrical legend. 3. Site plan showing location of utility source and characteristics.	1. Material and equipment legend, symbols, abbreviations. 2. All background sheets (floor plans) with scale, north arrow, column lines and room numbers. 3. Electric service location, substations, vault, etc.	1. Site plan with all services detailed. 2. Complete one-line diagrams with sizing of protection, transformers, and feeders for final horsepower selections. 3. Building electrical load analysis. 4. Panel schedules fully populated with

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
ELECTRICAL POWER DISTRIBUTION (Cont'd)	4. Floor plans (1/8" scale) showing switchgear, primary equipment that requires power such as pumps and air handling units, and emergency generator locations.	4. Exterior equipment locations. 5. Preliminary (normal, emergency) power riser and one-line diagram. 6. Grounding riser diagrams. 7. List of equipment on emergency power. 8. Emergency generator layout and fuel tank. 9. Equipment layout/sizes, with receptacles shown on power plans. 10. Panel locations/ schedules. 11. Building electrical load analysis per NEC requirements. 12. Uninterruptible power supply systems, location and risers. 13. Power quality criteria, THD and use of TVSS.	load summary. 5. Details of power service to building. 6. Power plans, including power cable trays (as applicable), electrical loads, special and duplex receptacles, and circuiting with furniture backgrounds shown (greyed-out) to show coordination with furniture. 7. Enlarged equipment room plans where required. 8. Plans and details of emergency power generation system and controls. Generator-set sizing calculations. 9. Connections to other building systems, including fire alarm and HVAC systems. 10. Details of special terminal devices, feeders, and special branch circuits. 11. General notes on conduit and wire sizes for 20 amp single phase branch circuits. 12. Grounding details. 13. MCC details. 14. Penetration details. 15. Short circuit calculations. 16. Overcurrent protection device coordination study. 17. Equipment arc flash hazard analysis. 18. Plan for temporary power during construction. 19. Complete (normal, emergency) power

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
ELECTRICAL POWER DISTRIBUTION (Cont'd)			riser and one-line diagram with sizing of protection, transformers and feeders for final horsepower selections.
LIGHTING	1. Preliminary lighting levels in footcandles for typical rooms.	1. Typical lighting plans (1/8" scale). 2. Fixture/switching layout. 3. Preliminary lighting fixture schedule. 4. General light fixture descriptions. 5. Schedule with typical room average maintained design footcandle levels that support ASHRAE/ANSI 90.1, including maximum Watts per square foot limitation. 6. Footcandle calculations for typical rooms with indirect lighting that establishes maximum ceiling uniformity ratio in accordance with IESNA recommendations.	1. Lighting plans, including control devices, switching, and circuiting. 2. Control diagrams. 3. Installation details, including structural support requirements. 4. General notes on conduit and wire sizes for all lighting branch circuits. 5. Complete lighting fixture schedule. 6. Lighting energy compliance form.
FIRE ALARM		1. Preliminary riser diagram. 2. Fire alarm zones. 3. Smoke zones. 4. Panel locations. 5. Preliminary input/output fire alarm operation sequence matrix.	1. Device locations with furniture backgrounds shown (greyed-out) to show coordination with furniture. 2. Indication of connection to fire alarm, HVAC and central campus monitoring systems. 3. Installation details. 4. Complete riser diagram.

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	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
			5. Complete input/output fire alarm operation sequence matrix.
TELECOMMUNICATIONS	1. Building and local distribution description. 2. Telecommunications room locations and sizes (Main Distribution and Intermediate Distribution Rooms).	1. Riser diagrams. 2. Voice/data utility outlet locations. 3. Conduit and cable tray plans. 4. Description of audio/visual systems. 5. Audio/visual equipment locations (indicate hangers, cabinets and connection boxes).	1. Communications plans that indicate: a. Location of all voice, data and video outlets with furniture backgrounds shown (grayed-out) to show coordination with furniture. b. Location of all MDR's and IDR's, with rack locations, rack elevations, cable trays and wall penetrations. c. Location of all wall mounted equipment with front view details. d. Detailed riser diagram for fiber and copper risers for data, voice and UTTV. e. Detailed cable tray layout for communications cabling distribution from MDR/IDR to work stations. 2. Details of telecommunications service to building. 3. Backboard layout and connection diagrams. 4. Cable schedule. 5. Connection details. 6. Structural support requirements. 7. Audio/visual equipment list.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
			8. Audio/visual system riser diagram(s).
SECURITY	1. Location of room(s) to house security equipment; coordinate with telecommunications equipment. 2. Narrative of security features and concept of security operations – physical, electronic systems, and staffing; site circulation controls; pedestrian circulation controls; deliveries/mail handling; loading dock security; lobby/security functions; head-end location/space requirements. 3. Connectivity method for centralized monitoring to UTPD Police Command Center (PCC) and Remote Command Center (RCC).	1. Updated narrative of security features and concept of operations. 2. General security / video surveillance system description and concept diagrams. 3. General description of card access system and combination door lock system. 4. Video surveillance system riser diagrams. 5. Access control system riser diagrams. 6. Security equipment locations. 7. Card access equipment closet layout and elevations. 8. Floor plans identifying egress paths to ensure that card readers do not impede emergency exiting. 9. UTPD Hub Room layout. 10. Security Equipment Schedule templates including: card readers, alarm points, control points, equipment racks/cabinets, security communications, cameras, video	1. Riser diagrams and overall concept diagrams. 2. Equipment room layout and security backboards and equipment rack/cabinet elevations. 3. Concealed and exposed raceways. 4. Installation details. 5. Door Details - show the conduit in the walls and the particular equipment to be installed on the door. Indicate one door type for every type of hardware proposed in the project. 6. Floor plans illustrating locking hardware type at each door location. 7. Show fiber paths from the project/building to the UTPD Police Command Center and Backup PCC Room for the video surveillance system. 8. Device numbering shown on floor plans, consistent with UTPD naming conventions. 9. Sequence of operations for security doors under normal condition, emergency power condition, and fire alarm condition. 10. Final door schedule with card readers,

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	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
SECURITY (Cont'd)	4. Special security construction aspects. 5. Tiers of security, i.e. building perimeter, interior floor perimeter ring, departmental suite security ring.	recording equipment, fiber optic transmission equipment. 11. Future expansion capacity. 12. Preliminary door schedule with card readers, alarm types, fire alarm interface, and access control hardware identified per Element D5038. 13. Security device legend. 14. Guard desk layout and equipment functionalities. 15. Security-related data network and telecommunications requirements. 16. Heat and power load calculations.	alarm types, fire alarm interface, and access control hardware identified per Element D5038. 11. Camera locations in reflected ceiling plan. 12. Camera angles on floor plans with designated zone of interest/target area. 13. Completed Security Equipment Schedules with total device counts, including native Excel spreadsheets for subsequent UTPD use. 14. Security device legend. 15. Security device termination closet assignments. 16. Identify all interface points with work of other disciplines, including, but not limited to, elevator controls, fire alarm, network switches, parking /gate controls, etc. 17. Identify list/quantity of IP address needs for all security equipment and coordinate with MD Anderson IT. 18. Submit video recording calculations. 19. Updated guard desk layout and equipment functionalities. 20. Security-related data network and telecommunications requirements. 21. Updated heat and power load calculations.

BUILDING COMPONENT	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENT PHASE (May require interim reviews)
	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
EXTERIOR IMPROVEMENTS / LANDSCAPING	1. Design concept plans.	1. Planting plan with complete hierarchy of plant materials, shown and identified. 2. Landscape layout identifying and locating accessories such as seating, trash receptacles, tables, tree grates, fountains, etc. 3. Landscape lighting if applicable. 4. Proposed grading. 5. Identify hardscape materials. 6. Show irrigation diagrammatically in terms of number of zones and type of components (sprays on risers, pop-up sprays, rotary heads, drip, etc.).	1. Existing tree protection. 2. Soil preparation and planting specifications. 3. Guying diagrams. 4. Piping diagrams. 5. Pipe sizes. 6. Landscape and irrigation details and legends.
CIVIL / SITE UTILITIES	1. Site plan(s), to include the following: a. Existing conditions. b. Demolition. c. Building outline(s). d. Future expansion. e. Site entrance. f. Roads and driveways. g. Parking locations. h. Pedestrian circulation. i. Utility requirements.	1. Drawings shall include pipe sizes, invert elevations, materials, location and description of manholes, bedding and installation details, large scale drawings of curb and gutter, and thrust blocks. 2. Utility plans with connections to utility sources, elevations and details. 3. Show all existing utilities and utilities provided by other design disciplines, municipalities and utility companies for coordination purposes. (i.e., electrical service,	1. Extent of construction area. 2. Area traffic plan, if existing roads/walks are impacted. 3. Site development phasing. 4. Construction site access. 5. Staging area. 6. Construction signage. 7. Site details, including hardscape. 8. Final pipe sizes. 9. Connection details. 10. Photometrics of proposed site lighting. 11. Protection requirements for construction, plantings that remain.

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	DESIGN SUBMITTAL TO ALIGN WITH A/E WORK PLAN		
CIVIL / SITE UTILITIES (Cont'd)	j. Site utilities. k. Preliminary grading plan. l. Storm water strategies. m. Relationships of all proposed work to existing site survey.	telecommunication service, natural gas service, water service, sanitary service, TECO utilities, etc.). 4. Proposed grading contours with applicable spot elevations, meters, drain inlets, manholes and other related structures. 5. Identify all hardscape materials within scope of civil work. 6. Show temporary storm water runoff and containment to meet applicable standards. 7. Verify and identify all easements and property lines. 8. General dimensions and elevations. 9. Permanent exterior signage. 10. Parking/roadway plans and elevations. 11. Vehicle and pedestrian traffic controls (if required). 12. Site lighting plan. 13. Sanitary sewer flow calculations. 14. Plan to address existing hazardous/contaminated materials, if applicable. 15. Dewatering plan. 16. Stormwater Pollution Prevention Plan (SWPPP).	

PART 3 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	03-02-10	Initial Adoption of Element. Renumbered and renamed Element from Z2010 Design Submittal Requirements; added section within Table on Life Safety; additional revisions throughout Table.	SAK
Rev. 1	07-08-10	HVAC: added preliminary flow diagrams at Schematic Design Phase; Integrated Automation: clarified requirement to address MEP systems, not just HVAC.	SAK
Rev. 2	08-12-10	Life Safety: added UL design numbers and design drawing requirement; Building Interior: added installation details for firestopping.	SLH, JD
Rev. 3	09-16-10	Added design submittal requirements for security systems; added requirement to submit HVAC load calculations and economic evaluations.	MCM, SAK
Rev. 4	03-31-11	Added requirement for U.L. documentation for wall joints to Life Safety schedule.	JC
Rev. 5	05-24-12	Updated security system deliverables with door schedule requirements for security interface.	MCM

END OF ELEMENT Z201001

PART 1 - GENERAL

1.01 OVERVIEW

A. As part of each Design Phase deliverable for all new building construction, building expansions and additions, and major renovation projects, the A/E shall furnish a document titled “Design Intent Document” that describes the complete architectural and engineering design intent for the Project including design guiding principles, assumptions, issues, recommendations, and narrative assessment of the architectural and infrastructure systems .

B. Develop the Design Intent Document on a system-by-system basis, preferably in order by UNIFORMAT II classification, using a consistent style for each system.

PART 2 - DESCRIPTION

2.01 DOCUMENT PURPOSE

A. The purpose of the Design Intent Document is to establish early agreement between the A/E and Owner as to overall design approach and detailed design assumptions. This document shall address in written, narrative form, all assumptions and reasoning behind decisions made during the Design phases and provide a final assessment of all architectural and infrastructure systems. The A/E shall address site and building components relevant to the Project.

B. The Design Intent Document shall identify and justify all proposed exceptions to materials, equipment, products and methods listed within Owner’s Master Construction Specifications and the Owner’s Design Guideline Elements.

C. In developing the Design Intent Document, the A/E with Owner’s input, must thoroughly consider all design criteria and operational parameters during each Design Phase and document the agreed-upon results. Deviations from design criteria and operational parameters accepted during the Bidding Phase must be recorded at the end of Bidding and incorporated into the Design Intent Document.

D. The Design Intent Document will be used as a permanent reference regarding the operating sequences and design parameters for the facility, will be used during the commissioning process, and will be used as a reference for future renovation work throughout the life of the facility.

E. When renovating building areas and/or tying into existing systems:

1. Verify and demonstrate that the existing systems/structures have sufficient capacity to serve/support the new work.

2. List all existing major building components, materials, equipment and systems proposed to be reused or salvaged.

2.02 DOCUMENT PREPARATION

A. The Design Intent Document shall be created and submitted as a “stand alone” document along with the other Design Phase Deliverables and shall not be incorporated as part of the Project Manual. The final approved Design Intent Document shall be provided to the Owner in electronic format at completion of services.

B. The Design Intent Document shall be updated as the project goals and requirements are expanded and defined, and submitted at the end of Schematic Design, Design Development, and Construction Document phases. Each update shall incorporate new and revised information resulting from:

1. Changes in Project Scope
2. Code interpretations
3. Owner input
4. Utility provider input
5. Municipality input
6. Owner’s Underwriter input
7. Design coordination meetings
8. Test reports on existing conditions
9. Design calculations
10. Equipment selections
11. Soils, sound, effluent, vibration, structural, wind tunnel, and other studies
12. Project budget adjustments
13. Project schedule/phasing
14. Constructability issues

C. To facilitate the production of an “as-built” Design Intent Document, the Project Team shall identify changes during construction that impact the Construction Document Phase Design Intent Document and notify the Owner's Project Manager accordingly. When revisions to construction documents are issued, their authors shall include a communication labeled “Impact on Design Intent”. At the conclusion of the project, the Owner may elect to have the Construction Document Phase Design Intent Document updated with as-built information. The means and methods for this as-built update shall be negotiated by the Owner on a project-by-project basis.

PART 3 - CONTENT

3.01 OVERVIEW

A. The Design Intent Document must address the following areas of design as a minimum and as applicable to the Project. Include additional descriptive information that the A/E deems pertinent or helpful for the Owner to understand, operate and maintain the installed systems.

3.02 ARCHITECTURAL AND GENERAL CONSTRUCTION

A. Occupancy classification, fire resistance rating, and construction type.

B. Describe materials for all major items of construction and all interior and exterior finishes.

C. Describe any special construction features incorporated into the facility.

D. Floor load assumptions.

E. Compliance with acoustical and vibration requirements. List areas of high noise and vibration and acoustic design principles applied. State if an acoustical consultant is required for the Project. Provide noise criteria and acoustic assumptions and calculations.

F. Fire and life safety considerations and fire zoning rationale.

G. Assurance that equipment of more than one manufacturer can be accommodated in designated equipment rooms and that adequate space for access, maintenance, repair, and removal of equipment is planned.

H. Statement of coordination verifying that all ductwork, piping, conduit, lighting, raceways, and other above-ceiling items will fit at the stated height above the finished floor and that these building systems have been coordinated with the architectural and structural design documents.

3.03 STRUCTURAL SYSTEMS

A. Describe proposed foundation design and structural framing system and alternatives considered. Provide a summary of why the selected system was chosen over the alternatives. Provide a preliminary cost estimate of each alternative structural system considered and identify time of construction for each alternative. This will allow Owner to make structural system selections based on engineering and economic factors.

B. Brief description of structure:

1. Building functions.

2. Number of floors, floor-to-floor height.

3. Building height.

4. Exterior walls, interior partitions.

5. Overall building dimensions and frequency of expansion joints including those at exposed exterior building components.

6. Unusual design features.

C. Structural System Selected:

1. Describe the floor and roof structural systems.

2. Discuss reasons for selection of systems. This should include comments on system economics as opposed to other types, unusual spans and loads, fireproofing and any other factors governing selection of structural system.

D. Stress Distribution in Frame:

1. Give a brief statement of method of distributing loads and moments throughout frame.

2. Discuss method of distributing wind loads. Wind loads must be taken to the integral parts of the structure.

E. Structural Analysis and Proportioning Members:

1. State method of stress analysis (i.e. working stress, ultimate strength).

2. List codes, standards and pertinent references to be used as criteria for sizing members.

3. Give class and strength of structural materials to be used per Design Guideline Element Z2015 – Structural Criteria.

4. Major analysis and design assumptions shall be briefly described in the “Structural Notes” on the Drawings.

F. Design Loads:

1. If the A/E believes that the Project is of a nature where there could be changes in function and therefore changes in stiffners criteria or increases in future applied loads, then the A/E should inform Owner. A live load schedule can then be determined to fit the specific requirements of the structure.

2. Floor design live loads; uniform and concentrated.

3. List roof loads.

4. List wind loads.

G. Foundation Design:

1. Description of foundation conditions, type of foundation to be used, method by which the allowable bearing values are to be determined, and maximum allowable bearing capacity for the foundation.

2. As soon as soils investigations have been completed, provide detailed descriptions of foundation type and soils capacities actually used in sizing foundation members. State anticipated settlements if known.

3. Discuss waterproofing below grade if required, and method of removing water at exterior walls and under ground level slab.

4. Discuss lateral load assumptions at below grade locations.

5. Discuss unusual foundation and shoring problems due to nature of soils, proximity of adjacent structures, etc.

H. Upon request by Owner, provide one (1) copy of sample design calculations of representative floor, roof, column and wall elements and any other structural member requested. Sample calculations and design assumptions shall be presented in a manner that can readily be followed. Members shall be cross-referenced to plans and details with number system that permits easy identification of the member and its location in the structure.

I. Furnish sample structural design calculations for a typical interior and exterior bay from roof through foundation. Sample calculations shall show:

1. Unit dead loads with partitions load assumptions.

2. Unit live loads with sustained load assumptions and reduction factors.

3. Deflections. Show justification for long and slender members.

4. Ponding.

5. Vibration considerations where applicable.

J. Furnish additional calculations showing any unusual problems encountered involving cantilevers, torsions, foundation walls, shoring, etc.

K. Review the possibility of loads due to specialized equipment with the A/E team and Owner.

3.04 FIRE SUPPRESSION SYSTEMS

A. Describe type(s) of standpipe, sprinkler and gaseous extinguishing systems to be used and note locations to be protected by each type of system. Qualify all demands proposed for redundancy, safety factor and/or future expansion.

B. Identify hazard classifications of occupancy and applicable code references.

C. Describe location and capacity of source for each system.

D. When tying into existing systems:

1. Verify and demonstrate that the existing systems have sufficient capacity to support the new work.

2. List all existing major equipment or systems to be reused or salvaged.

E. Water supply available at point of connection (static pressure and residual pressure at design flow). This data must be based on flow tests taken at or near the point of connection.

F. Describe fire pump operating parameters.

G. Approximate water demand for wet systems.

H. Statement of adequacy / inadequacy of water supply and planned upgrades by local utility, if any.

I. Identify and justify all proposed exceptions to materials, equipment, products and methods, listed within Owner's Master Construction Specifications.

J. Identify and justify all proposed exceptions to the Owner's Design Guidelines.

K. Calculated design loads for all systems. Provide calculations used for sizing equipment and piping. Identify and include values for estimated diversity, safety factor, future demands and redundancy.

L. Include additional descriptive information that the A/E deems pertinent or helpful for the Owner to understand, operate and maintain the installed systems.

3.05 PLUMBING SYSTEMS

A. Description of all proposed systems and components summarizing design intent and functioning. Include all performance criteria and parameters. Qualify all demands proposed for redundancy, safety factor and/or future expansion.

B. Describe location and capacity of source for each system.

C. When tying into existing building systems:

1. Verify and demonstrate that the existing systems have sufficient capacity to support the new work.

2. List all existing major equipment or systems to be reused or salvaged.

D. Estimated maximum and minimum water pressure at the building service entrance and indication if booster pumping will be required.

E. Type, size, and design of all domestic water heating equipment and distribution system.

F. Design temperature of domestic hot water distribution system and method of recirculation within the building. Clarify how prevention of scalding and Legionella is incorporated.

G. Describe all water and energy conservation aspects incorporated into the design of the various systems.

H. Identify and justify all proposed exceptions to materials, equipment, products and methods, listed within Owner's Master Construction Specifications.

I. Identify and justify all proposed exceptions to the Owner's Design Guidelines.

J. Calculated peak design loads for all systems. Provide calculations used for sizing equipment and piping. Identify and include values for estimated diversity, safety factor, future demands and redundancy.

K. Include additional descriptive information that the A/E deems pertinent or helpful for the Owner to understand, operate and maintain the installed systems.

3.06 HVAC AND INTEGRATED AUTOMATION SYSTEMS

A. State Energy Code Compliance; ANSI/ASHRAE/IESNA 90.1.

B. Indoor and outdoor design conditions, all seasons.

C. Interior design conditions, temperature and humidity, by room type.

D. Identify special humidification or de-humidification requirements.

E. Description of systems and components and why selected system is preferred over other types considered.

F. Air distribution zoning rationale.

G. Ventilation strategies, requirements and calculations. Indicate outside air quantity per person and per square foot, in all areas. Indicate type of filtration, including any special filtration requirements to meet air quality criteria.

H. Heating and cooling load calculations with assumptions, diversity, spare capacity and that include building envelope and supply and return air quantities (CFM); steam, hot and chilled water flows and line sizes. Include minimum air change rates per room type. Include equipment loads (Watts per square foot) and diversities assumed for HVAC system sizing.

I. Describe any features being incorporated in the HVAC system for energy conservation; provide relevant technical analysis for basis of selection.

J. Occupancy, usage, and schedule assumptions, all seasons.

K. Life safety operating modes.

L. System sequences of operation (normal start, run, re-start on emergency power), setpoints, and dead-bands. Address system redundancy.

M. Sequences of operation for interactive systems.

N. Equipment sizing criteria and calculations.

O. U-value calculations on various building exposures.

P. Information that the A/E deems pertinent or helpful for the Owner to understand the evolution of design, and to operate and maintain the installed systems.

Q. For building additions and renovations, describe new equipment to be added, including new auxiliary equipment and identify source of normal and emergency power for their operation.

R. Identify systems that require emergency power.

3.07 ELECTRICAL SYSTEMS

A. State Energy Code Compliance; ANSI/ASHRAE/IESNA 90.1.

B. Lighting requirements and calculations.

C. Fire and life safety considerations.

D. Equipment load assumptions and calculations; include estimate of total and estimate for specific concentrated loads, such as special equipment and equipment that requires emergency power.

E. Description of systems, components, and methods for achieving Owner's objectives.

F. Fire alarm input/output matrix recommended by NFPA 72 pertaining to fire alarm sequence of operations and to document the actual sequence of operations.

G. Sequences of operation for interactive systems.

H. Equipment sizing criteria and calculations.

I. Determination of short-circuit duty required for all service entrance protective devices and switchgear.

J. Protective device coordination analysis.

K. Statement relative to the adequacy of primary power source. If primary source is inadequate, state measures proposed to correct the deficiency.

L. Electrical characteristics of power supply to the Project Site and within the Project, including circuit interrupting requirements, voltage regulation, and power quality criteria where appropriate.

M. Emergency generator and associated paralleling and switching system.

N. Arc flash hazard assessment, noting requirements for maximum allowable arc flash hazard Class.

O. Ensure adequate space for all electrical apparatus meets code requirements for working space and dedicated electrical space. Allow ample room for access and servicing, removal and replacement of parts, etc., as required. Resolve space discrepancies with the Architect.

P. Lightning protection system.

3.08 COMMUNICATION SYSTEMS

A. Type and arrangement of telecommunications, closed circuit television systems (CCTV), nurse call, and security systems.

B. Space required for telecommunications and security equipment, point of connection to utility, size of incoming duct/conduit and size of equipment mounting backboard to be provided. Ensure adequate space for system equipment on a per floor basis. Allow ample wall space for termination of equipment and cable runs from all device locations on floors. Resolve space discrepancies with the A/E.

C. Identify wiring and cabling requirements plus terminations.

D. Identify interference and clearance requirements.

E. Statement relative to interface provision for multi-use systems.

F. Verify that all security equipment is to be on dedicated UPS circuits.

G. Verify that all security access controllers will communicate via the MD Anderson network.

3.09 EXTERIOR IMPROVEMENTS AND LANDSCAPING

A. Describe existing site improvements to remain, to be altered, and to be demolished.

B. Describe proposed pedestrian and vehicular access, roads, sidewalks, and parking, including accessibility for the disabled.

C. Describe the type and volume of traffic at the Project Site.

D. Describe proposed site improvements.

E. Describe proposed landscape development, both hardscape and softscape, including proposed special features such as fountains, sculpture, etc.

3.10 CIVIL / SITE UTILITIES

A. Describe existing site utilities, including, but not limited to, type, capacity, condition, present usage, and any unsatisfactory elements. Describe proposed locations of all utility connections required to serve the Project.

B. State materials to be used for water, storm, sewer, gas and other site utility piping.

C. Describe measures to be taken and/or features or structures required to comply with storm water collection, detention, and disposal.

PART 4 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	03-02-10	Initial Adoption of Element. Renumbered and renamed Element from Z2010 Design Submittal Requirements.	SAK
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z201002

Z201003 Energy and Sustainability

PART 1 - GENERAL

1.01 OVERVIEW

A. As part of the Schematic Design Phase deliverable for all new building construction, building additions, and major renovations when requested by the Owner, the A/E shall furnish a document titled “Proposed Project Energy and Sustainability Initiatives”. The document shall list the title and proposed submittal date of each energy related compliance form and analysis that will be transmitted to the Owner. The document shall also include A/E recommendations for energy conservation opportunities for the Owner to consider into the Project Scope.

B. The “Proposed Project Energy and Sustainability Initiatives” document shall be updated and submitted for each subsequent Design Phase deliverable.

PART 2 - ENERGY DESIGN STANDARD COMPLIANCE

2.01 GENERAL

A. All State buildings and facilities must comply with energy design standards as adopted by the State Energy Conservation Office (SECO). SECO adopted by reference, the energy conservation design standard ANSI/ASHRAE/IESNA Standard 90.1. Draft compliance forms shall be submitted to the Owner with a copy to the Owner’s Director of Energy Management as part of the Design Development Submittal. Finally, to certify compliance with this standard, the A/E must complete and submit the corrected Energy Design Compliance Certification forms to Owner with a copy to the Owner’s Director of Energy Management as part of the Construction Document Submittal.

B. Upon MD Anderson’s approval of the A/E’s completed forms, MD Anderson will submit the compliance forms that certify the A/E’s compliance with ANSI/ASHRAE/IESNA Standard 90.1 to SECO prior to beginning construction. This procedure applies to new building construction, additions, and major renovation projects.

2.02 ENERGY DESIGN COMPLIANCE FORMS

A. Energy Conservation Design Standard Compliance Certification for Nonresidential Buildings.

1. Building Envelope Compliance Documentation.

2. Energy Cost Budget (ECB) Compliance Report, as appropriate.

3. HVAC Compliance Documentation as appropriate to the Project:

    a. HVAC Simplified Approach Option.

    b. HVAC Mandatory Provisions.

    c. HVAC Prescriptive Requirements.

4. Lighting Compliance Documentation.

5. Performance Rating Report Documentation.

6. Service Water Heating Compliance Documentation.

PART 3 - ALTERNATIVE ENERGY SYSTEMS

3.01 GENERAL

A. Prepare and submit for Owner review, an alternate energy analysis in accordance with Section 2166.403, Title 10 of the Texas Administrative Code.

B. The purpose of the code is to provide an economic feasibility analysis of the use of alternate energy sources for potential applications to this Project.

PART 4 - WATER CONSERVATION DESIGN STANDARD COMPLIANCE

4.01 GENERAL

A. All new buildings or major renovations projects shall comply with SECO's "Water Efficiency Standards for State Buildings and Institutions of Higher Education Facilities". Draft compliance form and associated documents, if appropriate, shall be submitted to the Owner and a copy to the Owner's Director of Energy Management as part of the Design Development Submittal. To certify compliance with this standard, the A/E must complete and submit the corrected form and associated documents, if appropriate, to Owner and a copy to the Owner's Director of Energy Management as part of the Construction Document Submittal. Upon Owner approval of the completed form and associated supporting documents, Owner will submit form to SECO prior to beginning construction.

B. The A/E will design into the Project on-site reclaimed system technologies or submit to the Owner a written determination as to the impracticality of installing on-site reclaimed system technologies as defined in Government Code Section 447.004 paragraph c-1 & c-2 Design Standards.

C. The Owner will notify SECO of any impracticality determinations and provide to the office the A/E's documentation supporting the determination.

4.02 GOVERNMENT CODE SECTION 447.004 PARAGRAPH C-1 & C-2:

A. (c-1) The procedural standards adopted under this section must require that on-site reclaimed system technologies, including rainwater harvesting, condensate collection, or cooling tower blow down, or a combination of those system technologies, for non-potable indoor use and landscape watering, be incorporated into the design and construction of:

   1. Each new state building with a roof measuring at least 10,000 square feet; and

   2. Any other new state building for which the incorporation of such system is feasible.

B. (c-2) The procedural standards required by Subsection (c-1) do not apply to buildings if the state agency or institution of higher education constructing the building:

1. Determines that compliance with those standards is impractical; and
2. Notifies SECO of the determination and provides to the office documentation supporting the determination.

PART 5 - HIGH PERFORMANCE BUILDING DESIGN

5.01 LEED AND ENERGY EFFICIENCY

A. While sustainability and energy conservation are critical factors in the determination of system design concepts and in the selection of building materials, MD Anderson does not intend to seek the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED^{TM}) certification. The A/E; however, shall design new building construction, building additions, and major renovation projects to a standard that complies with LEED Silver, without submitting LEED certification documentation.

B. The A/E shall identify and document LEED rating system credits under LEED as appropriate to the Project for Owner review.

C. Energy efficiency initiatives that meet a minimum 20 percent return on investment shall be included in the Project.

D. Refer to other Design Guideline Elements for energy recovery and conservation requirements related to specific building systems and components.

5.02 ENERGY MODELING

A. The A/E shall develop a TRACE 700 energy simulation model of the Project early in the Design Phase for all new building construction, building additions, and as requested by the Owner.

B. The energy model will be used to estimate and to improve the design's energy performance as it progresses through the design phases and will allow the project team to assess energy implications of different system strategies.

C. Submit the TRACE 700 model to the Owner for review at completion of Design Development and Construction Document phases.

5.03 LIFE CYCLE COST ANALYSIS

A. During the Design Phase of a project, the A/E may be directed by the Owner to perform life cycle cost analyses of various building system categories including energy plant, HVAC, electrical, building envelope, building site, and structural systems.

B. Use life cycle cost analysis to access strategies and design alternatives that affect the Project's energy use over a period of time, incorporating energy costs, maintenance costs, and energy savings for the expected system life.

C. The A/E with Owner's input will establish objectives, determine criteria, identify and develop design alternatives, and gather cost information for evaluating design alternates.

5.04 SUBMETERING

A. The A/E shall coordinate location and type of electrical, BTU, and flow submeters with the Owner's Energy Management team during the Design Phase. Reference Owner's Master Construction Specifications for product types and other Design Guideline Elements for specific system requirements.

PART 6 - SUSTAINABILITY PROGRAMS

6.01 GENERAL

A. This section is intended to assist the A/E with planning space for waste disposal and recycling containers.

6.02 INTERIOR SITE REQUIREMENTS

A. Public spaces shall offer recycling containers and/or collection systems near building entrances, reception locations, dining areas, and conference spaces. Identifiable alcoves shall be designed for public spaces with high traffic access.

B. Alcoves containing recycling sort systems shall have impervious measures in place to protect wall surfaces. Retail or custom containers developed with protection shields may be substituted; confirm type to be provided with Owner.

C. Non-public space recycling system installations shall be limited to prevent obstructions. Use of personal bins is preferred to limit installation of large containers. Large containers shall only be placed near work rooms, mail rooms, break rooms, and vending alcoves. Installation at elevator banks is permitted, if space is available.

D. Personal desk-side recycling containers shall be planned for workstations and/or offices. Bins will be self-serviced by occupants to the nearest recycling sort system or recycling bin.

6.03 EXTERIOR SITE REQUIREMENTS

A. As applicable to the Project, the design shall provide space to accommodate at least two (2) waste containers/compactors of varying size to allow for separation of solid waste and recycling materials. The potential for additional containers is optional pending building type and frequency of building maintenance; confirm with Owner.

B. Waste containers/compactors shall be located side by side in the enclosures or in the same central storage area to allow for single point waste/recycling operations. Staging of containers one in front of the other is not permitted.

C. Recycling containers and collection systems, either retail or custom, shall meet MD Anderson design standards for aesthetics, performance, and waste services. Consult with Owner on special requirements for waste containers, compactors, and enclosures.

D. All costs associated with the purchase and placement of recycling containers shall be included in project construction or renovation costs.

PART 7 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	12-13-12	Initial Adoption of Element	
Rev. 1	12-20-12	Deleted LEED, Energy Efficiency Goals and Energy Modeling Requirements. Paragraphs 5.01, 5.02 and 5.03.	SAK
Rev. 2	03-05-13	Revised Part 4 – Water Conservation Design Standard Compliance; Added Sections 5.01 LEED and Energy Efficiency, 5.02 Energy Modeling, and Part 6 Sustainability Programs	SAK, CYC, LTK, JRC
Rev. 3	04-29-14	Deleted paragraph 6.02 "Recycling Containers" and included pertinent wording into paragraph 6.03 "Exterior Site Requirements" to eliminate redundancy.	RWF
Rev. 4			
Rev. 5			

END OF ELEMENT Z2010003

PART 1 - GENERAL

1.01 OVERVIEW

A. This Design Guideline Element describes minimum A/E deliverables for each Design Phase submission. This Design Guideline Element does not address intermediate submissions or supplementary information that may be required.

B. Refer to Design Guideline Element Z201001, Design Phase Deliverables, for a summary of deliverables required at submission of each Design Phase, organized by building system or component.

C. In addition to Drawings and Specifications, the A/E must submit a written narrative of design assumptions as described in Part 4 of this Design Guideline Element; Design Intent Document. A detailed outline of requirements is described within Design Guideline Element Z201002.

PART 2 - DESIGN PHASE PLANNING

2.01 OWNER'S PROJECT TEAM

A. Owner may designate a single point of contact person, such as a Design Facilitator, to represent the Owner's Project Manager in technical matters related to design and to facilitate the overall Design Phase process. This individual will keep the Owner's Project Manager informed of all direct communication with the A/E.

B. The Owner's Project Manager and/or Design Facilitator will facilitate participation of facility and non-facility personnel that have expertise in, or are responsible for, certain building systems.

C. Depending on the complexity of the project, the A/E and Owner will engage in work sessions focused on specific building systems at appropriate intervals during the Design Phase to communicate design concepts and to clarify Owner's expectations.

D. The civil, structural, HVAC, electrical, plumbing, fire protection engineering, telecommunications, security, and other consultants as applicable shall participate in all reviews, work sessions, and presentations where the appropriate discipline is involved.

2.02 WORK PLAN

A. Upon Owner's Notice to Proceed with Design Phase services, the A/E shall prepare and submit a Work Plan for Owner's review at the initial project meeting. The A/E's Work Plan should address the following:

1. Milestone dates for Design Phase deliverables based on Owner's preliminary schedule and A/E's evaluation of the project scope.

2. Projected design submittals appropriate to the project scope and delivery method with transmittal dates. Include Owner review periods and time for resolution of review comments.

3. Identification and projected dates of work sessions with Owner's technical project team to present and discuss design concepts, value engineering suggestions, technical evaluations and studies, and to resolve issues. Owner's project team may include representatives from architecture, engineering, planning, and operations groups.

B. Owner and A/E will jointly adjust the Work Plan to accommodate project scope and schedule requirements.

C. Concurrent with the Work Plan, the A/E shall prepare and maintain a Pending Issues Report throughout the Design Phase to record and track issues with required actions and decision history. An example may be seen as Attachment A, Pending Issues Report. The example indicates the kind of information that should be maintained and documented for pending issues. The A/E shall submit a current Pending Issues Report with each Design Phase Submittal and upon Owner's request.

2.03 CHANGE MANAGEMENT PROCESS

A. While the Owner's Design Guidelines represent minimum standards for products, systems, methods, and materials, the A/E is encouraged to present alternate approaches to the design for Owner's consideration.

B. Alternate design concepts that deviate from the Owner's Design Guidelines and that affect the construction cost limitation are typically presented to the Owner's Executive Management or Core Team for approval in a "Pros and Cons List" format. The Pros and Cons List states the issue, option(s) for consideration, pros and cons of each option, the recommended option, and signatures of the Owner's project team members designating their approval.

C. The A/E shall track design-related decisions that deviate from the Owner's Design Guidelines within a spreadsheet type format and also address deviations in narrative form within the Design Intent Document.

PART 3 - DESIGN SUBMITTALS

3.01 OVERVIEW

A. Starting from schematic or concept design and throughout the entire course of the design phase, all Drawings and Project Manuals issued for review shall identify the purpose of the document, the date the document is issued, the name of the Architect of record or name and license number of the Engineer of record, and shall conspicuously state "Not for regulatory approval, bidding, permitting, or construction" along with all other necessary indications as required by the Texas professional practice regulations (Texas Board Of Architectural Examiners / Texas Board Of Professional Engineers).

B. Not all projects follow the Schematic, Design Development, and Construction Document phasing as described within the A/E Agreement. Depending on the project schedule or complexity, interim or progress design submittals may not be necessary or feasible.

C. Owner may elect to stage or “fast-track” portions of the work. If the Owner elects to implement the Project in stages, the A/E will submit the design for Owner review in several procurement packages that may encompass multiple building components.

D. Prepare Project Manuals in accordance with Design Guideline Element 2010, Project Manual Guidelines.

E. Each Design Phase or progress submittal is a continuation of design.

3.02 SCHEMATIC DESIGN SUBMITTAL

A. The primary objective of the Schematic Design Phase is to clearly define a feasible concept based on the Project scope that the Owner will understand and approve. Produce a diagrammatic representation of the Project, including site plans, general floor plans, and sketches of the building exterior and selected interior spaces. List specification sections to be incorporated, and provide the Design Intent Document as described in Part 4 and Design Guideline Element Z201002. The design shall be generated from the approved Facility Program and/or Pre-Design Report, resulting conceptual studies, and alternative schemes developed in conference with the Owner.

B. The A/E shall prepare technical evaluations and/or studies and present written recommendations during the Schematic Design Phase as required by the Agreement or as described in Design Guideline Element 1010 – Project Summary and elsewhere within these Design Guidelines.

C. Include certain minimum information on each standard drawing title block. Submit a mock-up of the title block to the Owner’s Project Manager for review before reproduction on drawing sheets or use. Information to be included on drawing title blocks shall include, at a minimum:

1. Owner's approved Project name and number.
2. A/E’s name and street address.
3. A/E’s consultants’ names and professional discipline(s).
4. Location for the date of issue of the plans with space for several revision dates.
5. Location for professional seals along with the license numbers of the professional firms.
6. Location for the sheet title.

D. Include a Project Data Sheet(s) in each set of documents. The Project data sheet shall include, at a minimum, the following information specific to the Project design:

1. Abbreviations used, and their meaning.
2. Alternate bid descriptions.

3. Project address.
4. Date of documents.
5. Drawing symbols and symbol descriptions.
6. Future provisions for expansion (all design disciplines).
7. List of Drawings, Tables and Schedules.
8. Materials legend.
9. A/E's name and address.
10. A/E's consultants' names and addresses.
11. Project name and Owner Project number.
12. Square footage per Project level and the Project total (gross and assignable square footage).
13. Vicinity map.

E. Include a Building Code Analysis as a separate written report in the Schematic Design submittal, to be integrated into the Drawings under later submittals. Refer to Design Guideline Element Z2005, Exhibit 1 for a template.

3.03 DESIGN DEVELOPMENT SUBMITTAL

A. In addition to requirements described for the Schematic Design submittal, the Design Development submittal indicates continued development of the Project design and detailing, refinement and confirmation of program requirements and Schematic Design efforts, and specifications that fully describe the nature and intent of the Project. The design is a continuation of Schematic Design documents, resulting studies, and alternative schemes developed in conference with Owner. All remaining major design decisions shall be made during this phase.

B. In the Design Development Phase, the Project shall be developed to a level of detail necessary to establish a clear, coordinated description of all aspects of the Project. Major elements including equipment, fire protection, mechanical, electrical, structural, telecommunications, security, and plumbing systems shall be designed and coordinated through enlarged scale drawings, detailed elevations, sections and plans as required.

C. The Design Development Phase is the last opportunity for design input that involves Owner User Groups. Any change to the Project's Scope or program after this phase will likely incur budget and schedule impacts. The A/E shall be focused on integrating all program requirements into the design and providing the Contractor with information necessary to complete a comprehensive GMP Proposal as applicable per the A/E Agreement.

D. The A/E is responsible for submitting to Owner, an updated Design Intent Document that addresses all comments received as a result of Owner's review of this document when initially submitted as part of the Schematic Design Phase deliverable. In addition, the A/E shall provide written evaluation of design and construction components to meet LEED certification criteria, as directed by Owner on a Project-specific basis.

3.04 CONSTRUCTION DOCUMENT SUBMITTAL

A. In addition to requirements described for the Design Development submittal, the Construction Document submittal reflects completion of Drawings and Specifications that incorporate and illustrate all aspects of the Project in sufficient detail for the construction process.

B. The A/E shall submit the completed Design Intent Document that addresses all comments received as a result of Owner's review of this document when submitted as part of the Design Development deliverable.

C. Seal, sign, and date construction documents that are issued for permitting, bidding, regulatory approval, or construction purposes in accordance with the Texas professional practice regulations (Texas Board Of Architectural Examiners / Texas Board Of Professional Engineers).

PART 4 - DESIGN SUBMITTAL REVIEW PROCESS

4.01 PURPOSE

A. The A/E will be required to present and then submit Drawings and Specifications to Owner representatives for review and comment at intervals as outlined in the Agreement. Additional reviews may be required if the Project scope changes or if an earlier review found the Drawings and Specifications unacceptable.

B. Owner reviewers perform design submittal reviews for verification of compliance with the Owner's Design Guidelines and Project Scope. The A/E is solely responsible for completeness, accuracy, code compliance and coordination of all Contract Documents.

C. The A/E must coordinate and check all documents prior to submission to Owner for review. Submittals that reveal incompleteness, lack of coordination, or failure to incorporate or resolve Owner's prior comments with written explanation will not be accepted or reviewed. Rejection of submittals shall not alleviate the A/E's responsibility, however, to meet the Project Schedule.

4.02 REVIEW COMMENT FORM

A. Owner will furnish review comments in a Review Comment Form to the A/E for each Design Phase submittal. The Review Comment Form is located within Owner's Drawing Review Application, which the A/E will use in receiving and responding to review comments. The A/E shall provide a detailed written response on the Review Comment Form to each Owner review comment indicating where in the documents and how the comment has been addressed in the documents. Written responses to all previous design review comments shall be made in sufficient detail for verification purposes, such as locations of revised details, specification sections, and updated drawings. Generic responses such as "will comply", "will add", or "will incorporate" are not acceptable.

B. The A/E shall submit the completed Review Comment Form for the Design Phase submittal prior to the scheduled review meeting with the Owner's project team, as directed by the Owner's Project Manager. Update resulting resolutions on the Review Comment Form and transmit to the Owner's Project Manager in order to obtain Owner's approval to proceed to the next Design Phase.

C. To expedite the review process, the A/E must also provide a response code as indicated on the Review Comment Form, as follows:

1. Have incorporated comment (respond with date that comment was incorporated and initials of the individual who made the revision).
2. Will not incorporate revision (see response).
3. MD Anderson to provide further direction/clarification.
4. Decision pending further review – action A/E.
5. Comment conflicts with Design Guidelines or previous directive.
6. For information only.

4.03 OWNER'S APPROVAL

A. The A/E shall obtain Owner's written approval of the Work of each Design Phase before proceeding to the next Design Phase. In addition, furnish affirmation by the firm principal that previous review comments have been fully addressed and incorporated in the current submittal.

B. Documents at any Design Phase submittal shall be considered "complete" when all areas of design (i.e. Civil, Architectural, Structural, HVAC, Electrical, etc.) are 100 percent complete as defined herein and agreed upon by Owner.

C. The A/E shall also include within each Design Phase submittal a detailed written description clearly defining any information and/or direction required from the Owner that will affect the next Design Phase.

PART 5 - DESIGN INTENT DOCUMENT

5.01 DESCRIPTION

A. As part of each Design Phase deliverable for all new building construction, building expansions and additions, and major renovation projects, the A/E shall furnish a document titled "Design Intent Document" that describes the complete architectural and engineering design intent for the Project including design guiding principles, assumptions, issues, recommendations, and narrative assessment of the architectural and infrastructure systems .

B. The purpose of the Design Intent Document is to establish early agreement between the A/E and Owner as to overall design approach and detailed design assumptions. This document shall address in written, narrative form, all assumptions and reasoning behind decisions made during the Design phases and provide a final assessment of all architectural and infrastructure systems. The A/E shall address site and building components relevant to the Project.

C. Refer to Design Guideline Element Z201002, Design Intent Document, for a detailed description of the document format and content.

PART 6 - CONSTRUCTION COST ESTIMATE

6.01 GENERAL

A. If required by the A/E Agreement, the A/E shall provide a Construction Cost Estimate by an independent estimating company, acceptable to the Owner, throughout the entire design process at the end of each design phase (or as necessary to meet the Owner's identified Construction Cost Limitation). An example may be seen as Attachment B, Cost Quantity Survey.

B. GMP Proposal and Final Construction Cost Estimates shall be based upon detailed quantities and unit costs for all materials, labor, equipment, building systems, overhead and profit, administrative expenses, General Conditions, fees and contingencies.

PART 7 - FLOOD ELEVATION CERTIFICATION

7.01 GENERAL

A. Prepare and submit for Owner review, a Federal Emergency Management Agency (FEMA) flood elevation certificate and a flood proofing certificate (if applicable) as a deliverable to Owner for signature at the time of Project Substantial Completion.

B. Flood elevation certificate must be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify the building's elevation information.

PART 8 - ADA COMPLIANCE

8.01 GENERAL

A. The A/E shall provide MD Anderson with copies of Texas Accessibility Standards compliance related correspondence with the Texas Department of Licensing and Regulation, and any Registered Accessibility Specialists involved with the Project. Furnish documents pertaining to the Project's registration, plan review, plan review response, inspection, inspection response, and substantial compliance.

B. Transmit copies to MD Anderson in a timely manner as soon as documents are completed or as they become available to the A/E.

PART 9 - ROOM NUMBER CONTROL SET

9.01 GENERAL

A. Allocating and maintaining room number assignments in a controlled manner is an important component of the Owner's ability to successfully manage its facilities. Room numbers are used as unique identifiers of space in the Owner's space management and asset management databases. As such, room numbers play a critical role in the Owner's facilities maintenance and operations procedures; its master space planning efforts; and, its wayfinding systems. Maintaining accurate room number records is essential for meeting regulatory reporting requirements of the Texas Higher Education Coordinating Board, Joint Commission, as well as, for accurate Medicare \ Medicaid cost reporting.

B. The A/E shall provide the Owner with a comprehensive set of architectural floor plans, hereinafter referred to as the project "Room Number Control Set" (or, "Set"), separate and distinct from other required drawing submittals. The time of the initial Set submission will be determined on a per-project basis and will be scheduled to allow the Owner sufficient time to designate room numbers and sufficient time for the A/E to incorporate the designated room numbers into the100 percent Design Development document review set. The time of the initial Set submission will be identified in the A/E's Work Plan.

C. The A/E shall resubmit the Room Number Control Set (complete set) any time following its initial creation that the Owner approves a change to the architectural layout. Resubmission is for the purpose of Owner's assessment and reassignment of room number designations as necessary.

D. The A/E shall not distribute documents for bidding or construction purposes if the documents contain changes to the architectural layout that affects one or more room number assignments until the revised room number assignment has been obtained from the Owner and incorporated into the documents by the A/E. Distribution of documents for Owner's review of proposed changes to the architectural layout is acceptable.

E. The A/E shall not, under any circumstance, unilaterally assign room numbers. The Owner has sole authority to assign room number designations.

9.02 ROOM NUMBER CONTROL SET REQUIREMENTS

A. The initial submittal and each resubmission shall consist of one bound paper copy and one CD-ROM containing the document in its native, electronic format.

B. The Cover Sheet shall contain at a minimum-

1. The Owner's Project Name
2. The Owner's project number
3. The Set title: Room Number Control Set
4. The Date of submittal

C. The Set shall contain a sheet index

D. The Set shall contain sheets of Architectural floor plan(s) representing every building level. Each sheet shall contain:

1. The most current, Owner approved, architectural layout of the associated building level (or subdivision)

2. Owner’s previously assigned Room Numbers (if any)

3. Revision “clouds” keyed to a Revision log and highlighting changes to the architectural layout

4. Match lines (if any)

5. Key plan identifying floor plan subdivision (if any)

E. Each floor plan sheet shall scale 1/8”=1’-0” or larger.

F. Maximum sheet size = 30”X42”

G. Each Sheet shall have a Title Block containing:

1. A/E’s project title block per Owner’s CADD Standard

2. Set title: Room Number Control Set

3. Owner’s Project Name

4. Owner’s Project Number

5. A completed Revision log \ history

6. Associated Floor level

7. Document Revision History

PART 10 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	02-27-07	Part 3, B: clarification on review comment resolution; Part 4: clarification on structural, plumbing, HVAC and electrical requirements for Design Intent Document; Added Part 10 – ADA Compliance; Attachment A: additional requirements on Life Safety Plans, HVAC, and electrical power distribution submittal requirements.	SAK
Rev. 2	04-24-08	General Revisions Throughout Document.	DOS, SAK,

Issue	Date	Revision Description	Reviser
			JD, PN, LN, CS, JP
Rev. 3	08-05-08	Added Interim Life Safety Plans submittal requirement during Design Development Phase. Attachment “A” - Building Interior.	SH
Rev. 4	02-24-09	Added Life Safety Plans and Interim Life Safety Plans submittal requirement during Construction Document Phase. Attachment “A” - Building Interior.	SH
Rev. 5	05-14-09	Added latest TBPE requirements for engineering firms to include their professional license number along with the professional engineers seal which has the engineer’s license number. Paragraph 2.02C.5.	PN
Rev. 6	06-09-09	Added note to Attachment A, CD Phase, HVAC to denote location of valve chain operators.	JCD
Rev. 7	03-02-10	Added Part 2 - Design Phase Planning; Revised 4.02 Review Comment Form; Revised 9.01 Flood Elevation Certification; Added Part 11 – On-Site Reclaimed System Technologies; Relocated Design Phase Deliverables to new Element Z201001; Relocated Design Intent Document to new Element Z201002.	SAK
Rev. 8	11-11-10	Added Part 12 – Room Number Control Set.	JS
Rev. 9	12-02-10	3.02 - Schematic Design Submittal: Deleted requirement for “number of sheets” in drawing title block.	SAK
Rev. 10	01-19-12	Updated Part 7 with new SECO requirements.	SAK
Rev. 11	12-13-12	Deleted articles addressing Energy Design Standard Compliance, Alternate Energy Systems and On-Site Reclaimed System Technologies. Relocated them to new Element Z201003.	DOS
Rev. 12	03-21-13	Revised 2.01A and B Project Team; and 2.03B Change Management Process.	SAK

END OF ELEMENT Z2010

ATTACHMENT A - PENDING ISSUES REPORT EXAMPLE

PROJECT NAME
THE UNIVERSITY OF TEXAS MD ANDERSON CANCER CENTER
M D ANDERSON PROJECT NUMBER

Action Number	Date Action Initiated	Requested By	Requested Action	Responsible Party	Due Date for Resolution	Action Item/Comment	Status (Open/ Closed)
01	09/01/06	A/E	Chemical storage list/quantities	Owner	10/01/06	Per 50% CD review meeting	Open
02	09/01/06	Owner	Upgrade Roof warranty	CM	10/01/06	Per 50% CD review meeting	Accepted – 9/15/06

ATTACHMENT B - COST QUANTITY SURVEY EXAMPLE

PROJECT NAME
THE UNIVERSITY OF TEXAS MD ANDERSON CANCER CENTER
OWNER'S PROJECT NUMBER

TITLE (DESIGN DEVELOPMENT OR CONSTRUCTION DOCUMENT ESTIMATE)

SUMMARY - BASE BID
(REPEAT FOR EACH ALTERNATE BID)

DATE OF ESTIMATE

SPECIFICATION DIVISION	DESCRIPTION	$ (XXX,XXX)	$/GSF (XX,XXX GSF)
DIVISION 01	GENERAL REQUIREMENTS	XXX,XXX	X.XX
DIVISION 02	EXISTING CONDITIONS	X	X.XX
DIVISION 03	CONCRETE	X	X.XX
DIVISION 04	MASONRY	X	X.XX
DIVISION 05	METALS	X	X.XX
DIVISION 06	WOOD, PLASTICS AND COMPOSITES	X	X.XX
DIVISION 07	THERMAL AND MOISTURE PROTECTION	X	X.XX
DIVISION 08	OPENINGS	X	X.XX
DIVISION 09	FINISHES	X	X.XX
DIVISION 10	SPECIALTIES	X	X.XX
DIVISION 11	EQUIPMENT	X	X.XX
DIVISION 12	FURNISHINGS	X	X.XX
DIVISION 13	SPECIAL CONSTRUCTION EQUIPMENT	X	X.XX
DIVISION 14	CONVEYING EQUIPMENT	X	X.XX
DIVISION 20	COMMON FIRE SUPPRESSION, PLUMBING AND HVAC REQUIREMENTS	X	X.XX
DIVISION 21	FIRE SUPPRESSION	X	X.XX
DIVISION 22	PLUMBING	X	X.XX
DIVISION 23	HEATING, VENTILATING, AND AIR CONDITIONING	X	X.XX
DIVISION 25	INTEGRATED AUTOMATION	X	X.XX
DIVISION 26	ELECTRICAL	X	X.XX
DIVISION 27	COMMUNICATIONS	X	X.XX
DIVISION 28	ELECTRONIC SAFETY AND SECURITY	X	X.XX
DIVISION 31	EARTHWORK	X	X.XX
DIVISION 32	EXTERIOR IMPROVEMENTS	X	
DIVISION 33	UTILITIES	X	
	SUBTOTAL:	**XXX,XXX**	
	ADD FOR GENERAL CONDITIONS –	XXX,XXX	

SPECIFICATION DIVISION	DESCRIPTION	$ (XXX,XXX)	$/GSF (XX,XXX GSF)
	XX%		
	ADD FOR GENERAL CONTRACTOR'S FEE - % :	XXX,XXX	
	SUBTOTAL:	XXX,XXX	
	ADD FOR GENERAL CONTINGENCIES - % :		
	SUBTOTAL:	**XXX,XXX**	
	(Describe, if any) SPECIAL CASH ALLOWANCE(S):	XXX,XXX	
	CONSTRUCTION CONTINGENCY ALLOWANCE:	XXX,XXX	
	TOTAL OF ESTIMATE:	**XXX,XXX**	

REFERENCE	DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL
DIVISION 03 - CONCRETE					
03 30 00 Cast-in-Place Concrete					
200	Retaining wall 1'6" deep	X,XXX	SF	XX.XX	XX,XXX
300	Concrete topping slab	X,XXX	SF	XX.XX	XX,XXX
500	10'x 10' Housekeeping pad	X	EA	XX.XX	XX,XXX
510	6" Housekeeping pad	X	EA	XX.XX	XX,XXX
REFERENCE 03 30 00 - SUBTOTAL:					**XX,XXX**
03 34 50 Concrete Finishing					
100	Broom finish to concrete topping and sidewalk	X,XXX	SF	XX.XX	XX,XXX
REFERENCE 03 34 50 – SUBTOTAL:					**XX,XXX**

Z2011 Equipment Naming Convention and Acronyms

PART 1. GENERAL

1.01 OVERVIEW

A. This Section identifies mechanical, electrical, and plumbing (MEP) equipment naming conventions and acronyms for the A/E to use when identifying equipment in the Contract Documents.

PART 2. MEP EQUIPMENT NAMING CONVENTION

1.02 GENERAL

A. The 1st, 2nd, 3rd, 4th and 5th characters are the equipment type designator.

-	**O**	**A**	**H**	**U**	**-**	**X**	**X**	**-**	**X**	**X**	**X**

Equipment Type Designator

B. The 6th character is a dash and serves as a placeholder.

-	**O**	**A**	**H**	**U**	**-**	**X**	**X**	**-**	**X**	**X**	**X**

Placeholder

C. The 7th and 8th characters are the building floor.

-	**O**	**A**	**H**	**U**	**-**	**X**	**X**	**-**	**X**	**X**	**X**

Building Floor Level

D. The 9th character is a dash and serves as a placeholder.

-	**O**	**A**	**H**	**U**	**-**	**X**	**X**	**-**	**X**	**X**	**X**

Placeholder

E. The 10th, 11th and 12th characters are sequential equipment numbers.

-	O	A	H	U	-	X	X	-	X	X	X

Sequential Equipment Number

F. Example for a chilled water pump on the 3rd floor of a building:

1. Chilled Water Pump = CHWP
2. CHWP-03-001

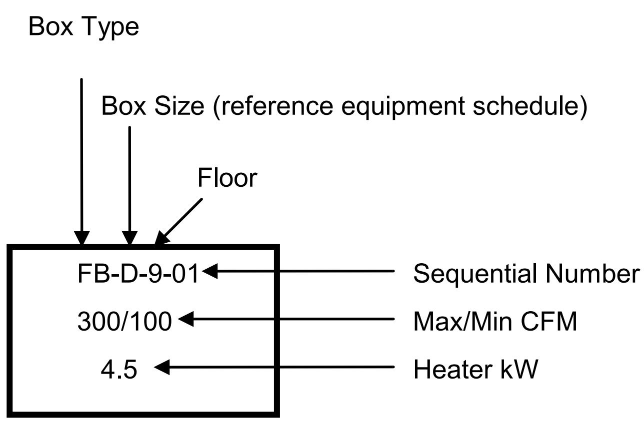
G. Example for a secondary chilled water pump on the 1st floor of a building:

1. Secondary Chilled Water Pump = CHWSP
2. CHWSP-01-001

H. Example for a fire/smoke damper on the 23rd floor:

1. Fire/Smoke Damper = FSD (see MEP Equipment Tag List)
2. FSD-23-001

I. Variable Air Volume (VAV) Terminal Unit Identification:



1. Fan Powered Box = FB
2. VAV (no fan) Box = VB
3. Box Size:
   a. A = 100 - 300 CFM

b. B = 175 - 600 CFM

c. C = 275 - 1000 CFM

d. D = 390 - 1500 CFM

e. E = 535 – 2000 CFM

PART 3. ELECTRICAL PANEL NAMING CONVENTION

1.03 GENERAL

A. The 1st, 2nd, 3rd, 4th and 5th characters are the building name.

-	**B**	**S**	**R**	**B**	**-**	**X**	**X**	**-**	**X**	**X**	**X**

Building Name

B. The 6th and 7th characters are the building floor.

-	**B**	**S**	**R**	**B**	**0**	**1**	**X**	**X**	**X**	**X**	**-**	**X**

Building Floor Level

C. The 8th and 9th characters are the system type. (*see list below)

-	**B**	**S**	**R**	**B**	**0**	**1**	**L**	**S**	**X**	**X**

System Type

D. The 10th character is the system voltage, L for Low voltage 120/208V, M for Medium voltage 4 - 160V and H for High voltage 277/480.

-	**B**	**S**	**R**	**B**	**0**	**1**	**L**	**S**	**H**	**X**

Voltage

E. The 11th character is the sequential panel alpha character.

-	B	S	R	B	0	1	L	S	H	A

Sequential Panel Designation

F. Example for Clinical Research Building (CRB), level 8, normal power, low voltage, 3rd panel in sequential order:

1. CRB08NPLC.

G. Example for a Faculty Center Tower (FCT) high voltage, critical branch panel on the 20th floor:

1. FCT20CBHA.

H. System Types:

1. Normal Power = NP
2. Emergency Power = EP
3. Critical Branch = CB
4. Life Safety = LS
5. Equipment Branch = EB

PART 4. MECHANICAL ACRONYMS

ACRONYM	MECHANICAL EQUIPMENT DESCRIPTION	ACRONYM	MECHANICAL EQUIPMENT DESCRIPTION
ACU	Air Conditioning Unit	FB	Fan Powered VAV Terminal Unit
ACCU	Air Cooled Condensing Unit	FCU	Fan Coil Unit
ACHP	Electric Heat Pump	FFH	Final Filter Housing
AHU	Air Handling Unit	FD	Fire Damper
AS	Air Separator	FM	Flow Meter
AVBE	Air Valve Biological Exhaust	FTK	Flash Tank
AVCE	Air Valve Cage Exhaust	FSD	Fire/Smoke Damper
AVEI	Air Valve Exhaust Air Isolation Rm.	GCC	Glycol Cooling Coil
AVES	Air Valve Exhaust Air Surgery	GCH	Glycol Chiller
AVGE	Air Valve General Exhaust	GEF	General Exhaust Fan
AVRE	Air Valve Radiological Exhaust	GUH	Gas Unit Heater
AVRP	Air Valve Return Air Protective Environmental Rm.	H	Humidifier

Z2011 Equipment Naming Convention and Acronyms

ACRONYM	MECHANICAL EQUIPMENT DESCRIPTION	ACRONYM	MECHANICAL EQUIPMENT DESCRIPTION
AVRR	Air Valve Return Air Radiology		
AVSR	Air Valve Supply Air Radiology	HC	Hot Water Heating Coil
AVRS	Air Valve Return Air Surgery	HEF	Fume Hood Exhaust Fan
AVSI	Air Valve Supply Air Isolation Rm.	HEX	Steam to Water Heat Exchanger
AVSL	Air Valve Supply Lab	HPSRS	High Seam Pressure Reducing Station
AVSP	Air Valve Supply` Air Protective Environmental Rm.	HRCH	Heat Recover Chiller
AVSS	Air Valve Supply Air Surgery	HWB	Hot Water Boiler
BEF	Biological Exhaust Fan	HWP	Hot Water Pump
BP	Boiler Feed Pump	KEF	Kitchen Exhaust Fan
BTD	Bubble Tight Damper	OAHU	Outside Air Handling Unit
CEF	Cage Wash Exhaust Fan	PACU	Packaged Air Conditioning Unit
CF	Chemical Feeder	MPSRS	Medium Steam Pressure Reducing Station
CH	Chiller	RF	Return Fan
CHHEX	Chilled Water Heat Exchanger	REF	Radiological Exhaust Fan
CTK	Compression Tank	SB	Steam Boiler
CC	Cooling Coil	SC	Steam Heating Coil
CHWP	Primary or Chilled Water Pump	SD	Smoke Damper
CHWSP	Secondary Chilled Water Pump	SF	Supply Fan
CHWTP	Chilled Water Tertiary Pump	SPF	Stairwell Pressurization Fan
CP	Condensate Pump	SG	Clean Steam Generator
CR	Condensate Receiver	TACU	Telecommunication Fan Coil Unit
CRAC	Computer Room AC Units		
CT	Cooling Tower	TEF	Toilet Exhaust Fan
CWP	Chiller Condenser Water Pump	TFCU	Telecommunication Fan Coil Unit
CWSF	Condenser Water Side Stream Filter	VB	VAV Terminal Unit
DA	Deareator	VFD	Variable Frequency Drive
DDVAV	Dual Duct VAV Terminal Unit		
DSTR	Duplex Strainer		
EDH	Electric Duct Heater		
EF	Exhaust Fan		
FLTR	Filter Caisson		
EHC	Electric Heating Coil		
ERU	Energy Recovery Unit		
EUH	Electric Unit Heater		
ETK	Expansion Tank		
HUH	Hot Water Unit Heater		

PART 5. ELECTRICAL ACRONYMS

ACRONYM	ELECTRICAL EQUIPMENT DESCRIPTION	ACRONYM	ELECTRICA EQUIPMENT DESCRIPTION
ATS	Automatic Transfer Switch	MSG	Main Switchgear
DP	Distribution Panel	T	Transformer
EG	Emergency Generator	TE	Transformer (Emergency Power)
MCC	Motor Control Center	TN	Transformer (Normal Power)
MSB	Main Switch Board	UPS	Uninterruptible Power System

PART 6. PLUMBING ACRONYMS

ACRONYM	PLUMBING EQUIPMENT DESCRIPTION	ACRONYM	PLUMBING EQUIPMENT DESCRIPTION
ANT	Acid Neutralization Tank	LAC	Laboratory Air Compressor
AVB	Atmospheric Vacuum Breaker (Potable Water)	LAV	Lavatory
BFP	Backflow Preventer (Potable Water)	LGA	Lavatory Gas/Vacuum Local Alarm Panel
COCM	Carbon Dioxide Cylinder Manifold	LGMA	Laboratory Gas/Vacuum Master Alarm Panel
COT	Carbon Dioxide Tank	LGV	Laboratory Gas/Vacuum Zone Valve Wall Box
COTG	Cleanout To Grade (Exterior)	LI	Linter Interceptor
CWT	Combination Fire And Domestic Water Storage (Surge) Tank	LNT	Liquid Nitrogen Tank
DB	Dialysis Water Supply and Drain Wall Box	LOT	Liquid Oxygen Tank
DGV	Dental Gas/Vacuum Zone Valve Wall Box	LVP	Laboratory Vacuum Pump
DHWRP	Domestic Hot Water Recirculating Pump	MAC	Medical Air Compressor
DIS	De-ionized Water System	MGA	Medical Gas/Vacuum Local Alarm Panel
DWBT	Domestic Water Bladder Tank	MGMA	Medical Gas/Vacuum Master Alarm Panel
DWEXT	Domestic Hot Water Expansion Tank	MGV	Medical Gas/Vacuum Zone Valve Wall Box
DWP	Domestic Water Booster Pump	MS	Mop Sink
DWPRV	Domestic Water Pressure Regulating Valve	MVP	Medical Vacuum Pump
DWT	Domestic Water Storage (Surge) Tank	NCM	Nitrogen Cylinder Manifold
EDF	Electric Drinking Fountain	NOCM	Nitrous Oxide Cylinder Manifold
ES	Emergency Shower	OCM	Oxygen Cylinder Manifold

Z2011 Equipment Naming Convention and Acronyms

ACRONYM	PLUMBING EQUIPMENT DESCRIPTION	ACRONYM	PLUMBING EQUIPMENT DESCRIPTION
ESEW	Emergency Shower and Eyewash Unit	OD	Overflow Roof Drain (Secondary)
ESP	Elevator Sump Pump	OI	Oil Interceptor
EW	Eyewash	PT	Plaster Trap
EWC	Electric Water Cooler	PVB	Pressure Vacuum Breaker (Potable Water)
EWH	Electric Water Heater	RD	Roof Drain (Primary)
FCO	Floor Cleanout	ROS	Reverse Osmosis System
FCV	Flow Control Valve (Domestic Hot Water Balancing)	SA	Shock Absorber (Water Hammer Arrestor)
FD	Floor Drain	SAMPW	Sampling Well (Exterior Drainage)
FDC	Fire Department Connection	SE	Sewage Ejector
FHC	Fire Hose Cabinet	SH	Shower
FOT	Fuel Oil Tank (Diesel)	SK	Sink
FP	Fire Protection Water Pump	SP	Sump Pump
FPATS	Fire Pump Automatic Transfer Switch	STP	Storm Sump Pump
FPBFP	Fire Protection Backflow Preventer	SWH	Steam Domestic Water heater
FPDAC	Fire Protection Dry Air Compressor	TD	Trench Drain
FPSG	Fire Pump Switch Gear	TMV	Thermostatic Master Mixing Valve Assembly
FS	Floor Sink	TP	Trap Primer
FWT	Fire Protection Water Storage (Surge) Tank	UR	Urinal
GI	Grease Interceptor	WC	Water Closet (Toilet)
GWH	Gas Fired Domestic Water Heater	WCO	Wall Cleanout
HB	Hose Bibb	WD	Water Supply And Drain Wall Box (Clothes Washer)
IW	Indirect Waste Receptor	WH	Wall Hydrant
JP	Jockey Pump (Fire Protection Water Pressure Maintenance)	WS	Water Softener

PART 7. DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-25-08	Added medium voltage to Part 3-1.03-D and added MEP acronyms to Part 5.	JCD
Rev. 2	06-21-11	Added Smoke Damper acronym (SD) and Heat Recovery Chiller (HRCH) to Part 4, Mechanical Acronyms.	JCD
Rev. 3	05-17-12	Added Dual Duct VAV Terminal Unit (DDVAV) to mechanical acronym list.	JCD
Rev. 4	10-30-12	Added AVSS, AVRS, AVSP, AVRP, AVSI & AVES to the mechanical acronym list.	JCD
Rev. 5	02-26-13	Added AVRR and AVSR to the mechanical acronym list.	PDN
Rev. 6	08-01-13	Added HWB to the mechanical list for Hot Water Boiler.	PDN

END OF ELEMENT Z2011

Z2015 Structural Criteria

PART 1 - GENERAL REQUIREMENTS

1.01 OVERVIEW

A. Load Reductions – Structures built for Owner must be designed for loads large enough to permit wide flexibility in their functions, and as such are subject to increased loads and high sustained live loads. Loads are often applied to large areas of usable floor space (thereby making liberal live load reduction factors undesirable).

B. Deflections - Live loads and deflection limitations must be assumed to accommodate these conditions of design. Care must be exercised in control of immediate and long-time deflections to prevent immediate and future damage to non-structural elements attached to the structure.

C. Building Codes - The more stringent design requirements between the applicable building codes and these guidelines shall be used. The latest issue of the International Building Code (IBC) shall be used unless otherwise directed by the Owner's Project Manager.

D. Document Review Schedule - The A/E will be required to present the Drawings and Specifications for review to Owner at the intervals outlined in Element Z2010 of these Guidelines. Intermediate reviews may be required if the scope of the Project has been changed or if an earlier review found the Drawings and Specifications unacceptable either as a whole or in part.

E. Review Meetings - The Structural Engineering Consultant(s) (Engineer) will participate in all reviews, Work sessions and presentations where this discipline is involved. Items to be included for review at each phase or stage of completion are outlined in Element Z2010.

F. Consistency of Design Assumptions – Design assumptions made for efficiency in analysis must be carried through the design and proportioning of the actual members. The design assumptions must be consistent with Owner's goals. For example, the practice of designing pan joists or ribbed slabs as "tee beams" may save slightly in the cost of the reinforcing bars in the pan ribs. This practice, however, compromises future flexibility of the structure in terms of slab penetrations between the ribs. Another example would be the assignment of large bending moments to columns for the sake of beam design, and then neglecting these beam moments when designing the columns.

G. Structural Integrity – The structural system selected should be adequately described and detailed such that all parts of the facility are incorporated and connected with the structure so as to allow the facility to function as a unit under extreme service conditions. An example would be in the cases for exterior cladding and roofing systems, which must be adequately fastened to the structure to resist the worst case loading conditions, but which also must be detailed to avoid distress under more typical thermal and moisture exposures. It makes little sense to design a roof system capable of resisting 90 or 120 mph winds unless the connections to the structure and the structure itself are substantial enough to resist the loads to be transferred.

H. Verify with Owner representative location of any of the following and plan accordingly:

1. Folding Door (partition)

2. Projection Screen

3. High Density Filing Units

1.02 RENOVATION WORK

A. Structural demolition Drawings shall be included.

B. All penetrations of existing structural components shall be shown in the structural Drawings. Reinforcement of these structural components shall be designed and detailed as required. Drawings shall show all original framing in the areas near the new penetrations.

C. Drawings shall show all original structural framing with new framing superimposed. Clearly show original framing to remain in place.

D. Where portions of an existing structure are required to be completely demolished, Drawings shall show all original structural framing and provide adequate details clarifying location of concrete saw cuts and details of any enforcement required.

E. Small penetrations of existing concrete slabs (cores for pipes, saw cut openings for ductwork, etc.) shall require the Contractor to drill pilot holes to verify that these penetrations will not cut beams or joists. Use of Ferroscan or ground penetrating radar is recommended as a precaution to help identify conduit which may be embedded in concrete. Note: Neither Ferroscan nor radar can differentiate between metal rebar and conduit.

PART 2 - LOADING AND DETECTION STANDARDS

2.01 GENERAL

A. All roofs shall be designed with sufficient slope or camber to assure adequate drainage after long-time deflection from dead load or shall be designed to support maximum loads including possible ponding due to deflection.

B. Structural systems and members shall be designed and detailed to accommodate the specific mechanical, electrical, and other equipment as specified by the Architect. All substitutions resulting in changes in the magnitude or location of these loads, or in the revision in the number, location, or size of penetrations through structural elements shall be coordinated by the Contractor at Contractor's expense including providing design calculations by a registered professional engineer addressing the proposed substitution.

C. Reduction of Live Loads:

1. No reduction shall be applied to the roof live load.

2. No reduction of the live load shall be allowed in the design of any slabs or joists.

3. In designing a column, girder, truss, wall, pier or foundation carrying more than one floor, the live loads of the floors which are supported by such members may be reduced, except in buildings used for storage or warehouse purposes and in open parking decks. The reduced load shall be not less than the following percentages of the live load for which such floors were designed:

    a. 100 percent for members carrying one (1) floor,

    b. 90 percent for members carrying two (2) floors,

    c. 80 percent for members carrying three (3) floors,

    d. and at corresponding decreasing percentages for each successive floor.

    e. In no case, however, shall the load be less than seventy percent of the live load for any floor in buildings of occupancies other than those for which specific provision is made herein.

4. Except as noted above, beams, girders and trusses shall be designed to support the full dead and live loads; provided that in buildings other than those used for storage or warehouse purposes and open parking decks, beams, girders or trusses carrying three hundred square feet or more of tributary floor area may be designed to carry eight-five percent of the live load and the full dead load. This load reduction shall not be used in addition to reduction set forth above.

D. Wind Loads:

1. The integral structural parts shall be designed to resist the total lateral loads in design for wind. Non-structure elements shall be sufficiently attached to the structural framing system to prevent shedding of components in a design loading event.

2. Buildings and structures shall be designed to withstand the minimum horizontal and uplift pressures set forth in the latest edition of the IBC. The IBC wind design parameters shall be clearly indicated on the design drawings.

3. If the building, structure, or components thereof is in a location considered by the Engineer, or Owner, to be unusually exposed, higher wind loads may be specified.

4. For all Projects, metal roof deck connections shall also meet Factory Mutual's connection requirements. RE: FM Global, Property Loss Prevention Data Sheets 1-29, Roof Deck Securement and Above-Deck Roof Components, Section 2.2.13

E. Seismic and Geologic Factors – Notify Owner if seismic or unusual geologic conditions occur that would affect the design of the structure.

F. Control of Deflection - Steel:

1. Design Structural steel members in accordance with A.I.S.C. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, latest edition with the following exceptions:

Roof and Floor Load	Maximum Deflection
Live Load Only	1/360
Dead Load and Live Load	1/240

2. It is preferred that flexural members be selected with sufficient depth and stiffness to deflect approximately 1/360 maximum under dead load plus live load conditions. If in the Engineer's judgment this requirement creates unreasonable cost or aesthetic problems, 1/240 may be used.

G. Ponding and Vibration - Use A.I.S.C. Manual of Steel Construction Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, latest edition. Engineer shall use due regard in proportioning to resist vibration to avoid occupancy discomfort due to transient live load vibrations.

H. Control of Deflection - Concrete:

1. Reinforced concrete members subject to bending shall be designed with adequate stiffness to limit deflections or any deformations as set forth in building Code Requirements for Reinforced Concrete (ACI 318 - latest edition), except that the following Allowable Deflection Table shall govern.

Type of Member	Deflection To Be Considered	Deflection Limitation
Flat roofs not supporting or attached to non-structural elements likely to be damaged by large deflections.	Immediate deflection due to live load, L	1/240**
Floors not supporting or attached to non-structural elements likely to be damaged by large deflections.	Immediate deflection due to live load, L	1/360
Roof or floor construction supporting or attached to non-structural elements likely to be damaged by large deflections	That part of the total deflection which occurs after attachment of the non-structural elements, the sum of the long-time deflection due to all sustained loads and the immediate deflection due to any additional live load.*	1/480***
Roof or floor construction supporting or attached to non-structural elements not likely to be damaged by large deflections.		1/360****

* Total long-time deflection may be reduced by the amount of deflection which occurs before attachment of the nonstructural elements. This amount shall be

determined on the basis of accepted engineering data relating to the time-deflection characteristics of members similar to those being considered.

** This limit is not intended to safeguard against ponding. Ponding should be checked by suitable calculations of deflection, including the added deflections due to pond water, and considering long-time effects of all sustained loads, camber, construction tolerances and reliability of provisions for drainage.

*** This limit may be exceeded if adequate measures are taken to prevent damage to supported or attached elements.

**** But not greater than the tolerance provided for the nonstructural elements. This limit may be exceeded if camber is provided so that the total deflection minus the camber does not exceed the limitation.

2. Assume a minimum 50 percent of live load as acting with sustained load.

PART 3 - STRUCTURAL ELEMENTS

3.01 GENERAL

A. This Section consists of various systems and details, which Owner prefers to use or avoid as stated. While it is not the intent that these items must be included or excluded from consideration, they are listed to assure special attention be given to them in order to eliminate recurrent problems. A thorough discussion of the merits of possible structural systems should be held early in the design process.

3.02 FOUNDATIONS

A. Avoid pre-cast pre-stressed piling.

B. Avoid slab-on-fill in areas of expansive soils. If a slab-on fill is approved then it shall include a 10 mil vapor barrier which meets ASTM E1745 standards

C. Avoid the use of waxed cardboard carton forms to form a void space for isolation purposes at active soils.

D. Avoid pan-joist and/or particularly waffle-joist systems where extensive penetration of floors will occur. Skip-joists, with clear rib dimensions of at least 48 inches, are preferred.

E. Avoid two-way post-tensioned systems such as banded flat plates. These highly optimized systems do not lend themselves to future penetrations and live load changes and will be used only with written authorization from Owner. Post-tensioning is an appropriate choice for some applications such as in a girder/skip-joist ribbed slab. In many cases, the overall building systems Work best when the girders supporting the skip-joists are maintained at a depth no greater than the skip-joist ribs. For longer spans, post-tensioning is helpful in controlling the deflections of the girder without deepening it past the pan rib depth. The consulting structural engineer shall present various options for consideration at the

Schematic and Design Development stages which considers various approaches in lieu of girders deeper than the pan ribs. A preference hierarchy would go something like this:

1. Post tensioning
2. Deep girders
3. Cambered formwork
4. Haunch Girders.
   a. Combinations of these four approaches shall not be used without specific written approval by Owner.

F. Avoid pre-cast – pre-stressed double-tees. Use only with written authorization from Owner. The decision to use pre-cast double tees in lieu of CIP framing shall be made based on cost-benefit analysis for life cycle costing for a 50 year life cycle; with the exception of parking structures.

G. Avoid excessive span/depth ratios to minimize deflections and to keep the system rigid.

H. Avoid the practice of designing pan joists or ribbed slabs as “tee beams” because this practice comprises future flexibility of the structure in terms of slab penetrations between ribs.

I. Avoid the assignment of large bending moments to columns for the sake of beam design and then neglecting these beam moments when designing the columns.

3.03 CONCRETE SYSTEMS

A. Avoid structural suspended slabs less than 5 inches thick.

B. Strive to use standard depth for girders joists and obtain a “flush” bottom structure so that joists and beams are the same depth throughout the structure. The savings in formwork usually more than offsets the expense of extra concrete.

C. Avoid sprayed-on fireproofing requiring a monolithic finish on thin slab, pan joist or waffle-joist systems.

3.04 STRUCTURAL STEEL FRAMING

A. Avoid light steel structures with long-span joists without positive shear diaphragm roof, such as metal decking.

B. Avoid columns without seat angles for beam and girder connections.

C. Avoid full penetration field welding (both in the shop and field) without strict specification to welder qualification, welding procedures, and inspection and testing, including X-ray testing.

D. Avoid all “weathering” steel including “weathering” sheet metal.

E. Avoid higher strength steels other than ASTM A992 Grade 50 for W – shaped members, ASTM A500, Grade B, 46 ksi. Steel for tube shaped members and A36 steel for miscellaneous plates and members.

F. Avoid ASTM A-490 bolts.

G. Avoid high-strength bolted connections without investigating and specifying latest state-of-the-art methods of bolt tightening, inspection, and documentation.

H. Avoid use of touching dissimilar metals conditions in all structural situations. Use compatible metals or provide isolation devices.

I. Clearly identify Architecturally Exposed Structural Steel (AESS) and provide appropriate specifications and details. Minimize the use of AESS to reduce cost.

3.05 PRE-CAST CONCRETE

A. Avoid extra longspan floor members or very large wall panels without thorough research as to transport route from various supply sources, traffic congestion on campus, availability of local machines capable of handling, etc.

B. Avoid the use of systems that are unfamiliar to the local construction trades.

C. Avoid systems that are flimsy or difficult to support and to attach.

D. Avoid light weight concrete (weight less than 145 pcf) without written authorization from Owner.

E. Avoid the use of epoxy coated rebar.

3.06 CAST IN PLACE CONCRETE

A. Avoid the use of grade 80 rebar, full penetration weld splices, and bar spacing which provides less than 1-1/2 inch clear separation. Should this prove unavoidable, specify ¾ foot maximum aggregate and 1 inch clear separation. Lap splices on column bars or use cad-weld or acceptable mechanical devices where possible.

B. Avoid light weight structural concrete with monolithic finish.

C. Avoid the use of several concrete strengths for structural elements. Limit upper working stress to 6,000 psi unless approved in writing by Owner.

D. Avoid architectural cast-in-place concrete with conventional reinforcement cover. Use a 2 inch minimum cover in addition to rustications. Provide 4-1/2 inch minimum clearance for vibrators. Tie wires must not have long free ends and must be bent away from concrete faces. Clipped ends must be removed from forms prior to concrete placement.

E. Avoid the use of sandblasted concrete without written approval by Owner. If approved, use stainless steel or plastic bolsters.

F. Avoid the repair of cracks in architectural concrete with conventional caulking compounds. Repairs shall be made by low pressure epoxy material.

G. Fly-ash in structural concrete shall be used only with written permission by Owner for architecturally exposed concrete. For all other concrete, a maximum of 25 percent (by weight) of type C or F fly ash may be used. The fly ash shall come from a TxDot approved source and shall include monthly mill certificates to confirm the adequacy of the ash.

H. Dapped beam and corbels in lieu of double columns at expansion joints.

3.07 MASONRY

A. Avoid light gage metal stud backup for exposed masonry veneer (especially brick). CMU is the preferred masonry backup. Use light gage metal stud backup only with written authorization from Owner. When allowed, the light gage framing shall limit deflections under service wind loads to 1/1000.

B. The use of masonry cement is not allowed. Use Portland cement only for mortar.

C. Type “N” mortar is preferred. Type “S” mortar should only be used when absolutely necessary since it is less durable than type “N” mortar.

D. Mortar cube testing and prism testing are not reliable indications of the in-place strength of the masonry. They are, however, used by our inspectors as a quality control measure and should be included in our testing requirements.

PART 4 - ENGINEERING TESTING

4.01 GENERAL

A. During design, it will be necessary for Owner to provide the A/E with “Pre-Design Engineering Information.” Requests for these services as deemed necessary by the A/E should be made to Owner. Owner will select a qualified Engineering Testing Firm to provide the A/E with information when required.

B. It is the Owner’s practice to assign Owner’s own personnel to both “represent the Owner” and provide for inspection during project construction. An independent, commercial testing agency will be selected by and paid for by Owner to provide the engineering testing and materials inspection during construction. These services provide the Owner, A/E and the Contractor with unbiased, third party, technical information and also augments Owner personnel in specific technical inspections.

4.02 PRE-DESIGN TESTING

A. Sub-Surface Investigations for Foundations: The prime purpose of a sub-surface investigation for foundation design is to accomplish an efficient use of natural, in place materials for the support of imposed structural loads. Soil and rock formations have specific engineering properties which affect the supporting value and stability of the founding media and are influenced by the geological history of the formation.

B. Sub-surface exploration for foundation design should delineate the horizontal and vertical limits of the deposition and establish the engineering properties that will affect the foundation design. The location and depth of the borings are selected to accomplish this purpose. Test borings are normally spaced geometrically to provide one boring for each 6,000 to 10,000 square feet of area. Inconsistencies or non-uniform conditions require a much closer spacing. The borings should penetrate to a minimum depth of twice the width of the loaded area beneath the founding level.

C. Spacing of borings, establishment of boring depth and selection of engineering tests are the responsibility of an experienced soils engineer with consultation of the A/E, structural engineer and Owner to obtain the necessary information at a minimum of cost.

D. Procedure:

1. On or before the Pre-Design Conference, the Owner's Project Manager will forward the results of any sub-surface investigations performed at or in the vicinity of the site for A/E study.

2. The A/E and its consultants will study preliminary information, and with the Owner's Project Manager will determine whether additional exploratory testing will be required, and to what extent. If so, the A/E will proceed to acquire testing information through a testing lab approved by Owner. Owner will pay for testing information not-to-exceed the agreed estimated cost.

3. After the schematic phase has been approved, the A/E and its consultants, the Owner's Project Manager, and the soils testing engineer for the laboratory will determine, based on projected structural loading (supplied by the A/E), the scope of any additional sub-surface tests which may be required. The A/E will proceed to acquire testing information not to exceed the agreed estimated cost.

4. Embankments and Fill Areas: The use of soil for engineering purposes such as compacted fill for the support of structural load, levees and berms, and slope improvement should be accomplished by using soil mechanics technology. The compaction of the soil should accomplish an improvement in the ability of the soil to withstand shearing stresses, prevent excessive settlement and minimize volume changes in the soil. The degree of compaction that more nearly satisfies the majority of these considerations shall be determined by an approved soils laboratory. The optimum degree of compaction that will accomplish the intended purpose is selected from the resulting test data.

5. Pavement Design: The soil investigation for pavement design includes shallow (5 feet) undisturbed core borings spaced approximately every 200 feet along the proposed street or at approximately every 10,000 square feet for a parking area. Intermediate borings are drilled in those instances where inconsistencies are encountered. The engineering design of the pavement section utilizes the soil investigation data provided by the soils laboratory, an analysis of the available construction materials, and a study to determine

the types of vehicles that will utilize the pavement and a projection of the number of wheel load applications anticipated during the design period. The A/E and its consultants are expected to design a pavement which will meet the desired performance level with a minimum of maintenance expenditure.

6. Concrete Materials: Unusual applications of concrete construction can be assisted by a pre-design material investigation. Unusual concrete application problems should be studied prior to design in order to resolve problems that are created by the uniqueness of design. Pre-design testing is extremely helpful in eliminating unnecessary expenses and potential construction problems.

PART 5 - CONSTRUCTION TESTING

5.01 CONCRETE

A. All concrete tests performed in the laboratory and on the job site, the design of mixes, and the inspection of concrete production should be performed in accordance with the applicable ASTM and ACI standards. The technician should be properly trained and completely familiar with the standards for the Work he is performing.

B. These standard methods have been proven to be satisfactory when conscientiously applied by the testing agency and cooperatively accepted by all parties concerned with the concrete construction Work.

C. The prime purpose of concrete testing and inspection is to provide all parties with the pertinent information required for successfully accomplishing the Work. The testing agency must meet and comply with the requirements of ASTM E-329.

5.02 SOIL (EMBANKMENTS, FILL AND SUBGRADE)

A. The testing for soil compaction during the construction of embankments, fills and subgrades for pavement is accomplished by frequent tests of the moisture and field density of the compacted material. The frequency of field density tests is approximately one for each 4,000 to 8,000 square feet in each lift in embankments and fills and one for each 300 linear feet of street. Fill areas with limited access to compaction equipment should be tested more frequently.

B. A laboratory moisture-density curve is required for each of the materials to allow comparison with the field density in order to determine the percent of compaction obtained. Mixing of different materials during the excavation of fill material will also necessitate a moisture-density curve. Blends of materials should be frequently checked with a single compacted specimen to obtain the compacted weight of material for comparison with the available moisture-density curves. Each of the soils encountered in the project should be identified by liquid limit, plastic index and minus 20 mesh sieve tests.

C. These identification test correlations should be accompanied by a description of the materials with respect to color, texture and soil type. The common method of identification and description is found in the unified system of soil classification. The degree of compaction required in the specifications should be established by a pre-design analysis of the soil. The field density tests are made to confirm compliance with the specification requirements. To be of value, the test results must be representative of an area that has been uniformly prepared.

5.03 BASE AND SUB-BASE PAVEMENTS

A. Two types of tests are required in the construction of pavement sub-base and base layers. These are tests performed for acceptance of material sources and tests to verify construction procedures. The acceptable test may be duplicated during the progress of the Work when deemed necessary by the job inspector. Acceptance tests for the pavement sub-base and base materials normally include the Los Angeles abrasion of the aggregate, the gradation of the material and the plasticity index of the fines. The gradation of the material and the plasticity of the fines should be checked at frequent intervals during the construction to maintain the specified quality.

B. The selection of quality standards for specifying materials should be done carefully to prevent the use of requirements that are uncommon in the area or that specify a quality which cannot be obtained within an economical distance. Texas Highway Department standards may prevail in one portion of the state and federal specifications might be the controlling factor in other parts of the state.

1. A quality pavement can be obtained with either of the two standards, but the familiarity to the suppliers in the area is important in specifying a material that would be easily recognized. Equivalent pavement sections can be obtained with stabilization techniques that will improve the available materials to an economic advantage. These determinations should be made prior to the completion of the Construction Contract Documents and Specifications. The compaction of the material is checked by field density tests. These tests are made at a frequency of approximately one for each 4,000 to 8,000 square feet per 6-inch layer.

2. The location of the field density tests should be subject to the direction of the job inspector. The tests should be representative of a uniformly compacted area. A sufficient number of moisture-density curves should be performed to establish the range of compacted material weight for computing the percent of compaction obtained by the Contractor.

5.04 STRUCTURAL METALS

A. Welded connections:

1. A procedure for satisfactorily welding the joint should be qualified prior to initiating any field welding. The qualification of an acceptable procedure should include the joint preparation; joint fit-up the type and size of the welding rod, the position of welding, methods to be used in cleaning the weld and the size and type of metal to be jointed by the weld. Sufficient tests should be performed on the joint welded by the proposed procedure until the procedure has proven to be satisfactory.

2. In addition to qualifying the procedure for welding, each welder should be qualified by testing the specimens he prepares using the procedure qualified for the project.

Qualified procedures and certified welders will indicate the availability of adequate methods or skills, but do not ensure the required performance.

3. Welding should be done under the observation of a qualified welding inspector. In addition, a sufficient number of radiographs or ultrasounds should be taken of in place welds to evaluate the performance of each welder.

B. Bolted Connections:

1. High strength bolted connections that depend on tightening of the bolts to a specific tension should be tightened by the “turn of the nut” method.

5.05 OTHER BUILDING MATERIALS

A. There are other building materials that require testing on a Project. The design of masonry mortar mixes and the job testing of mortar using mortar cube testing and prism compression testing is recommended as a quality control method by our inspectors.

B. Lightweight concrete masonry units and structural clay masonry products should be tested for absorption and compression. A performance requirement should be tested prior to final acceptance and payment.

PART 6 - COORDINATION OF DESIGN

A. The Engineer shall coordinate Work with the Architect and the Mechanical and Electrical Engineers to avoid conflicts in dimensions and space requirements.

B. Close attention should be given to mechanical requirements for construction clearances, openings, penetration of structural members, inertia pads, equipment weights, vibrations and special framing.

C. The Engineer shall review architectural details to verify that lintels, shelf angles, handrail anchors, miscellaneous framing members, clip angles, anchors, bolts and welds have been properly sized and spaced for their required carrying capacity. Evaluate details for simplicity, economy, ease of erection and flexibility to meet construction tolerances. This review should be continuous as required during preparation of Construction Contract Documents.

D. The architectural elevations shall clearly indicate the locations of all vertical and horizontal joints in all masonry. These joints shall be reviewed by the Structural Engineer.

E. Any new openings or penetrations through existing structures shall be coordinated with all other design disciplines and shall be clearly shown in the Structural Drawings.

PART 7 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	10-30-08	Added paragraph 1.01 H., requiring coordination of folding partitions, projection screens and high density filing systems.	LN
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z2015

Z2020 Furniture and Accessories Planning

PART 1 - REQUIREMENTS FOR WORKING WITH MD ANDERSON PLANNER DESIGNER

1.01 OVERVIEW

A. The MD Anderson Planner/Designer shall participate in the space, furniture and equipment programming, building design and space planning, A/E document review processes and construction phase for the purpose of providing consultation and advice to the A/E on matters related to the Owner's Integrated Space and Furniture Planning Standards (ISFPS), A/E layouts and the Owner's interior finish material types and application standards.

B. Moveable furnishings budgets identified as "Owner Managed" are the responsibility of the Owner's Planner/Designer. Furniture planning and production work for the Project may be outsourced to an Interiors Design Firm or "Service Provider". Where the furnishings design work for a project is outsourced, the Planner/Designer assigned to the Project shall serve as the coordinator for the institution during the selection, specification and bidding process for all moveable furnishings.

C. Where the furnishings design work for a project is outsourced to a Service Provider, that firm shall be responsible for using the Owner's standard furniture items and finishes, specifications and deliverables. Proposals for alternate furniture selections shall be presented using the Owner's Process for Standard Furniture/Finish selection. This work shall be guided by and overseen by the Planner/Designer.

D. The Planner/Designer's roles and responsibilities include, but are not limited to, the following areas described within Part 1 of this Design Guideline Element.

1.02 PROGRAMMING

A. Participate in programming information meetings with A/E, Department Contact and Service Provider (when used).

B. Verify that department's programming requirements are being met where applicable.

C. Verify initial furniture plans meet programming space requirements.

D. Verify that room assignments meet Owner's Integrated Space and Furniture Planning Standards (ISFPS). All variances should be noted and reported to the Project Director/Project Manager. Approvals must be obtained at appropriate level of authorization.

1.03 PLANNING

A. Verify A/E and Service Provider's (when used) application of the Owner's Integrated Space and Furniture Planning Standards for Offices (ISFPS).

B. Prepare existing furniture and equipment inventories for re-use, or if Service Provider is used, participate and review existing equipment and furniture inventories for accuracy.

C. Participate in furniture planning meetings with department contact and Service Provider (when used):

1. Meeting #1 – initial review of proposed typicals with discussion of end-user needs, verification that MD Anderson standards are used accordingly (product and application)

2. Meeting #2 – verify revisions, if any, are completed.

3. Meeting #3 – review final plans with end-user from approval and sign-off.

D. Communicate all furniture questions and issues that are addressed at meetings and/or by end user to appropriate Lead Planner/Designer for the Project. Service Provider (when used) will add and maintain all questions and/or issues to a cumulative spreadsheet referencing answers and solutions.

E. Participate in the medical and/or office equipment planning meeting with Move Coordinator for Information Services Support and Designated Department Contact, and Service Provider (when used) as needed.

F. Communicate any revisions to furniture plans after final sign-off to Project Director/Project Manager, and Planner/Designer for Project and Service Provider (when used). Project Director/Project Manager must approve all revisions prior to Service Provider updating drawings.

G. Verify the Room by Room and Product Summary Lists reflect new vs. existing product to be used.

H. Verify electrical and data outlets, thermostats and strobe lights are placed in locations, which do not interfere with furniture/accessories. Refer to Part 4 of this Element for the Owner's Room Device Mounting Guideline. All discrepancies should be noted and provided to Project Director/Project Manager. Project Director/Project Manager will approve relocations as appropriate and then Planner/Designer shall advise Service Provider (when used) to make revisions to drawings.

I. Verify medical and/or office equipment and the furniture needs to accommodate such equipment has been noted on furniture plans.

1.04 FURNITURE ORDERING/INSTALLATION

A. Verify Room by Room and Product Summary Lists are correct, matching to furniture plans. Communicate any discrepancies to Planner/Designer for the Project and Service Provider (when used) for resolution.

B. Prepare purchase requisitions for all new furniture orders using a standard template for the Project. Template will include process and information to be indicated on the requisition (i.e., dept name, org code, cost center, delivery info, etc.).

C. Participate in installation of new furniture and compile punch-list walk-throughs as required. Identify and follow-up with status of product and installation punch-list issues to verify that all have been completed prior to move-in.

D. Verify completion of installation to Planner/Designer for the Project for approval of invoices.

E. Verify delivery of equipment prior to move-in.

1.05 CONSTRUCTION

A. Complete walk-throughs as required to identify areas of concern/issues regarding space build-out, electrical and data connectivity for equipment. All areas of concern and issues should be noted and provided to Project Director, Project Manager, and Project Manager Activation/Deactivation. Project Director/Project Manager will approve relocations/additions/changes as appropriate.

B. Field verify spaces for furniture and equipment fit as needed and note all critical dimensions. Provide critical clearance dimensions where required to Project Director/Project Manager.

C. Be prepared to resolve issues relating to furniture and equipment as they arise.

D. Provide department tours of the new space as requested, but only after Project Director/Project Manager provides approval and directions for tours so that tours may commence. Ensure tour participants wear the appropriate safety equipment (hard hats and safety glasses, closed toe shoes) as required.

1.06 MOVE RELATED

A. Participate in move planning meetings and walk-through of origin and destination spaces with Project Manager Activation/Deactivation, Project Manager Move Management, Move Coordinator for Information Services Support, Designated Departmental Contact, and Service Provider (when used).

B. Complete minor adjustments to furniture plans and listings as required by the change management process prior to established deadline.

C. Review New and Existing Furniture and Equipment List from Service Provider (when used) with departmental contact.

D. Assist departmental contact with proper completion of Asset Transfer Forms prior to move and provide copies of ERN’s to Project Director/Project Manager for filing.

E. Participate in pre-move walk through with Project Manager and/or Construction Coordinator to verify space is ready for move in and confirm deadline completion.

F. Post furniture and equipment plans as required for accurate placement of existing furniture.

G. Participate in actual move including walk-throughs of origin and destination space on move weekend with Project Manager Activation/Deactivation, Project Manager Move Management, Designated Departmental Contact, and Service Provider (when used).

H. Complete post move customer service walk through with departmental contact to address punch list items as well as additional needs.

I. Verify that origin space has been locked down.

1.07 DEACTIVATION

A. Complete minor adjustments to furniture plans and listings as required due to changes as part of the actual move. Forward any changes to Planner/Designer and Data Management's Asset Management group for FM Space updating.

B. Participate in De-activation planning for furniture and equipment.

C. De-Activate the move from space as the Project requires.

D. Ensure all origin areas are clear of patient information.

E. Confirm all keys to origin space have been returned.

PART 2 - RESPONSIBILITIES OF THE A/E

2.01 GENERAL

A. The A/E shall prepare Furniture Layouts utilizing Owner's typical furniture standards to demonstrate that Programming requirements have been met.

2.02 GUIDELINES FOR FURNITURE PLANS / CAD FILES

A. All Drawings shall use Owner's CAD standards provided by Planner/Designer at the onset of the Project.

2.03 PRELIMINARY FURNITURE LAYOUTS

A. The A/E shall provide preliminary furniture layouts for the entire building during the Design Development stage to substantiate and verify that program space requirements are being met, to identify critical dimensions are noted and to confirm electrical, telecommunication, and audio/visual locations (refer to Room Device Mounting Guideline). While the A/E's furniture layouts may be further refined during the Construction Document phase, the A/E's preliminary furniture layouts shall be both well resolved and workable, and must conform to Texas Accessibility Standards (T.A.S).

B. Planning by the A/E shall be provided for furniture items as they relate to doorways, circulation, windows, electrical outlets, communications system outlets, mechanical and plumbing coordination and T.A.S. clearances. Also included are proper location/placement of temperature sensors, light switches, fire alarm strobes, and signage in conjunction with furniture planning. Refer to Owner's Room Device Mounting Guideline.

C. The Owner's Integrated Space and Furniture Planning Standards (ISFPS) be distributed to the A/E during the initial planning meeting.

D. Preliminary furniture layouts shall include an indication of all major artwork locations as identified by the Owner. The A/E is responsible for coordinating wall and ceiling mounted items with planned artwork, as well as providing appropriate lighting design at these locations.

2.04 FINAL FURNITURE LAYOUTS

A. Requests for revisions to the Preliminary Furniture Layouts, which are specifically identified by Planner/Designer during the Design Development review period, shall be incorporated into the layouts as part of the Design Development effort. Construction documents shall be required to show furniture layouts. In addition, the A/E shall convey its Final Approved Furniture Layouts to all of its trades so that all work is coordinated.

B. The layouts prepared by the A/E Team may be further refined when the Outsource Interior Design (when used) firm and Planner/Designer meets with the end user group. Planner/Designer shall make these revised layouts available to the A/E Team for coordination purposes.

C. When final revised layouts have been completed, a clean set of floor plans that include walls, windows, doors, room numbers, built-in cabinetry, millwork, fire and safety control devices, mechanical and electrical control devices, artwork locations, and equipment (in their individual associated layers) shall be sent to Planner/Designer. In addition to the floor plans indicated above, a site/project location map shall be included for purposes of coordinating move efforts. All Drawings and related information shall be transmitted electronically, the A/E shall advise the Planner/ Designer of software type and version used prior to sending (drawing format is preferred).

2.05 REVISIONS TO FLOOR PLANS DURING CONSTRUCTION

A. The A/E shall immediately notify the Planner/Designer of any revisions made to the floor plans during construction through the Owner's Project Director and/or Owner's Project Manager.

2.06 FIXED OR BUILT-IN FURNISHINGS AND ACCESSORIES THAT ARE THE RESPONSIBILITY OF THE A/E

A. Items that are built-in or affixed to the structural, mechanical or plumbing members of a building fall under the design and specification responsibility of the A/E and are to be procured through the Construction Contract (refer to attachment citing minimum clearance). Those items may include but are not limited to:

1. Built-in dishwashers, microwaves, and refrigerators
2. Fixed auditorium and lecture hall seating
3. Fixed classroom seating and tables
4. Fixed laboratory casework and equipment
5. Food service equipment
6. High density files, shelving and floor tracks (motorized or manual)
7. Laboratory benches and tables
8. Lecterns tied-in to building's A/V data and/or electrical systems

9. Lockers
10. Mailboxes and mail centers
11. Projection screens
12. Dining Room built-in seating
13. Moveable partitions
14. Reception and Waiting Room TV and Beverage Stations, Conference Room TV Monitors
15. Workroom and Storeroom millwork

PART 3 - ADHERENCE TO FURNITURE AND SPACE STANDARDS

3.01 MAXIMIZING SPACE AND FOLLOWING REQUIREMENTS

A. Space Planning shall reflect the Owner’s Integrated Space and Furniture Planning Standards (ISFPS). This information will be distributed to the A/E during the initial planning meeting.

B. A database with ID description of each piece of furniture will be forwarded with the latest version electronically upon request. A/E will indicate standard ID code on furniture plan.

3.02 FOLLOWING STANDARDS IN DESIGN

A. Typical Owner’s space standard guidelines for furniture dimensions and layouts are outlined for the benefit and coordination of the A/E in space planning.

B. The latest editions of the Texas Accessibility Standards (T.A.S.), TDH, NFPA, and IBC shall be used in setting forth minimum standards.

3.03 BUILT-IN MILLWORK/CABINETRY

A. Built-in millwork/cabinetry shall meet T.A.S. accessibility requirements.

B. Where knee spaces occur, it is suggested that the counter height be at 30 inches (with a knee space height clearance of 27 inches) so that a standard task chair may also be used.

C. Attention shall be paid to the depth of aprons or pencil drawers in order to allow maximum leg space for occupant.

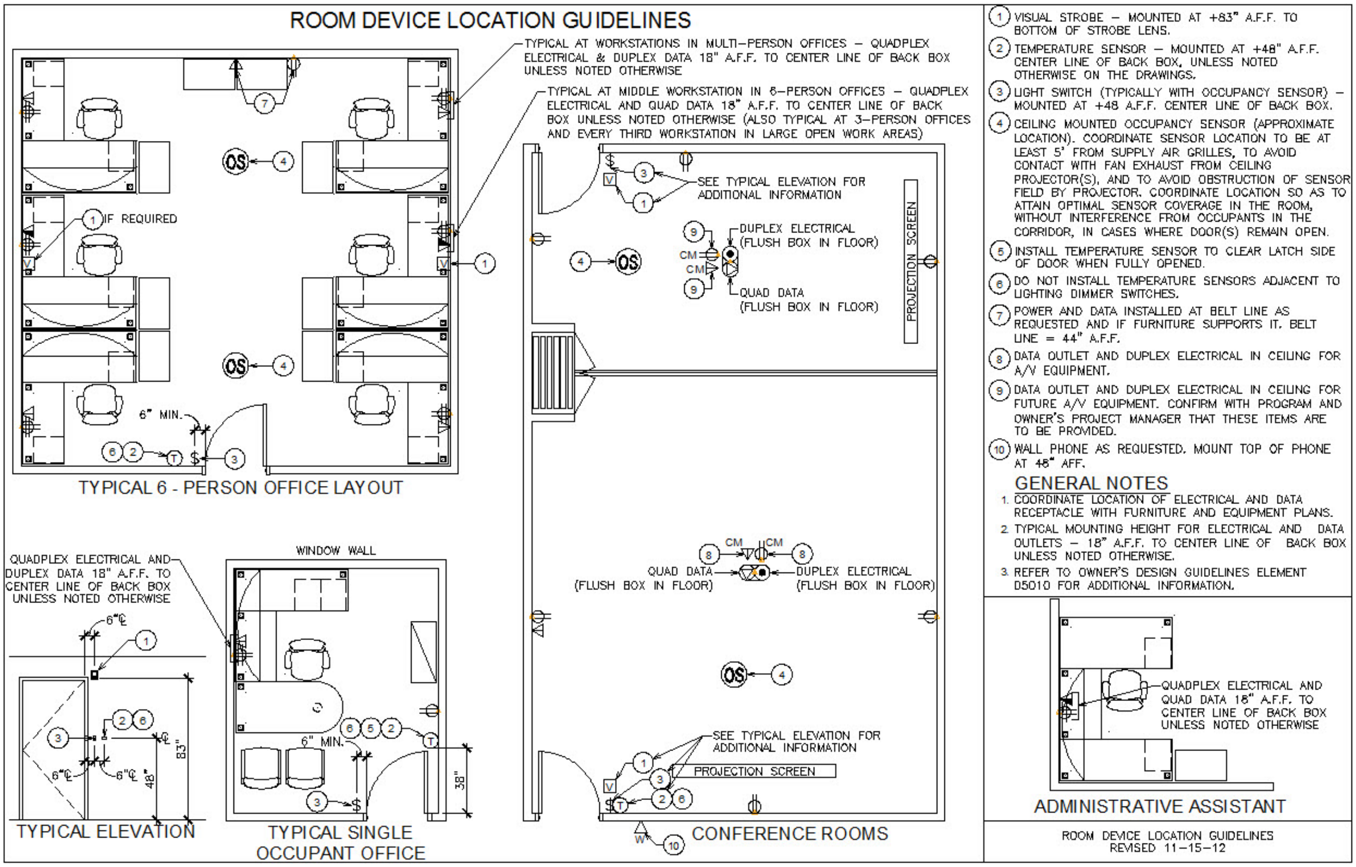
D. Grommets and cable tray locations to be confirmed with Planner/Designer for quantity, placement and attachment method details.

E. Refer to Owner’s Design Guideline Element E2010 Fixed Furnishings for scope of work criteria for these items.

PART 4 - INSTALLATION EXAMPLE ILLUSTRATIONS

4.01 ROOM DEVICE LOCATION GUIDELINE

A. Diagram 4.01A



PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	00-00-07	Initial Adoption of Element	
Rev. 1	05-17-07	Part 1: added Programming, Planning, Furniture Ordering/Installation, Construction, Move Related, and Deactivation requirements; Part 2: added Guidelines for Furniture Plans/CAD Files, revised Preliminary Furniture Layouts and Final Furniture Layouts.	JKT
Rev. 2	10-30-08	Changed document title. Made various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN
Rev. 3	08-02-12	Revised 2.03 B and C in reference to mounting guideline; Added 2.03 D; added 2.04 C artwork requirement; Revised 2.06 A14, and added 2.06 A15; Added reference to Project Manager Activation/Deactivation and Project Manager Move Management throughout document; Added Part 4.	JRC
Rev. 4	09-13-12	Revised room device location guideline; Part 4, 4.01 A.	JRC
Rev. 5	11-15-12	Added “Mount top of phone at 48” AFF.” On note 10 of Room Device Location Diagram. Paragraph 4.01 A.	JRC

END OF ELEMENT Z2020

PART 1 - GENERAL

1.01 OVERVIEW

A. The following information and specification details are designed to aid the A/E in understanding what falls into its scope of responsibility applicable to interior finishes. The categories listed within this Design Guideline Element define those key areas of responsibility.

PART 2 - RESPONSIBILITIES OF THE A/E TEAM

2.01 INTERIOR BUILDING FINISHES AND MATERIALS

A. Design Development:

1. At the Project onset, the A/E shall meet with the designated Owner's Facilities Planner/Designer to clarify all finish standards and applications that apply to the specific project.

2. The A/E shall base types of finish materials on those listed in Design Guideline Elements C3010, C3020, C3025, and C3030. In particular, finish products used on the Project shall meet or exceed the standards contained in Part 5, Specification Guidelines (where included), of these Design Guideline Elements.

3. All finish material types and applications should be presented to and approved by Owner by the end of the Design Development phase and prior to Guaranteed Maximum Price (GMP) acceptance. An Interior Finish Standards Schedule will be provided by the Facilities Planner/Designer at the onset of the Project's initial planning meeting.

B. Construction Documents:

1. By the 50 percent Construction Documents Submittal, the A/E shall prepare a presentation of previously approved interior finishes and design details to include proposed color schemes and material samples for Owner's approval of same and incorporate any changes required. A/E shall alert Owner of discontinuation or substitution of finish issues.

2. By the 95 percent Construction Documents Submittal, the A/E shall provide Owner with a final Finish Legend and Finish Schedule to represent those finishes approved by Owner.

3. A minimum of three sets of finish boards shall be produced by the A/E for use (1) at the construction site, (2) by the Project Director/ Manager, and (3) for Owner's Facilities Design/Planning teams. All finishes and materials displayed on the boards shall be clearly labeled, either on the front or the back of the board.

C. Product Submittals:

1. The A/E team shall immediately notify Owner of any changes (including value engineering) in Contractor submittals through the Owner's Project Director/Manager/Planner Designer.

2. A/E team shall forward all Contractor submittals through the Project Director/Manager to the designated Owner's Facilities Planner/Designer for approval.

3. The A/E team shall ensure each material sample is labeled with product manufacturer name, style, and color.

D. Built-in Accessories and Equipment Specifications that are the Responsibility of the A/E:

1. Items that are built-in or affixed to the structural, mechanical, or plumbing members of a building, or its AV systems, fall under the design specification responsibility of the A/E and are to be procured through the Construction Contract.

2. Finishes for these items shall be presented and approved with the rest of the building interior finishes. Those items include but are not limited to:

a. All Doors, including specialty doors such as Accordion Folding Doors, Glass Sliding Doors, etc.

b. Architectural Woodwork

c. Acoustical Wall Panels

d. Shelving for Supply Rooms

e. Building Directories and Mailboxes

f. Bulletin Boards in Public areas

g. Chalkboards and Dry Erase Marker Boards

h. Fixed Furniture and Furnishings (auditorium seating, dining seating, benches, lockers, headwalls)

i. Fixed Lighting Fixtures

j. Framing (doors and windows)

k. Handrails

l. Millwork

m. Raised Flooring

n. Operable Partition Walls

o. Plumbing Fixtures and Trim

p. Projection Screens

q. Toilet Compartment Partitions

r. Toilet Room Accessories

s. Wall and Corner Guards

t. Interior and Exterior Window Blinds, Drapery, Shutters, and Shades

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. All applicable provisions described within this Element shall be included within the Project Contract Documents.

B. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website: Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	00-00-07	Initial Adoption of Element	
Rev. 1	05-17-07	Revised Part 2; Design Development, Construction Documents requirements.	JKT
Rev. 2	10-30-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN
Rev. 3	04-11-13	2.01 A; revised item #1, added item #2.	LN
Rev. 4			
Rev. 5			

END OF ELEMENT Z2025

Z2030 Definitions of Building Areas

PART 1 - GENERAL

1.01 OVERVIEW

A. The A/E shall submit an estimate for the project's Gross Area and Assignable Area with the Schematic Design Phase submission and shall submit calculations with the Design Development Phase and the Construction Document Phase submissions, in accordance with criteria described within this Design Guideline Element.

B. The A/E shall design the Project so that the assignable to gross square foot ratio for the Project exceeds 0.60 to the extent possible, in accordance with the Texas Administrative Code, Title 19, Education. Where the following specialized space is predominant in the Project, the ratios of assignable square footage to gross square footage shall be as follows:

1. Office space; 0.65 or greater

2. Clinical, diagnostic support laboratories, technical research buildings: 0.50 or greater

PART 2 - DESIGN CRITERIA

2.01 GROSS AREA

A. Definition:

1. The sum of floor areas of a building including the exterior walls for all floor levels or areas that house floor surfaces including attics, basements, sub-basements, penthouses, mechanical rooms, etc., including floor penetration areas, however insignificant, such as circulation and shaft areas that connect one floor to another.

B. Basis for measurement:

1. Gross Area is computed by physically measuring or scaling measurements from the outside faces of exterior walls, disregarding cornices, pilasters, buttresses, etc., which extend beyond the wall faces.

2. Gross Area is measured to the nearest whole foot.

C. Description:

1. In addition to internal floored spaces, Gross Area should include the following, provided they have greater than six-foot six-inch clear ceiling height and potential usability:

a. Excavated basement areas.

b. Mezzanines.

c. Garages.

d. Enclosed porches, inner or outer balconies whether walled or not, if they are utilized for operational functions.

e. Corridors whether walled or not, provided they are within the outside face lines of the building, to the extent of the roof drip line.

f. Footprints of stairways, elevator shafts and ducts (examples of building infrastructure) are to be counted as Gross Area on each floor through which they pass.

2. Gross Area does not include:

a. Open, unroofed courts even if surrounded by the building; parking lots; playing fields; light wells, or portions of an upper floor eliminated by rooms or lobbies that rise above single-floor ceiling height.

b. Areas having less than a six-foot six-inch clear headroom or areas with lower ceilings that are usable for storage or other purposes.

2.02 STRUCTURAL AREA

A. Definition:

1. Sum of all areas on all floors of a building that cannot be occupied or put to use because of structural building features.

B. Basis for measurement:

1. It is determined by calculating the difference between the measured Gross Area and the measured Net Usable Area.

2. Measured in terms of area:

a. Structural Area = Gross Area – Net Usable Area.

C. Description:

1. Examples of building features normally classified as Structural Areas include exterior walls, fire walls, permanent partitions, unusable areas in attics or basements, or comparable portions of a building with ceiling height restrictions, as well as unexcavated basement areas.

2.03 NET USEABLE AREA (NUSF)

A. Definition:

1. Represents the Gross Area minus the Structural Area. The sum of Assignable Area and Nonassignable Area.

B. Basis for measurement:

1. Net Usable Area is computed by summing the Assignable Areas and the Nonassignable Area.

2. Measured in terms of net usable square feet (NUSF):

   a. Net Usable Area = Assignable Area + Nonassignable Area.

C. Description:

1. Net Usable Area should include space subdivisions of the ten assignable major room use categories and the three nonassignable space categories.

D. Limitations:

1. Deductions should not be made for necessary building columns and projections.

2. Areas defined as structural should not be included.

2.04 ASSIGNABLE AREA (ASSIGNABLE SQUARE-FEET – ASF)

A. Definition:

1. The sum of all areas within the interior walls of rooms on all floors of a building assigned to or available for assignment to, an occupant or use, excluding unassigned space. This is also referred to as net-assignable square-feet (NASF).

B. Basis for measurement:

1. Assignable Area is measured from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a six-foot six-inch clear ceiling height.

2. Measured in terms of assignable square feet (ASF):

   a. Assignable Area = Sum of Area Designated by the Ten Assignable Major Room Use Categories = Gross Area – Nonassignable Area – Structural Area.

C. Description:

1. Assignable Area should include space subdivisions of the ten major room use categories for assignable space – classrooms, labs, offices, study facilities, special use, general use, support, health care, residential and unassigned Area that are used to accomplish the institution’s mission.

D. Limitations:

1. Deductions should not be made for necessary building columns and projections. Areas defined below under Building Service Area, Circulation Area, Mechanical Area, and Structural Areas should not be included.

2.05 NONASSIGNABLE AREA

A. Definition:

1. Unassignable area of a building which is the sum of space within a building not assigned to directly support programs. Includes the Building Service Area, Circulation Area, and Mechanical Area.

B. Basis for measurement:

1. Nonassignable area is measured from the inside faces of surfaces that form the boundaries of the designated areas. Excludes areas having less than six-foot six-inch clear ceiling height.

2. Measured in terms of area:

a. Nonassignable Area = Sum of the Area Designated by Three Nonassignable Room Use Categories.

C. Description:

1. Nonassignable Area should include space subdivisions of the three nonassignable room use categories – building service, circulation mechanical that are used to support the building's general operation.

D. Limitations:

1. Deductions should not be made for necessary building columns and projections. Areas defined as assignable should not be included.

2.06 BUILDING SERVICE AREA

A. Definition:

1. Space used for the protection, care, and maintenance of a building, including restrooms that are accessible to the public.

B. Basis for measurement:

1. Building Service Area is computed by measuring from the inside faces of surfaces that form boundaries of the designated areas. Exclude areas having less than six-foot six-inch clear ceiling height.

C. Description:

1. Building Service Area should include janitor closets or similarly small cleanup spaces, maintenance material storage areas, trash rooms exclusively devoted to the storage of non-hazardous waste created by the building occupants as a whole.

D. Limitations:

1. Deductions should not be made for necessary building columns and minor projections. Areas defined as central physical plant shop areas, or special purpose storage or maintenance rooms, such as linen closets and housekeeping rooms in residence halls, are Assignable Areas and should not be included. Does not include private toilets.

2.07 CIRCULATION AREA

A. Definition:

1. Non-assignable hallway or stairwell space.

B. Basis for measurement:

1. Circulation Area is computed by measuring from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than six-foot six-inch clear ceiling height.

C. Description:

1. Circulation Area should include, but not be limited to, public corridors, fire towers, elevator lobbies, tunnels, bridges and each floor's footprint of elevator shafts, escalators, and stairways. Receiving areas, such as loading docks should be treated as circulation space.

2. Any part of a loading dock that is not covered is to be excluded from both Circulation Area and the Gross Area. A loading dock, which is also used for central storage, should be regarded as Assignable Area.

3. Also included are corridors whether walled or not, provided they are within the outside facelines of the buildings to the extent of the roof drop line.

D. Limitations:

1. Deductions should not be made for necessary building columns and minor projections. When determining corridor areas, only spaces required for public access should be included.

2. Restricted access private circulation aisles used only for circulation within an organizational unit's suite of rooms, auditoria or other working areas should not be included.

2.08 MECHANICAL AREA

A. Definition:

1. A portion of the facility's space that is designed to house mechanical equipment, utility services, and shaft areas.

B. Basis for measurement:

1. Mechanical Area is measured from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than six-foot six-inch clear ceiling height.

C. Description:

1. Mechanical Areas should include central utility plants, boiler rooms, mechanical and electrical equipment rooms, fuel rooms, meter and communications closets and each floor's footprint of air ducts, pipe shafts, mechanical service shafts, service chutes and stacks.

D. Limitations:

1. Deductions should not be made for necessary building columns and projections. Areas designated as private toilets are not included.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Not Applicable.

PART 4 - PRODUCTS

4.01 GENERAL

A. Not Applicable.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	03-02-10	Various revisions throughout document incorporating interior standards and eliminating project specific requirements.	LN, EA
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z2030

Z2035 Project Commissioning

PART 1 - GENERAL

1.01 OVERVIEW

A. MD Anderson is committed to commissioning our facilities to ensure that all systems are complete and functioning properly upon occupancy and that the facility staff has adequate system documentation and training. Commissioning refers to a systematic process confirming that building systems have been installed, properly started, and consistently operated according to criteria set forth in the Contract Documents, that all systems are complete and functioning in accordance with the A/E's Design Intent Document at Substantial Completion, and that the Contractor has provided MD Anderson's facility staff with adequate system documentation and training.

B. MD Anderson may contract directly with a Commissioning Authority as an extension of Owner's staff, to perform technical reviews of project design documents, observe completion of construction, verify equipment and system startup by Contractor or Subcontractor, observe prefunctional tests and functional performance tests of systems and integrated systems against requirements of the project Contract Documents, track deficiencies, and recommend solutions. The Commissioning Authority has authority only as delegated by the Owner, but has no authority to alter design or installation procedures.

C. To clarify the A/E's role in the design and construction process, this Design Guideline Element describes the intended scope of services that both the Commissioning Authority and A/E will be responsible for.

PART 2 - COMMISSIONING AUTHORITY'S RESPONSIBILITIES

2.01 GENERAL

A. In general, the Commissioning Authority, if retained by MD Anderson, will provide the following services during the Project's Design and Construction Phases.

2.02 DESIGN PHASE

A. Review and comment on project Drawings and Specifications for clarity, completeness, and compliance with the Owner's Design Guidelines.

B. Recommend alternative design approaches or value engineering items based on project Design Phase reviews.

C. Work with the A/E to make modifications and/or additions to the Master Construction Specifications for coordination with Commissioning requirements specific to the project scope.

2.03 CONSTRUCTION PHASE

A. Provide input to the Contractor on the first draft Commissioning Plan. The Commissioning Plan is a document prepared by the Contractor and approved by MD Anderson that provides the structure, schedule, and coordination planning for the Commissioning process from the construction phase through the warranty period. Review the Commissioning Plan for completeness.

B. Participate in Contractor's Pre-Installation meetings and Pre-Commissioning meetings with subcontractors.

C. Review Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with A/E and MD Anderson reviews.

D. Review Test, Adjust, and Balance (TAB) execution plan and review completed TAB reports.

E. Before startup, gather and review current control sequences and interlocks and work with Contractor and A/E until sufficient clarity has been obtained, in writing, to be able to prepare detailed testing procedures.

F. Verify start-up and prefunctional testing of all systems as defined in the Commissioning Plan. Monitor execution of functional performance testing, Owner demonstration of tests, integrated systems testing, and document results, follow-up, and signoffs.

G. Provide solution recommendations on deficiencies noted during the Commissioning process.

H. Perform site visits, as necessary, to observe component and system installations. Attend selected project meetings to obtain information on construction progress. Review project construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

PART 3 - ARCHITECT/ENGINEER'S RESPONSIBILITIES

3.01 GENERAL

A. The following describe the A/E's activities to support the commissioning process from the design phase through construction.

3.02 DESIGN PHASE

A. Document the development of design intent and operating parameters by all A/E team members within a document titled "Design Intent Document". The Design Intent Document describes the complete architectural and engineering design intent for the project including design guiding principles, assumptions, issues, recommendations, and narrative assessment of the architectural and infrastructure systems that comprise the building.

B. Update the Design Intent Document at each phase of design to incorporate current design documentation. Refer to Design Guideline Element Z2010 Design Submittal Requirements for additional information on the Design Intent Document format.

C. Adapt Owner's Master Construction Specifications to apply to project-specific applications.

D. Specify control sequences of operation within the Contract Documents.

E. Clarify the operation and control of equipment and systems to be commissioned where the Contract Documents are not sufficient for writing the Commissioning Plan and detailed test procedures.

F. Participate in project meetings related to commissioning activities.

3.03 CONSTRUCTION PHASE

A. Review prefunctional checklist, functional performance test, and integrated system test procedures and results.

B. Review functional performance test trend log data.

C. Review training plan.

D. Review test, adjust, and balance execution plan.

E. Coordinate resolution of design and operational deficiencies identified during commissioning, according to the Contract Documents.

F. Review operating and maintenance manuals.

G. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

H. Participate in project meetings related to commissioning activities.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications for fire suppression, plumbing, mechanical and electrical commissioning requirements, including examples of prefunctional checklists and functional performance tests to be used during the commissioning process.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	12-17-13	Changed the term “Commissioning Consultant” to “Commissioning Authority” throughout document. Added fire suppression and plumbing to 4.01 A.	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z2035

Z2050 Additional Life Safety and Asset Protection Requirements

PART 1 - GENERAL

1.01 OVERVIEW

A. The Architect/Engineer (A/E) shall ensure that the Project design incorporates adequate provisions to protect life, health and property due to spread of fire, smoke and water.

PART 2 - DESIGN CRITERIA

2.01 SENSITIVE AREAS

A. When developing floor plans, the A/E shall consider functions on upper and lower floor levels to avoid subjecting "Sensitive" areas from potential drain pipe or equipment leakage. Neither drainage piping nor fan coil units shall be located within the ceilings or exposed above "Sensitive" areas. The following areas are considered "Sensitive" by Owner:

1. Operating Rooms
2. Invasive Procedure Rooms
3. Bone Marrow Transplant / Protective Environment Areas
4. Intravenous Procedure Rooms (Chemotherapy)
5. Intensive Care
6. Inpatient Recovery Rooms
7. Sterile Supply Storage
8. Sterile Processing
9. Pharmacy I V Admixture
10. Pharmacy Drug Preparation
11. Pharmacy Drug Storage
12. Food Preparation, Storage, Serving
13. Data Centers
14. Electrical Equipment Rooms
15. Telecommunication Rooms

16. Potable Water Storage Tanks

17. Any Room Containing Imaging Equipment that May be Damaged Due to Water Leakage (MRI, Cat Scan, etc.)

18. Animal Holding Rooms

19. Animal Procedure Rooms

20. Laboratory Clean Rooms

B. Clarification to Areas Defined as ‘Sensitive’:

1. Sensitive areas listed apply to human and animal occupancies.

2. This requirement is applicable only to locations where contract documents designate room names or functions as listed above.

3. Additional areas may also require omission of drain lines and fan coil units as determined by Owner for a particular project. The A/E shall coordinate with the Owner’s Project Manager during the schematic design phase of a project to identify sensitive areas not listed.

C. When the Planner/Architect/Engineer determines that it is unavoidable to locate new fan coil units, drainage piping, waste piping or sanitary vent piping above a Sensitive area, the Planner/Architect/Engineer shall notify the Owner’s Project Manager in writing, before or during the schematic design phase of a project and obtain a clear direction to proceed.

2.02 EXISTING CONDITIONS

A. All existing sanitary waste, sanitary vent and storm drainage piping within the Project boundaries that are located above Sensitive areas shall be provided with heavy-duty joint connections having a minimum 15 psi pressure rating and meeting the performance criteria of Factory Mutual 1680.3.

B. All existing piping within the Project boundaries that are located above Sensitive areas receiving cooling coil condensate, ice machine drainage or conveying contents having temperatures below 55 degrees F shall be insulated and vapor sealed to prevent condensation.

C. All new and existing penetrations through rated partitions and floor slabs within the project boundary shall be sealed to provide a fire/smoke rating equal to or greater than the rating of the floor slab.

D. All new and existing penetrations through floor slabs within the project boundary shall be sealed watertight.

Z2050 Additional Life Safety and Asset Protection Requirements

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z2050

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for Fire Command Rooms at The University of Texas MD Anderson Cancer Center (Owner).

B. Refer to the "D" series Design Guideline Elements for requirements relating to mechanical, plumbing, and electrical work.

PART 2 - DESIGN CRITERIA

2.01 DESIGN REQUIREMENTS

A. The Fire Command Room shall be a minimum of 96 square feet in area, with a minimum dimension of 8 feet. Furnishings in the room shall be located so as to allow access to required wall mounted panels and equipment.

B. Unless required to have a higher rating, walls shall be minimum 1-hour fire resistance rated, with 45 minute rated door.

C. The room shall be located near the main entrance to the building (Lobby area), and is not to be located inside another space or under a vertical shaft enclosure.

D. Electrical outlets on emergency power shall be provided on all four walls of the room. Room lighting shall also be served by emergency power circuits.

E. The room shall include fire alarm panels, as well as visual indicator panels for all elevators and means to operate Phase 1 fire service.

F. The room shall be climate controlled to the same design standards as other normally occupied spaces.

G. Room finishes shall include lay-in ceiling, painted walls, resilient base, and vinyl composition tile or carpet at floor.

H. A data connection and two wall mounted telephones shall be provided in the room. One telephone shall be located adjacent to the elevator panel, and shall be programmed with the ability to join a conversation in progress in any of the building elevator cabs. Phone numbers for each elevator cab and instructions on how to call the elevators shall be posted at this telephone. A separate telephone with an outside line shall be provided for emergency personnel use.

I. A key box for fire department High-Rise plans and keys shall be located in the room.

J. A 911 box with Houston Fire Department specific 911 pad locks shall be included in the room.

2.02 FIRE-FIGHTERS SMOKE CONTROL PANEL

A. The Fire Command Room shall include fire-fighters smoke control panel(s) for fire department emergency response purposes, installed adjacent to the fire alarm control panel(s). Design of the smoke control panel(s) shall be per applicable codes, and shall include, as a minimum, the following features:

1. Manual control or override of automatic control for mechanical smoke control systems, including stair pressurization.
2. Prioritized controls for operating smoke control equipment, which allow ON-AUTO-OFF, OPEN-AUTO-CLOSE, and ON-OFF or OPEN-CLOSE control.
3. Indication of each fan, with display of air flow direction and relationship to other components.
4. Status indicators for smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows:
   a. WHITE- normal status for fans, dampers, and other equipment.
   b. RED- off or closed status for fans, dampers, and other equipment.
   c. GREEN- on or open status for fans, dampers, and other equipment.
   d. YELLOW/AMBER- fault status for fans, dampers, and other equipment.

2.03 GENERATOR ANNUNCIATOR PANEL

A. The Fire Command Room shall include remote generator annunciator panels for each generator providing power to the building. Points that shall be monitored and indicated include the following:

1. High, Low, and Normal Battery Voltage
2. Generator Running
3. Normal Utility Power
4. EPS Supplying Load
5. Low Oil Pressure, and Low Engine Temperature
6. Pre-High Coolant Temperature
7. Overspeed and Overcrank
8. Not In Auto
9. Battery Charger Malfunction
10. Low Fuel, and Low Coolant Level
11. All Automatic Transfer Switch Status. This is critical when emergency power is supplied from another location.

2.04 SECURITY

A. The Fire Command Room shall be equipped with card access control hardware. UT Police Department (UTPD) and MD Anderson Environmental Health and Safety (EH&S) personnel will have access to this room.

B. An electronic key override cylinder shall be provided inside the Fire Command Room. The cylinder shall accommodate a Best core, which interfaces with the access control system. Upon activation, the key switch will provide a signal to unlock all stairwell doors with card access in place and send an alarm signal to the security system.

2.05 FURNISHINGS

A. The Fire Command Room shall be designed to accommodate the following furnishings:

1. Dry marker erase board
2. 30 inch x 60 inch table
3. Task stool with adjustable arms
4. Task chair with adjustable arms

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. All finishes should reflect the standard finish application for the specific building in which the Fire Command Room is located.

PART 4 - PRODUCTS

4.01 GENERAL

A. For all projects (renovation and new), refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

C. Key box: MMF Industries, Model # 201911003 cabinet; single key; 110 Capacity.SD; Color: Sand

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	07-08-10	Initial Adoption of Element	
Rev. 1	08-02-11	Changed the word “temporary” to “temperature” in 2.03 A. 5&6.	JRC
Rev. 2	07-19-12	Revised telephone requirements in 2.01H.	JRC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4010

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for conference rooms, videoconference rooms, classrooms and other multimedia rooms at The University of Texas MD Anderson Cancer Center (Owner).

B. Note that the detailed construction considerations for audiovisual systems provided in this document are based on the requirements for Standard Definition (SD) cameras, projection systems and other displays. MD Anderson is currently in the process of evaluating High Definition (HD) equipment for these systems. The HD projection systems require wider projection screens and the equipment is often larger and heavier.

PART 2 - DESIGN CRITERIA

2.01 GENERAL CHARACTERISTICS

A. The rooms shall be located away from noise-generating activities taking place either outside or within the building. The rooms shall be located away from loud machinery, vending machines, offices, labs and traffic areas as well as outside traffic noise.

B. Ample space shall be provided in the room design for the programmed seating configuration, presentation space and support space such as furniture and equipment storage.

C. Adequate ceiling height shall be provided to allow an unobstructed view of properly sized information displays. Sight lines must be verified.

D. There shall be no columns in any room. Columns placed within the room's interior space severely hamper room arrangement and student viewing of the instructor and visual aids.

E. The front wall of the room behind the instructor area shall have no protrusions (structural or otherwise) into the room so that marker boards, projection screens or information displays can be installed across the entire wall of the presenter area.

F. There shall be no decorative elements such as paintings or other artwork located within the presentation area of the room.

G. The overall Mark II RC noise level shall be between 25(N) and 30(N) as a required goal for all presentation spaces.

H. Room design shall meet the requirements of the Texas Accessibility Standards, including provisions for wheelchair placement and listening systems for fixed seat type designs.

I. Consult with Owner on the use of power operators at all doors in major conference/meeting rooms with an occupant load of 50 or more, as well as use of hold-open features on selected doors in these spaces.

J. Provide credenza or millwork located below wall-mounted televisions which are not recessed into the wall and which would otherwise create a projecting object per Texas Accessibility Standards.

2.02 ROOM SHAPE AND CONFIGURATION

A. Owner shall be consulted regarding specific room requirements and room orientation requirements which may vary with intended room use.

B. In general, Owner prefers flexibility in room orientation so end-users are able to rearrange furniture components to meet specific event requirements. Some events may require row and column configuration, curved or semi-circular rows, break-out workgroup seating or no seating at all.

C. Rectangular shaped rooms are appropriate for many types of instructor-led presentations or lectures.

1. The length of the room shall not exceed its width by more than 50 percent.

2. The presentation area and information displays shall generally be located on the narrow wall of the room. Rooms that are wider than they are deep usually present unacceptable viewing angles for information displays and for information written on the marker board.

D. Wide room configurations may be appropriate to support seminar or group interaction among audience participants. This is relevant when curved or semi-circular rows are set up to encourage communications and easy eye-contact between participants.

2.03 ROOM SURFACES AND FINISHES

A. In non-videoconference rooms the front wall (i.e. the wall at the presentation end of the room), shall be hard surfaced (e.g., gypsum board, masonry or wood) with no special acoustical shaping or treatment.

B. In non-videoconference rooms the front three-quarters of each sidewall shall be constructed of hard (acoustically-non absorbent) materials (e.g. gypsum board, masonry or wood). These walls can be painted or vinyl-surfaced, but shall not employ fabric covering or any other acoustically absorbent finish.

C. In non-videoconference rooms install acoustically absorbent finish on the rear one-fourth of the sidewalls and the entire rear wall in order to absorb useless reflections and to dampen standing waves which reduces the room's "boominess". The sound absorbent material shall have a Noise Reduction Coefficient (NRC) of 0.60.

D. In videoconference rooms all of the walls shall be covered with acoustically absorbent materials with a NRC of 0.85.

E. Ceilings shall be a light color.

F. In non-videoconference rooms painted surfaces shall be light in color and shall be a durable finish to allow washing.

G. In non-videoconference rooms acoustically absorbent surfaces shall be light in color.

H. All finishes used in videoconference rooms shall be either from a list of finishes that have previously been certified for use in other videoconference room projects or samples shall be submitted to MD Anderson Telehealth Services for certification. In general, acceptable videoconference finishes have a maximum reflectance of 60 percent, and provide no patterns or textures that will cause the TV camera to produce a moiré in the picture and be tan, blue or teal in color.

I. In general, black or white surfaces shall be avoided.

J. The floors shall be carpeted with an anti-static, high traffic, commercial grade carpeting with no padding. Bright reflective carpet finishes shall not be used.

K. Marker boards used in videoconference capable conference rooms and classrooms shall have a finish designed for use in videoconference facilities. Most marker board manufacturers offer a television-friendly finish.

L. The reflectance values of paints, vinyl coverings, laminates and other finish materials shall be selected to enhance ambient illumination and the illumination at work surfaces. The following values are recommended:

1. Ceilings 70 percent - 90 percent
2. Walls 40 percent - 60 percent
3. Floors 30 percent - 50 percent
4. Desktops 35 percent - 50 percent

2.04 WALL CONSTRUCTION

A. Walls shall be mechanically isolated from the building structure and shall be isolated at the top and bottom with a Neoprene seal or equivalent.

B. Walls shall extend from slab to slab in order to reduce noise paths into the room.

C. In videoconference rooms double offset wall studs or sound channels shall be used so that the interior and exterior gypsum board is not attached to the same studs. This will minimize the transfer of noise from surrounding spaces.

D. Use a double layer of gypsum board with the inner layer being 5/8-inch thick and the outer layer being minimum ½-inch thick. In high noise areas use a 1/8-inch thick vinyl sound-block material for additional acoustical isolation.

E. Drywall seams shall be staggered and each layer shall be taped and floated individually.

2.05 WINDOWS

A. Large window areas provide light control and exterior noise problems and shall be minimized.

B. All window treatments shall be opaque and capable of eliminating all outside light from reaching the information displays. Window treatment shall be installed with channels in order to provide a light-tight abutment to the window frame.

C. A motorized window shading system that can be integrated with external audio-visual control systems shall be installed for each window.

D. Window shades shall provide an acoustical isolation of Sound Transmission Coefficient (STC) of 30 or higher.

2.06 DOORS

A. Doors shall be located in the back of the room away from the presentation area in order to minimize disruption. In rooms that require two egress points, the doors shall be located as far from the presentation area as possible.

B. Doors shall be 2-inch thick, sound-rated, or at a minimum, solid core to prevent noise from entering the room.

C. Doors shall be equipped with acoustically rated compressive seals.

D. All doors shall be a minimum of three (3) feet wide and shall be equipped with a vision panel made of shatterproof glass and tinted to reduce light transmission. The area of the glass shall not exceed 100 square inches and shall be double-paned with acoustically rated seals. Doors without a glass panel shall have large door scope viewer “Peep Holes” installed at standard height as well as accessible height to provide a view into the room to check on on-going activities. Where use of poster carts is planned, provide at least one four (4) feet wide by eight (8) feet tall door (or equivalent double door with 12” inactive leaf) into the room. Provide the same oversized door for poster carts at a storeroom serving the classroom/conference room. Confirm use of poster cart with Owner's Project Manager.

E. Because ventilation louvers permit sound transmission, doors shall not contain louvers.

2.07 CEILINGS

A. A minimum 9 foot ceiling height shall be utilized for rooms that are 24 feet or less in length. In rooms where the programmed seating requirements, presentations space, and support space require a room deeper than 24 feet, the following considerations for ceiling height shall be used:

1. The length of the room determines the maximum usable size of the projection screens. The height of the projection screen shall be 1/4 of the room length plus a minimum 6-inch black border at the top of the screen. A 42 foot long room would require a projection screen that has a minimum 10.5 foot high projection area plus the 6-inch black top border. The minimum goal would be to provide a projection screen surface height 1/6 the length of the room.

2. In a room with a flat floor, the bottom of the projection area of the screen shall be at least four (4) feet above the finished floor.

3. The height of the ceiling for a room longer than 24 feet shall be determined by the height of the projection screen plus the 6-inch black top border. For the 42 foot long room the minimum ceiling height would be 10.5 feet + 6-inches + 4 feet = 15 feet.

4. Rooms using tiered audience seating may have a lower ceiling.

B. Access hatches shall be installed in the ceiling wherever gypsum board or plaster is used in order to facilitate access to otherwise inaccessible areas of the ceiling cavity.

2.08 SEATING REQUIREMENTS FOR CLASSROOM CONFIGURATION

A. For preliminary planning purposes, 20 square foot per person shall be used. This will allow for seating, circulation, media equipment, space requirements to meet accessibility standards and adequate lecture space. The room layout shall allow for a minimum of 4 feet between each row of tables. This allows sufficient room for walking and for moving chairs in and out of position.

B. The first row of seating shall be a minimum of 1.5 times the width of the projection screen from the projection screen. A projection screen 7.5 feet high would be 12 feet wide, placing the first row of seating at 18 feet from the projection screen.

C. The room layout shall allow for no more than 10 people maximum in a row of adjoining tables. The maximum length of the first one or two rows of tables shall provide a viewing angle no greater than 60 degrees from the far edge of the projection screen from the reference viewing point. Example: If you were sitting in the first seat on the left end of the first audience row your maximum viewing angle of the far right edge of the projection screen would be 60 degrees (when measured as the variance from a straight-on view).

D. Tabletops shall have a non-glare, medium shade surface. Lights colors on tabletops cause reflections and eyestrain and are difficult to keep clean. Dark surfaces also cause eyestrain, especially when white paper is used on the tabletop.

E. In videoconference equipped classrooms a tabletop surface finish with a 40 percent to 45 percent reflectance is desired. This level of reflectance provides light fill in the shadow areas of the face.

F. In tiered classrooms/auditoriums, where fixed seating is installed, modesty panels or front panels shall be specified on all fixed tables.

2.09 PROJECTION SCREENS

A. There are two (2) types of projection systems used in MD Anderson classrooms and conference rooms, Front Projection and Rear Projection.

1. Front projection screens are utilized most often in the conference and classrooms. There are several front projection screen types found throughout the institution. The most common are wall mounted manually operated screens; next common are ceiling mounted (manually operated) screens and last are ceiling mounted (electrically operated). Final projection screen type selection will be provided by the Project team/Facility Program.

2. When using front projection screens, the projector is located in front of the screen and is pointed towards the screen. Projectors used in front projection systems are typically ceiling mounted.

3. There are a few rear projection screens within the institution, with most located in dedicated classrooms. Rear projection screens provide a higher contrast image than a front projection screen in high ambient lighting areas. Projectors are placed behind the screens and pointed at the rear of the screen. The image is projected onto the rear of the screen and is visible to the audience in the room. The light from the classroom passes through the rear screen and is not reflected back to the audience. Rear projection systems require a separate room behind the screen that is painted black and is kept completely dark. Typically the projector is pointed at a mirror that then reflects the image onto the screen. However, MD Anderson prefers direct projection system over maintenance-prone reflected mirror systems. Assistance from a consultant or rear screen manufacturer is required to setup a rear projection system.

4. Front projection screens with a Matte White finish shall be provided for rooms with lighting controls with two or more zones. One of the zones must include all the non-directional lighting fixtures within 9 feet and in front of the projection screen. For rooms with a ceiling higher than 9 feet, the coverage of the zoned area must be increased.

5. Front projection screens provided for rooms with little or no zoned control of the lighting and which have a high ambient light level across the room shall utilize a Cine-Grey type surface.

6. Projection screens that will be controlled by the audiovisual control system shall include a low voltage control option with a local 3 button control panel option.

7. Unless otherwise approved by Owner, all projection screens used in new construction shall have an aspect ratio of 16:10.

2.10 ACOUSTICAL SYSTEM

A. Consider use of wall and ceiling treatments that improve intelligibility in the classroom and keep external noise as well as internal building noise from being audible inside the classroom. Specify flooring with IIC (Impact Isolation Class) that prevents sound transmission. Specify walls with sound transmission class minimum rating of 50. Provide sound rated doors with acoustical door seals. The surface of the ceiling must be designed to accommodate the required acoustical properties of the room. The area of the ceiling to be acoustical tiled is a function of ceiling height. A 9 foot ceiling height typically requires that 40 to 50 percent of the total ceiling area be acoustical tile. A ceiling height of 10 feet typically requires that 50 to 60 percent of the ceiling be acoustical tile, and a ceiling height of 12 feet typically requires that 70 to 80 percent of the ceiling area be acoustical tile.

B. The acoustical tile shall be arranged in the center of the room, with a gypsum board ceiling enclosing the acoustical tile area.

C. Ceiling tiles with a Noise Reduction Coefficient (NRC) of 0.65-0.85 and a minimum Sound Transmission Coefficient (STC) of 50 shall be used.

D. Access hatches shall be installed in the ceiling wherever gypsum board or plaster is used to facilitate access to otherwise inaccessible areas of the ceiling cavity.

E. Separate classrooms from external and internal sources of noise such as loading docks, parking lots, streets, mechanical and equipment rooms, vending areas, elevator, locker rooms and dining facilities.

F. For occupied space on floors immediately above rooms equipped with videoconference or sound recording systems provide additional sound isolation on or below the floor to minimize sound transfer of noise from foot traffic, rolling carts, and closing doors, etc.

G. Minimal acoustical requirements:

1. RC Ratings:

   a. General Classrooms: 30(N) or less

   b. Auditorium/Lecture Hall: 25-30(N) or less

   c. Distance Learning Classroom: 25-30(N) or less

2. Reverberation Time:

   a. General Classroom: RT60 of 0.4 seconds or less

   b. Small Auditoriums: RT60 of 0.8 seconds or less

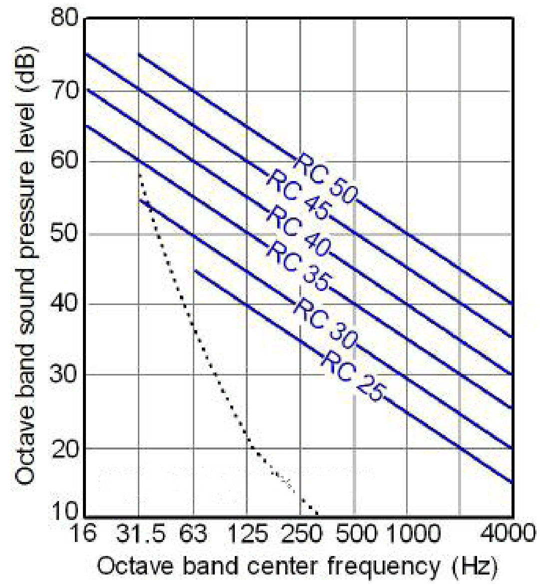
   c. Large Auditoriums: RT60 of 1.5 seconds or less

H. In all conference rooms, use acoustically absorbent materials with an NRC rating of 0.85 or greater.

I. Acoustical Standard Testing Procedures

1. Noise Criteria:

   a. Room Criteria (RC) measures background noise in a building over the frequency range 16 Hz to 4000 Hz. This is a reference level based on a chart of frequency vs. sound pressure (dB) curves that displays sound levels perceived by the human ear as equal in magnitude. The highest RC curve touched by a plot is the sound RC level. RC curves apply to sound pressure levels in an occupied space, and sound power level performance of HVAC systems.



b. Conditions: Windows and doors closed, with the HVAC on in the room and minimal external noise from adjacent locations.

c. Acquire Data: With microphone at 48 inches above the finished floor and located in the middle of the instructor station location area at the front of the room.

d. Standard: RC of 30(N) or less for classrooms, auditoriums and distance learning classrooms.

2. Reverb Time (RT60):

a. Reverberation time is the time required for the sound level in the room to decay 60 dB. In other words, it is the time needed for a loud sound to become inaudible after turning off the sound source.

b. Conditions: Windows and doors closed, with the HVAC on in the room and minimal external noise from adjacent locations.

c. Acquire Data: With microphone at 48 inches above the finished floor and located in the middle of the instructor station area at the front of the room.

d. Standard: RT60 of 0.40 seconds or less for standard classrooms, RT60 of 0.80 for small auditoriums (100 to 200 seats) and RT60 of 1.50 seconds for large auditoriums (more than 200 seats).

2.11 MECHANICAL SYSTEMS

A. Classrooms shall be maintained in accordance with the Owner's Design Guidelines regarding temperature and humidity.

B. System components (fans, ductwork and diffusers) shall be selected to meet the required sound power levels for the designated space.

C. Design the classroom HVAC systems to operate as a separate zone with controls to operate independently from other spaces within building. Projection booths, rear projection rooms and control rooms shall be equipped with separate HVAC systems or zoned independently of the classroom. HVAC for these rooms shall run 24x7 at a temperature of 72 degrees F with humidity of 45-to-55 percent.

D. Place air-conditioning registers along the perimeter of the room and the air returns in the center, front or rear of the room. Select air devices to provide low velocity airflow in order to minimize airflow noise in the room. Provide return air transfer duct with an offset inlet/outlet configuration to isolate the room from the noise in the plenum air space. If the mechanical room is in close proximity to the classroom, evaluate the requirement for sound attenuators based upon the classroom NC criteria in Section 2.10, to reduce the mechanical system noise to meet these guidelines.

E. Install and maintain mechanical systems (ducts and piping) along sidewalls for horizontal air flow into the room and to allow the front central area projection screens to be constructed as high as possible.

F. Coordinate systems so that space is provided for classroom technology components that may require installation space above finished ceilings.

G. Isolate equipment mounted adjacent to and above a classroom from vibration.

H. Do not locate supply air or return air devices close to projection screens.

I. Integrate systems that serve classrooms with the central monitoring system or energy management system.

J. Do not locate fan coil units or other fan powered elements of the mechanical system in the classroom ceiling space.

2.12 LIGHTING SYSTEMS

A. Lighting Goals:

1. All room lighting configurations shall be verified by using a computer lighting design program such as those offered by Lumen Micro or Lightolier.

2. Conference room non-videoconference: Measured at tabletop height 40 to 50 foot-candles horizontal all across the seating area of the room and 0 to 8 foot-candles on the projection screens.

3. Classroom non-videoconference: Measured at tabletop height 40 to 50 foot-candles horizontal all across the seating area of the room. Presentation area 40 to 50 foot-candles at lectern height of approximately 40-inches above the finished floor. Approximately 30 to 40 vertical foot-candles shall be provided at a height of 48-inches to 75-inches above the finished floor to provide lighting of the presenter and 0 to 8 foot-candles on the projection screens.

4. Conference room videoconference capable: Measured at tabletop height 40 foot-candles horizontal minimum all across the seating area of the room. Measured from 40-inches to 80-inches above the finished floor 50 to 70 foot-candles vertical all across the seating area. This would be as you look towards the projection screen from the seating area. From the presentation area looking towards the seating area a minimum of 40 horizontal foot-candles at the lectern work surface height; 40 to 60 foot-candles vertical measured from 40-inch to 80-inch above the finished floor, and. 0 to 10 foot-candles on the projection screens. Wall wash on all but the projection screen wall shall have a wash of 30 to 50 foot-candles. Note: To achieve the required vertical lighting goals the tabletop horizontal foot-candle lighting levels will typically be 40 percent higher than the achieved vertical foot-candle level. For instance, if there are 50 vertical foot-candles of light at a seating location there would typically be 70 horizontal foot-candles of light on the tabletop at that location.

5. Classrooms videoconference capable: Measured at tabletop height 40 foot-candles horizontal minimum all across the seating area of the room. Measured at 40-inches to 80-inches above the finished floor 50 to 70 foot-candles vertical all across the seating area. This would be as you look towards the projection screen from the seating area. From the presentation area looking towards the seating area 40 foot-candles minimum at the lectern work surface height of approximately 40-inches above the finished floor; 60 to 90 foot-candles vertical measured from 40-inches to 75-inches above the finished floor, and 0 to 8 foot-candles on the projection screens. Wall wash on all but the projection screen wall shall have a wash of 30 to 50 foot-candles. Note: To achieve the required vertical lighting goals the tabletop horizontal foot-candle lighting levels will typically be 40 percent higher than the achieved vertical foot-candle level. For instance if there 50 vertical foot-candles of light at a seating location there would typically be 70 horizontal foot-candles of light on the tabletop at that location.

6. Videoconference capable rooms used for general meetings: In most cases the extra lighting for videoconferencing is provided through separate dimmer or switched controls. Ensure that when these additional lighting fixtures are turned off that there is still a minimum of 40 horizontal foot-candles at tabletop height across the room.

7. The color temperature for all lighting fixtures shall be the same. The color temperature target goal is 3200 degrees Kelvin. Color temperature in the range of 3000 to 3500 degrees Kelvin is acceptable as long as all the fixtures are the same.

B. Standard direct/indirect fluorescent luminaries will be used.

C. Lighting fixture type, orientation, zoning and dimming control for non-videoconference equipped classrooms and conference rooms:

1. Standard direct/indirect luminaries will be used. See Design Guideline Element D5022.

2. Orient the luminaries where the length of the lamp is perpendicular to the projection screen. This orientation places the lowest light output node of the luminaries toward the projection screen.

3. Provide two zones using wall dimmers for control unless otherwise directed. Zone 1 shall be all luminaries within 9 feet of the projection screen and in front of the projection screen.

Zone 2 shall be all the other luminaries in the room. Place the wall dimmers at the standard location by the room entry doorway.

4. In classrooms with 9 foot to 11.5 foot high ceilings, provide two adjustable compact fluorescent down lights to illuminate the lectern and presenter when the other lighting is dimmed. Place the down lights above and in front of the lectern location to achieve a lighting angle of 20 degrees to 30 degrees. The lighting goal here is from 20 to 45 horizontal foot candles. Place the dimmer for these lights on a wall adjacent to the lectern location.

D. Lighting fixture type, orientation, zoning and dimming control for videoconference equipped classrooms and conference rooms:

1. The lighting design guideline for videoconference equipped conference rooms is the same as items C 1, 2 & 3 above, with following exception:

    a. In videoconference-equipped conference rooms, it is important to light the faces of the participants sitting at the conference table. In a conference room with a typical centered conference table there shall be a row of luminaries placed above the center line of the table. One of the fixtures shall be placed 2 feet in front of the presentation end of the conference table. This fixture will provide adequate light to illuminate the faces of the persons sitting at the end of the table.

2. In videoconference capable conference rooms, asymmetrical fluorescent luminaries equipped with 1 percent electronic dimming ballast shall be provided. Asymmetrical luminaries direct the light away from the projection screens and provide adequate down light for general meetings and videoconferences. A sufficient number of asymmetrical fluorescent luminaries shall be provided over the seating area to provide a range of 40-60 vertical foot-candles as you look towards the presentation area. Adjustable fixtures with pattern adjustment capabilities shall be used to provide 60-80 vertical foot-candles at the presentation area as the presenter looks towards the seating area. One (1) or two (2) compact fluorescent down lights shall be used above the lectern to light the workspace on the lectern. Use wall wash luminaries to light all but the presentation walls for videoconferences. Adjustable pattern wall wash fixtures shall be used to light the wall behind the presenter without spilling onto the projection screen. References for asymmetrical luminaries are in located in Part 5 – References, at the end of this document.

3. Light Dimming capabilities are an integral part of all conference rooms and classrooms. In videoconference capable rooms the power requirements for the additional videoconference lighting often causes the rooms power requirements to exceed the State of Texas and City of Houston guidelines for “watts-per-square foot” ratings. This is allowed under State of Texas and City of Houston guidelines when the rooms are used for videoconferencing. A dimming system provides adequate control of the lighting to maintain the State of Texas and City of Houston ratings for all other uses. Typically the videoconference lighting can only be turned on from protected sections of the room’s audiovisual control system control panels.

4. For small to medium videoconference capable conference rooms provide an electronic controlled dimming system such as the Lutron 3600 or ECO systems. Include an RS-232

audiovisual control system interface. Provide a minimum of 4 zones with one 5-button entry control panel and a multi-scene 3600 series wall mounted master controller. The master controller shall be located away from the entry door(s).

a. Zone 1 shall be the fluorescent luminaries immediately in front and to the side of the projection screen.

b. Zone 2-3 shall be the remainder of the fluorescent luminaries in the room.

c. Zone 4 shall be the adjustable pattern lighting for the lectern.

5. For videoconference capable classrooms provide an electronic controlled dimming system such as the Lutron 7000 or ECO systems. Include an RS-232 audiovisual control system interface. Provide a minimum of 13 zones with 1 5-button entry control panel and a multi-scene 4600 series wall mounted master controller.

   a. Zone 1 shall be the fluorescent luminaries immediately in front and to the side of the projection screen.

   b. Zone 2-4 shall be the remainder of the fluorescent luminaries in the room.

   c. Zone 5 shall be the compact fluorescent down light for the lectern.

   d. Zone 5-6 shall be adjustable pattern fixtures for the presentation area.

   e. Zone 7 shall be the wall wash luminaries behind the lectern.

   f. Zone 8-10 shall be the wall wash fixtures on the rear and 2 sidewalls.

   g. Zone 11 shall be the lighting in any technician control area.

   h. Zone 12-13 shall be for rear projection equipment rooms.

6. For divisible conference or ballrooms provide a partition location detection system so that room lighting controls are automatically configured as movable wall partitions are put in place or removed. Lutron has an option for partition location detection as part of their dimming systems. The partition location sensors must be carefully placed at the ends of the movable partition travel only. The sensors shall also be configured in the maintained mode and not the pulse mode.

7. In divisible conference or ballrooms with a movable partition sensor system, an advance lighting control is required. All sensor outputs shall be connected to the audiovisual control system for the room. The audiovisual control system would then be programmed to include the advanced lighting control.

8. Dimming systems that use the Lutron 7000 central controller shall provide laptop connection points in the conference or classroom and in the audiovisual equipment/control room.

2.13 DATA AND TELECOMMUNICATIONS REQUIREMENTS

A. All conference rooms are to have a minimum three (3) data RJ-45 outlets and one (1) analog fax/audioconference telephone line outlet installed. These connections are to be installed in designated floor boxes in new construction, or mounted on the front wall below the projection screen in existing construction.

B. All new construction classrooms will have a minimum of two (2) RJ-45 data outlets in each of the floor boxes, three (3) RJ-45 data outlets near the audiovisual support equipment racks, three (3) RJ-45 data outlets near the room technician control point and one (1) analog fax/audioconference line near the audiovisual support equipment racks. For existing classrooms the connections are to be installed in the wall box with the lectern connections or immediately next to the wall box.

C. In rooms with fixed tables, each seating location will have a RJ-45 data outlet in a popup or rear mount assembly. If wireless LAN connections can be used in the area, then these RJ-45 data outlets would not be required.

D. The Owner’s Project Manager shall work with MD Anderson Telecommunications services to determine if wireless access points shall be installed in these areas. Where wireless access points are provided, consideration shall be given to the maximum number of notebook PC's that can be served from a single point, and the total number that require connection.

E. In podiums equipped with multimedia equipment, include a small CISCO 8-port 10/100 data switch to consolidate the data wiring in the lecterns. Where multiple data ports are needed for the audiovisual support equipment another CISCO 24-port switch shall be included in the audiovisual system and located in the support rack.

F. Provide the following fiber counts and types for the rooms listed.

1. Videoconference equipped Conference Rooms: minimum of 2 multimode and 2 single mode fiber ports located below the projection screen near the audiovisual equipment cabinet.

2. Distance Learning Classrooms: minimum of 4 multimode and 4 singlemode fiber ports located above the equipment rack in the rear projection room or audiovisual control room or audiovisual equipment closet.

2.14 ELECTRICAL SYSTEMS

A. Any audio-visual system requires clean, high quality AC power to operate correctly and reliably, with the lowest possible hum and noise as recommended by the equipment manufacturer. A conservative number of ac power circuits shall be dedicated exclusively to the audio-visual systems. A minimum growth of 25 percent shall be included in the electrical system design. AC power circuits in floor boxes are to be provided as audiovisual power circuits.

B. For large conference rooms and all classrooms, a true isolation transformer is required, which is specifically designed for technical system power, and has isolated secondary windings.

The shield of this transformer shall be tied directly to the technical system ground at the distribution panel - not to the transformer case, which is tied to building ground.

C. Unless an isolation transformer is provided, all circuits for the system shall be taken from the same phase, with a dedicated distribution panel for all audio-visual classroom circuits.

D. An isolated, insulated ground of #00 AWG or larger copper shall be provided in a separate conduit, from the building ground at the transformer case to the room equipment electrical panel isolated ground bus and from the panel isolated ground buss to the video production and/or sound equipment rack(s) All grounds shall be connected as required by National Electrical Code.

E. There shall be no power transformers or lighting dimmer panels located in the same room with audiovisual equipment.

F. Each electrical outlet provided for audiovisual equipment is to include a dedicated ground and neutral wire.

G. In rooms where portable projection equipment will be used install 4 standard power outlets close to projector connection to serve additional equipment.

H. Ensure the Electrical Contractor properly implements that “Star” ground configuration. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other, and are each “home-run” to the dedicated breaker panel for AV systems.

I. Dedicated breaker panels shall be provided for audiovisual equipment where 24 or more circuits are required. In Classrooms and Conference Rooms with rear projection rooms or audiovisual equipment closets, the dedicated breaker panels shall be located in the rear projection room or audiovisual equipment closet. When a dedicated breaker panel provides circuits for multiple rooms, the panel shall be located in a central location near the room when possible.

J. All audio, video and control electrical circuits shall be fed from "clean" legs of the transformer, free of high inductive loads. There shall be no elevator motors, compressor motors, blower motors, etc. on the side of the power transformer that feeds the media equipment.

K. Electrical boxes are to be staggered and shall not be placed "back to back" on any interior room surfaces.

L. Utilization of overhead cable trays shall be considered for cable routing in audiovisual support equipment rooms and above the conference or classroom ceilings.

M. In rooms where the data/video projector is to be ceiling mounted, a flush in the ceiling 120VAC-power outlet is required. Location of the outlet to be determined during design.

N. Provide convenience outlets in the front of the room.

O. Coordinate special requirements for plasma display screens; ensure power and A/V connections are located behind display screen

P. Audiovisual flush mounted floor boxes are to be installed in new construction. The preferred floor boxes are FSR Inc. FL-600 series. The floor box installations are to include one conduit for 120VAC power, one 1-inch-conduit for data and a minimum of two 1¼-inch-conduits for the audiovisual connections. The actual number of required conduits shall be determined during the design phase of the Project. All floor boxes shall be confirmed with Owner’s Planner Designer.

1. Conference rooms in new construction shall include a minimum of one (1) floor box located generally under the proposed location of the conference table. The floor box audiovisual conduits are to terminate in a minimum of a 4-gang wall box on a wall to be determined in the conference room.

2. Classrooms in new construction shall include the following:

    a. Three (3) floor boxes evenly distributed in the presentation area.

    b. One floor box located approximately under the third row of seating centered on line with the center of the projection screen.

    c. The classroom floor box installation shall include one (1) 120VAC power conduit, one (1) 1-inch-conduit for data and three (3) 1¼-inch audiovisual conduits. The audiovisual conduits are to terminate in a gutter box in the general vicinity of the audiovisual support equipment racks.

2.15 OTHER CONSIDERATIONS

A. Provide a minimum of one MDA-TV connection in all conference rooms and classrooms. In locations without access to MDA-TV provide connections to local cable-TV systems or satellite downlinks.

B. In conference rooms the MDA-TV connection shall be on the wall below the projection screen or near the lectern connection panel. Place connection on lectern panel if possible.

C. In classrooms there shall be MDA-TV connections at the lectern location and audiovisual equipment support racks.

D. In classroom with floor boxes provide one MDA-TV outlet in the front of the room in the center floor box and the podium connection floor box.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

B. Obtain approval from Owner’s Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. For renovation projects, refer to Owner's Master Construction Specifications and Interior Finishes Standards. These are available on the Owner's Design Guidelines website:
Construction Specifications - http://www2.mdanderson.org/depts/cpm/standards/specs.html
Interior Finish Standards - http://www2.mdanderson.org/depts/cpm/standards/interiors.html

PART 5 - REFERENCES

A. Mark Lighting, http://www.marklighting.com/, preferred by MD Anderson.

1. VC2A Teleconference Series recessed directional lighting system.
2. VC2B Teleconference Series recessed directional lighting system.
3. VC2C Teleconference Series recessed directional lighting system.

B. Lightolier Lighting, http://www.lightolier.com/.

1. 2x2 Recessed Videoconferencing luminaries.
2. 2x4 Recessed Videoconferencing luminaries.

C. Focal Point Lighting, http://focalpointlights.com/

1. Vision series luminaries.

D. ICIA Classroom & Conference Room Lighting Design Seminar, InfoComm 2003, Orlando, Fl.

E. Ninth Edition IES Standards

F. National Clearinghouse for Educational Facilities, NCEF

G. Classrooms 4p. 2000

H. Lighting for Schools 6p. 2001

I. Multipurpose Spaces 2p. 2000

J. "Facilities Design Criteria for the Construction and Renovation of Multimedia Classrooms" Case Western University, 1997.

K. "Technology Enhanced Classrooms", Florida State University, March, 2002.

L. Davis, Don and Carolyn, Sound System Engineering, Indiana: Howard W. Sams & Co. Inc., 1975.

M. Recent MD Anderson building projects that include conference and classroom space.

PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	01-01-07	Initial Adoption of Element	
Rev. 1	11-01-07	Part 1, added Note “B”; revised Section 2.02 Room Shape; Section 2.07 deleted ceiling tile requirements; added new Section 2.10 Acoustical System w/ ceiling tile requirements; added requirements to Section 2.11 Mechanical Systems; added fiber count requirements to Section 2.13 Data and Telecom; added requirements to Section 2.14 Electrical Systems.	JEM
Rev. 2	10-09-08	Various revisions throughout document incorporating interior standards and eliminating project specific requirements. Clarified noise criteria throughout document. Added isolated ground buss for video and sound equipment, Paragraph 2.14 D.	LN, SH, PN, TG
Rev. 3	07-08-10	Element renumbered from Z2060; various revisions throughout document.	JM, KB, JC
Rev. 4	03-17-11	Added as second sentence of 2.13D: "Where wireless access points are provided, consideration shall be given to the maximum number of notebook PC's that can be served from a single point, and the total number that require connection." Changed 3rd sentence of 2.06D to read: “Doors without a glass panel shall have large door scope viewer “Peep Holes” installed at standard height as well as accessible height to provide a view into the room to check on on-going activities.” Added to 2.06D: “Where use of poster carts is planned, provide at least one four (4) feet wide by eight (8) feet tall door (or equivalent double door with 12” inactive leaf) into the room. Provide the same oversized door for poster carts at a storeroom serving the classroom/conference room. Confirm use of poster cart with Owner's Project Manager.”	JC
Rev. 5			

END OF ELEMENT Z4020

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for public/patient and staff toilet rooms, as well as showers at The University of Texas MD Anderson Cancer Center (Owner).

B. Refer to Design Guideline Elements C3010 Wall Finishes, C3020 Floor Finishes, C3025 Base Finishes, and C3030 Ceiling Finishes for material types at room envelope.

C. Refer to the "D" series Design Guideline Elements for requirements relating to mechanical, plumbing, and electrical work.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The 2012 Texas Accessibility Standards (TAS) of the Elimination of Architectural Barriers Texas Government Code, Chapter 469, and 2010 ADA Standards for Accessible Design (SAD) shall be adhered to for accessibility aspects of the design. In cases where requirements of the two Codes differ, the more stringent of requirements which provides compliance with TAS, shall be used.

B. Where single-user toilet rooms meeting 1994 TAS requirements are present within a project area, Owner preference is to renovate to provide compliance with 2012 TAS toilet room requirements. Budget constraints and potential reduced functionality of adjacent spaces shall be considered in determining if toilet rooms will be enlarged to meet 2012 TAS standards. Confirm scope of work with Owner's Project Manager.

2.02 DESIGN AND FINISHES

A. Thresholds at entrance doors shall be low profile, solid surface material. Refer to Owner's Installation Detail "Typical Restroom Door Threshold" available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/details.html

B. Refer to Part 4 of this Element for illustrations indicating tile joint layout requirements and special interior finish details at multi-user toilet rooms.

C. In multi-user toilet rooms, the design shall incorporate features which limit sight lines into the space, and ensure user privacy. Design elements such as vestibules, screen walls, and carefully considered door placement/door swing can provide a measure of privacy. Under no circumstances shall lavatories and urinals be in direct view when the entry door is opened as typically required for passage.

1. When entrance doors must be located adjacent to lobbies, waiting rooms, or other similar non- corridor public spaces, Owner preference is for the use of alcoves or other type of offsets for door placement.

D. Avoid use of toilet room doors that swing out into corridors, creating a safety hazard. If an out-swing corridor door is required, it shall be fully recessed in an offset. Ensure that the type of door lockset specified allows for entry by Owner in instances where the user requires emergency assistance.

E. At accessible stalls, every effort shall be made to provide a design which locates the side grab bar on the wall, in lieu of the toilet partition.

F. Where new/additional drinking fountains are required in the scope of work, locate them in close proximity to multi-user toilet rooms whenever possible. Use of hi/low units is preferred over individual drinking fountains. Recessing of units fully into an alcove is preferred in order to maintain usable corridor width. Where use of an alcove is not possible or appropriate, ensure TAS/SAD compliance is achieved through use of an apron at the high, non-accessible unit.

2.03 PLUMBING FIXTURES

A. For toilet room fixtures which are not subject to TAS/SAD, comply with International Plumbing Code (IPC) requirements for minimum stall size and fixture spacing. Plumbing fixture counts shall be based on IPC requirements.

B. Confirm with the Owner’s Project Manager the type of lavatory/sink to be used in the design. Generally, individual wall hung lavatories are used in single-user toilet rooms, and solid surface material sinks and counter tops are provided in multi-user toilet rooms. These general guidelines vary however, depending on location of toilet room and user group.

C. Where counter tops with integral sinks are provided, the design shall comply with Owner’s Installation Detail, “Counter Detail at Toilet” available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/details.html

D. A floor drain shall be provided in multi-user toilet rooms. The slab shall be continuously sloped or “dished” in the vicinity of floor drain at these rooms.

2.04 TOILET AND BATH ACCESSORIES

A. Owner-furnished toilet and bath accessories will include toilet seat cover dispensers, sharps containers and soap dispensers. Confirm with Owner’s Project Manager.

B. Contractor-furnished toilet and bath accessories shall include automatic paper towel dispensers, grab bars and towel bars, toilet paper dispensers, feminine napkin dispensers, diaper changing stations, aluminum framed mirrors, and wall mounted trash receptacles. Provide power to Owner and Contractor provided accessories where required.

C. The distance that each toilet room accessory projects beyond the face of wall must be carefully considered when determining the adequacy of a design, as it relates to clear approach space required by TAS/SAD at doors and fixtures.

D. Owner preference is to locate paper towel dispensers and waste receptacles near lavatories/sinks. Provide multiple dispensers and receptacles when more than two sinks are present. Where recessed motorized paper towel dispensers are used, sound attenuation blankets of minimum 3-inch thickness shall be provided in the wall surrounding all sides of the unit.

E. Toilet tissue dispenser mounting location shall be based on Owner’s Installation Details. These are available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/details.html

F. Containers for sharps are required to be provided in various toilet rooms. Confirm with Owner's Project Manager and Owner's Environmental Health and Safety group all details regarding the furnishing, placement, installation and types of sharps containers.

2.05 SHOWERS

A. Where showers are provided, a drain shall be installed in each shower. The finished floor within showers shall be sloped at ¼" per foot to drain.

B. A "worst case" location for the shower curtain, which may be attached to an outward curving rod, shall be anticipated when determining the extent of floor area to be sloped to shower drain. Additional floor drain(s) shall be located in adjacent areas so as to remove all water that may escape the shower(s).

C. Owner approval is required for any design that does not provide a depressed slab for purposes of achieving required finished floor slope at both shower(s) and adjacent areas.

D. Where operable seats are provided in showers, they shall be the type with outboard, folding legs, capable of supporting a weight of 800 pounds minimum. Cantilever type seats supported solely from the wall shall not be used.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Include all applicable Owner's Installation Details referenced within this Element.

B. Develop and include all other installation details required to clearly communicate design intent and insure constructability.

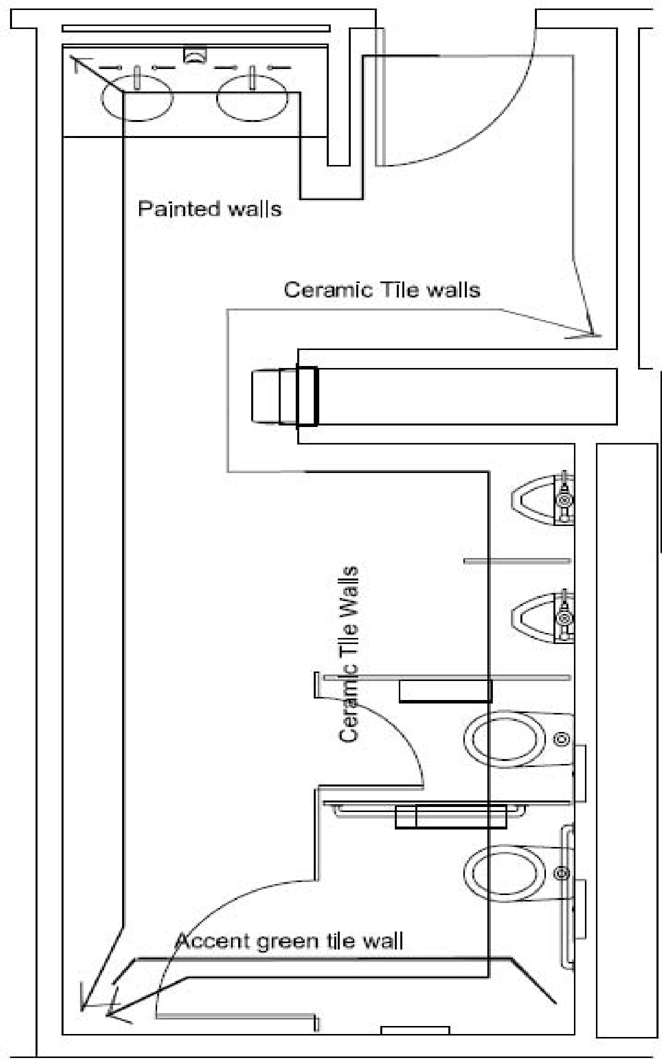
C. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

D. Include in the specifications the requirement that Contractor confirm correct slope of floor to drain at toilet rooms and showers has been provided prior to starting installation of tile or other finish material. Include the requirement for leakage (flood) testing of shower pans, as well as membrane water proofing at toilet rooms and showers.

PART 4 - INSTALLATION EXAMPLE ILLUSTRATIONS

4.01 TOILET ROOM WALL TILE LAYOUTS/PATTERNS/DETAILS

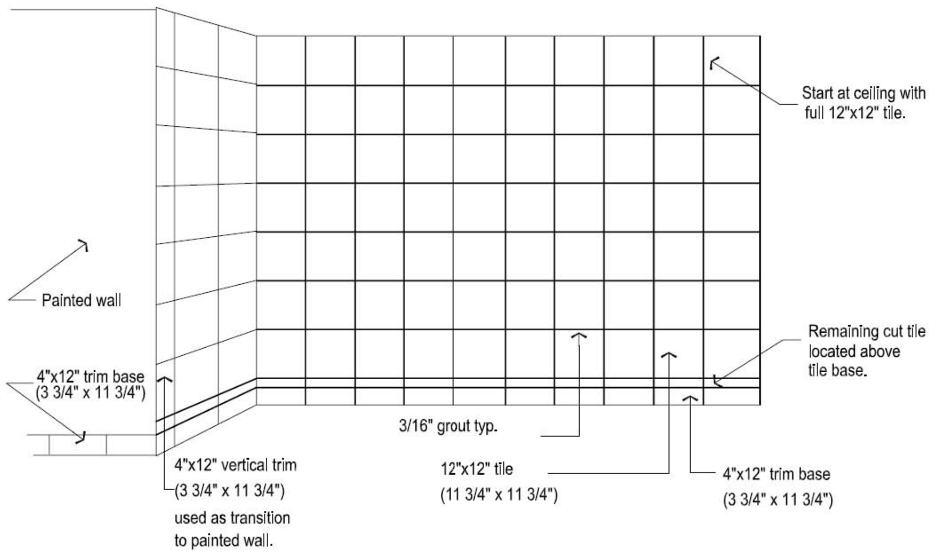
A. Diagram 4.01A



Walls at vestibule and nearby are painted. Ceramic Tile is started at/near the toilet fixture wall. The wall opposite the entry door typically receives full height/width accent green tile. The wall behind the toilet fixtures typically receives the accent medallions centered on the wall.

PLAN – TYPICAL WALL TILE LAYOUT IN TOILET FACILITIES

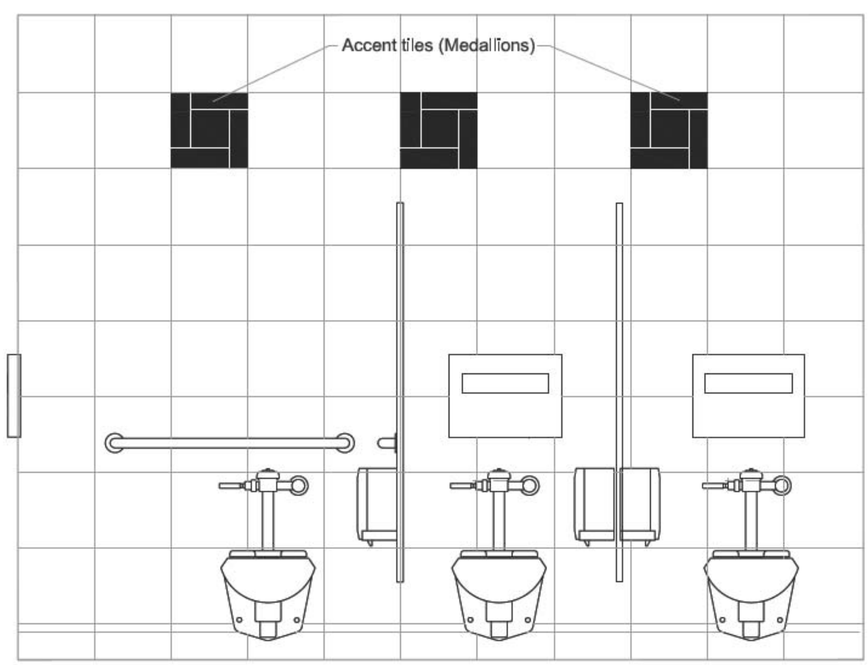
B. Diagram 4.01B



Strict adherence to the tile layout (shown at right) should be followed when wall tile is specified in toilet rooms.

ELEVATION - TYPICAL WALL TILE LAYOUT

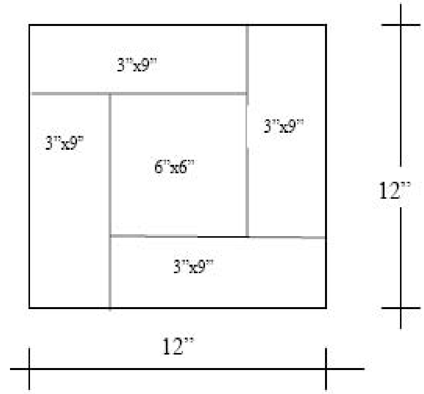
C. Diagram 4.01C



Center the accent tiles (medallions) on toilet fixture wall with two field (neutral) tiles between each accent (medallion) tile.

ELEVATION - TYPICAL WALL TILE LAYOUT AT FIXTURE WALL

D. Diagram 4.01D



Accent wall tile (medallion) total size is 12"W X 12"H. Outer tile pieces are 3" X 9" and center tile piece is 6"W X 6"H.

DETAIL – ACCENT WALL TILE (MEDALLION)

4.02 MULTI-USER TOILET ROOM COUNTER TOPS AND INTEGRAL SINKS

A. Diagram 4.02A

PHOTO - TYPICAL COUNTER TOPS W/ INTEGRAL SINK BOWLS

PART 5 - PRODUCTS

5.01 GENERAL

A. For all projects (renovation and new construction), refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

C. Confirm with Owner's Project Manager the specific toilet room accessories to be used, and whether Owner or Contractor will provide/install each item.

PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	12-11-07	Initial Adoption of Element	
Rev. 1	10-09-08	Added links to Installation Details, Master Construction Specifications and Interior Finishes Standards located on the Owner's Design Guidelines Internet site. Paragraphs 2.01 K., 2.01 P. and 4.01 A.	JRC
Rev. 2	12-23-08	Added provisions for sharps containers, paragraph 2.01,Q. Added Part 4 – Installation Example Illustrations	JRC, JT
Rev. 3	07-08-10	Renumbered Element from Z2065.	DOS
Rev. 4	11-22-11	Deleted exclusion of facilities within in-patient rooms in 1.01. Revised 2.01 A, F, G, and I to include ADA. Added 2.01 R and S relating to drains at restrooms and showers. Added 3.01 D to require testing of floor slope and performance of membrane waterproofing.	JRC
Rev. 5	04-17-12	Revised TAS reference in 2.01 A; Revised 2.01 B in its entirety; Added attenuation requirements in 2.01 L. ; Added 2.01 T.	JRC
Rev. 6	04-11-13	Reorganized content in Part 2; added toilet and bath accessories, 2.04.	JRC

END OF ELEMENT Z4030

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for housekeeping rooms (janitor’s closets) at The University of Texas MD Anderson Cancer Center (Owner).

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. The Texas Department of Licensing and Regulation, Texas Accessibility Standards of the Architectural Barriers Act, Article 9102, Texas Civil Statutes (TAS), and the 2010 ADA Standards for Accessible Design (SAD) shall be adhered to for accessibility aspects of the design. In cases where requirements of the two Codes differ, the requirements which provide compliance with TAS shall be used.

B. Housekeeping room floor area shall be sized to accommodate, with minimal circulation space, a mop sink, housekeeping cart (2’x4’), buffer (2’x3’), trash can (24” diameter), and mop pail (16” diameter). At housekeeping rooms serving patient care areas, additional space shall be provided to accommodate an 18” x 2’ minimum enclosed storage cabinet. Rooms shall be no less than 55 sq. ft. in area.

C. Refer to Specification section 22 40 00 for type of mop sink to be provided. Confirm choice of sink dimensions, including height, to be used with Owner’s Project Manager. The mop sink shall be located in a corner of the room. Fiber reinforced plastic (FRP) panels extending to a height of 6’ A.F.F. shall be applied at walls adjoining the mop sink. Extend the FRP wainscot 3’ minimum beyond the ends of the mop sink. Edges of the FRP shall be sealed to the wall.

D. A stainless steel shelf with 3 (minimum) mop holders shall be mounted over the mop sink at the side wall. An additional 4’ long minimum stainless steel shelf shall be provided at a wall near the mop sink. Mount shelves at 5’ A.F.F.

E. Doors to housekeeping rooms shall be 3’-6” wide.

F. Provide in-wall blocking behind the 4’shelf, as well as at a height of 4’-8” A.F.F. to 6’ A.F.F. at walls behind and beside the mop sink.

G. Refer to Design Guideline Elements C3010 Wall Finishes, C3020 Floor Finishes, C3025 Base Finishes, and C3030 Ceiling Finishes for material types at room envelope. In addition to the seamless sheet vinyl flooring noted in Element C3020, sealed concrete may be considered for the floor finish. In addition to the gypsum wallboard noted in C3030, 2’x2’ lay-in acoustical tile may be considered for use at ceilings. Confirm floor and ceiling selection with the Owner’s Project Manager.

H. Refer to the “D” series Design Guideline Elements for requirements relating to mechanical, plumbing, and electrical work. A negative net air flow/exhaust shall be provided in all housekeeping rooms.

I. Water service shall be provided at the mop sink as indicated in Owner’s Installation Detail “Housekeeping Mop Sink Water Outlets”, available on the Owner’s Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/details.html. The preferred location for water service is at the rear wall of the mop sink.

1. Infrequently, hot water service is required in selected housekeeping rooms. Confirm use of hot water and required type of water outlet with the Owner's Project Manager. Note that mixing faucets are not allowed.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. For all projects (renovation and new), refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	06-21-11	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4035

Element Z General Design Requirements

Room Standards Z4040 Battery Charging Rooms

PART 1 - GENERAL

1.01 OVERVIEW

A. This document addresses minimum code requirements, guidelines, regulations and provides design and construction criteria for battery charging operations at the University of Texas M.D. Anderson Cancer Center (Owner). This includes, but is not limited to, rooms designated for charging portable floor scrubbing machines, UPS battery rooms as well as other spaces in which battery systems are permitted by Code to share with the equipment they support.

B. Where the A/E considers that compliance is not possible, the A/E shall communicate such concerns in writing to the Owner's Project Manager and resolve all non-compliance issues in sufficient time during the design phase of the Project to meet contract schedule obligations.

PART 2 - DESIGN CRITERIA

2.01 CODES AND REGULATIONS

A. The NFPA 101 Life Safety Code shall be adhered to for all life safety requirements.

B. The Occupational Safety and Health Administration 29 Code of Federal Regulations (CFR) 1910.178 Powered Industrial Trucks and 29CFR1926.441 Batteries and Battery Charging shall be adhered to for eyewash/safety shower, ventilation and fire protection requirements.

C. The NFPA 70 National Electrical Code shall be adhered to for the electrical design and installation of battery charging operations.

2.02 LOCATION AND OCCUPANCY SEPARATION

A. Battery systems shall be housed in a noncombustible, locked room or space to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

B. Battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier. Provide fire barrier with higher rating, as required by Code, where project condition dictates.

2.03 ACCESS DOORS

A. The battery room doors shall open outward. The fire rating of the door shall be coordinated with fire rating of the wall.

B. Access and entrance to working space around the battery shall be provided as required by NFPA 70, Spaces about Electrical Equipment. Space equal to the width and depth of the equipment and expending from the floor to a height of 6-feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone.

C. Passageways shall be of sufficient width to allow the replacement of all battery room equipment. The minimum aisle width shall be 36 inches.

2.04 CEILINGS AND FLOORS

A. The battery room ceiling shall be slightly pitched toward the exhaust air outlet and shall be constructed of gypsum board, plaster or other hard, continuous surface. The design intent is to ensure that pockets of trapped Hydrogen gas do not occur, preventing the accumulation of an explosive mixture.

B. Floors shall be of acid resistant construction or protected from acid accumulations.

2.05 TEMPERATURE CONTROL AND MECHANICAL VENTILATION

A. Air conditioning and ventilation systems must address health and safety as well as room temperature and performance requirements of the batteries and other equipment in the room. Exhaust air is necessary to remove the production of hydrogen gas which is produced during the battery charging process.

B. For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation is necessary to remove accumulated explosive hydrogen gas produced by the battery charging process. The ventilation fan shall be continuously on during battery charging process with a ventilation rate of not less than 1 CFM/ft^2 of floor area of the room, or using battery manufacturer's recommendations, whichever is more stringent.

C. Where mechanical ventilation is installed, the following shall be required:

1. Interlock means shall be provided such that the initiation of battery charging process will automatically turn on the ventilation fan. A local manual override means shall be provided.
2. Airflow sensors shall be installed to initiate an alarm if the ventilation fan becomes inoperative.
3. Control equipment for the exhaust fan shall be located more than 6 ft from the battery and a minimum of 4 in. below the lowest point of the highest ventilation opening.
4. Where mechanical ventilation is used in a dedicated battery room, all exhaust shall be directly to the outdoors.
5. Fans used to remove air from a battery room shall be Class B spark resistant. If the fan and motor are located within the battery room or within the battery room exhaust air stream the fan motor, electrical disconnect switch shall meet explosion proof standards.

D. The supply air in battery charging operations shall be approximately 95 percent of the exhaust ventilation rate to maintain slightly negative room pressure to prevent fumes and gases from migrating outside the room. Exhaust air shall not pass over electrical equipment unless the equipment is listed for the use. Supply air inlets shall be no higher than the tops of the battery cells and exhaust outlets at the highest level in the room.

2.06 ELECTRICAL

A. Battery room lighting shall be installed to provide a minimum level of illumination of 30 footcandles. Luminaires shall not be installed directly over cells or exposed energized conductors and circuit parts. Switches for the controls of the luminaires shall be readily accessible.

B. Emergency illumination shall be provided for safe egress from the battery room.

C. General-purpose outlets shall be installed for the maintenance of the battery. General-purpose outlets shall be installed at least 6 feet from the battery and a minimum of 4 in. below the lowest point of the highest ventilation opening.

D. Ventilation fans serving battery charging areas shall be fed by emergency power.

2.07 OTHER CONSIDERATIONS

A. Fire alarm and fire protections systems shall be provided per MD Anderson Cancer Center standard.

B. Metalwork, wiring and all other materials that may be exposed to corrosive solids, liquids or gases shall be corrosion resistant and suitable for battery charging operations.

C. An eyewash and safety shower shall be provided within 25 feet of battery charging operation.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. In addition to incorporating all applicable life safety and building code requirements, provisions described within this Element shall be included within the Project Contract Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Refer to battery manufacturer material safety data sheet.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	12-18-08	Initial Adoption of Element	
Rev. 1	1-22-09	Made various format corrections throughout document. Added applicable conditions “for stationary storage battery systems having an electrolyte capacity of more than 100 gal in sprinkled buildings or 50 gal in un-sprinkled buildings for flooded lead-acid, nickel-cadmium, and valve-regulated lead–acid (VRLA) batteries, or 1000 pounds for lithium-ion and lithium metal polymer batteries used for facility standby power, emergency power, or uninterrupted power supplies” to 2.05 A and 2.05 C.	JD
Rev. 2	2-26-09	Revision made based on comments received in a meeting on 2/13/09 with Phil Newcomb, Jim Mathis, Jennifer Moffett, and Linette Moore. Comments from Bryan Galloy on 2/17/09 were also incorporated in this revision.	JD
Rev. 3	12-01-09	Renumbered Element from Z2070	SK
Rev. 4	07-08-10	Renumbered Element from F1035	DOS
Rev. 5	06-14-12	Revised 2.05 C.5. by adding the Class B spark resistant fan design, and also expanded on explosion proof motor, disconnects, and switches. (Internal email change request via email)	VS / PDN

END OF ELEMENT Z4040

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for working mothers rooms at The University of Texas MD Anderson Cancer Center (Owner). These rooms are intended to provide comfortable, private spaces for use by women who are nursing.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. 2012 Texas Accessibility Standards (TAS), Elimination of Architectural Barriers, Texas Government Code, Chapter 469, and the 2010 ADA Standards for Accessible Design (SAD) shall be adhered to for accessibility aspects of the design. In cases where requirements of the two Codes differ, the requirements which provide compliance with TAS shall be used.

B. The number of cubicles/individuals to be accommodated in the room at one time shall be confirmed from the building program or Owner's Project Manager. Access to the room shall be controlled by card reader.

C. Working mothers rooms shall provide the following for common use by all occupants: base cabinet, wall cabinet, accessible under-counter refrigerator, full length wall- mounted mirror, marker/tack board, and lockers. Rooms designed to accommodate more than one person at a time shall provide 5' wide, minimum, cubicles with draw curtains on one or more sides.

D. The room's base cabinet shall be plastic laminate covered, with doors/drawers, and solid surface material counter top and splash. Provide an accessible, stainless steel sink in the cabinet. The wall cabinet shall be plastic laminate covered. Items on the wall above the counter shall include paper towel dispenser, soap dispenser, and GFCI electrical outlets. Additionally, under-counter lighting shall be provided if budget permits.

E. 24" high x 12" wide x 18" deep plastic laminate covered lockers shall be provided in a quantity equal to three times the number of cubicles in the room. Provide three lockers in single-user rooms. Lockers shall be provided with a hasp or have other provisions to allow portable locks to be used.

F. Individual cubicles shall be provided with track mounted curtains on at least one side, a 18" wide x 12" deep plastic laminate covered wall shelf (or Owner-provided side table in lieu of shelf as an option to be confirmed with Owner's Project Manager), an electrical receptacle above the shelf or side table, and a wall sconce light with wall switch. Each cubicle shall accommodate an Owner-provided chair, magazine rack, and wall mounted artwork. Single-user rooms shall also be provided with similar shelf, receptacle, wall sconce, and furnishings.

G. Refer to Design Guideline Elements C3010 Wall Finishes, C3020 Floor Finishes, C3025 Base Finishes, and C3030 Ceiling Finishes for material types at room envelope.

H. Refer to the "D" series Design Guideline Elements for requirements relating to mechanical, plumbing, and electrical work.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Obtain approval from Owner's Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

PART 4 - PRODUCTS

4.01 GENERAL

A. For all projects (renovation and new), refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	09-15-11	Initial Adoption of Element	
Rev. 1	10-30-12	Updated TAS standards reference to "2012 Texas Accessibility Standards (TAS), Elimination of Architectural Barriers, Texas Government Code, Chapter 469" in Paragraph 2.01 A.	JC
Rev. 2	04-11-13	Added side table as an option in lieu of wall shelf; deleted requirement for DVD player, TV, and foot stool; added hasp requirement at lockers.	JC
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4045

Element Z General Design Requirements

Room Standards

Z4050 Liquid Nitrogen Freezer Rooms

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for rooms containing liquified nitrogen-based freezers at The University of Texas MD Anderson Cancer Center (Owner).

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Locate liquid nitrogen (LN2) freezer rooms typically on the first floor, and in close proximity to the bulk LN2 storage tank serving them, so as to minimize the length and complexity of connecting piping and to maximize system efficiency.

B. Access to the room shall be provided by an outward opening 36" active leaf door with lite, in combination with a 36" inactive leaf. Provide exit device hardware at the active leaf, and card reader for secure entry.

C. Suggested minimum width for space modules consisting of freezers located on either side of an access corridor is 11 feet. Confirm with Owner's project manager the sizes of freezers to be used, and if module width should be increased.

D. Finishes in the room shall include a colored fluid-applied epoxy flooring with integral 4" coved base, semi-gloss interior latex paint at walls, and 2'x2' lay-in fissured acoustical tile ceiling.

E. Locate a connection/station for filling dewars (manual fill freezers) near the entrance to the room. Provide a wall-mounted push-button at 48" AFF with identifying signage, to actuate the pneumatically powered, normally closed filler valve. Pressing the push-button shall allow LN2 flow, and releasing it shall cause flow to stop. Provide a minimum 5' x 5' stainless steel protection sheet at floor and a 24" x 24" x 6" high x 18 ga. stainless steel pan directly under the filling connection. Walls adjacent to the connection shall be provided with a stainless steel sheet wainscot to 6' AFF.

F. Connection manifolds for freezers located against a wall shall be mounted on stainless steel Unistrut supports which are anchored to the wall with stainless steel hardware. Provide blocking in walls as required. Connection manifolds for freezers located at islands shall be mounted to painted steel tube posts attached to the floor. Mount manifolds at 60" AFF.

G. LN2 freezer room exhaust ductwork shall be galvanized and routed to the general exhaust air system. Exhaust systems for these rooms shall not be housed in the same chase that contains environmental air, as described in NFPA 90A, section 5.3.4.5 (2002 ed.).

H. Locate the bottom of exhaust air grilles low to the floor where they can function most efficiently to capture vaporized (cold) nitrogen gas frequently vented when freezers automatically fill, as well as any vapor from a leak in the system. Balance all exhaust grilles to equal velocity. Supply air grilles shall be placed in the ceiling. Quantity of air to be exhausted from the room shall be based on the following air change rates:

Room Description	Occupied AC/hr (minimum)	Unoccupied AC/hr (minimum)	Vacant AC/hr (minimum)
LN_2 Freezer Room	17	17	17

I. Provide an automatic shut-off valve on the vacuum insulated (LN2) piping inside the building, near its entry point to the building. This pneumatically powered, normally closed valve is to be actuated by 120 volt signal from contacts in the oxygen detection system controller panel, as well as from an emergency power-off (EPO) button positioned inside the room. The EPO button is to be a push-pull type allowing the valve to close and signaling an alarm when pushed in, and allowing reset of the valve and alarm system when pulled out. The EPO button shall be located near the door to the room at 48” AFF and labeled with identifying signage. Similarly locate any additional EPO buttons with signage as design dictates.

J. Provide an oxygen (O2) detection system with multi-channel controller panel, non-latching alarms, and multiple O2 transmitters having zirconium oxide sensors. The controller panel is to contain a red strobe and 85 dB horn, be integrated with EPO button(s) to control the automatic shut-off valve, and send an alarm signal to the Building Automation System (BAS). The controller panel shall be mounted outside the room above the main entrance door at an easily visible location. Oxygen sensors, mounted at 42” AFF, shall be provided adjacent to the fill station and throughout the room at locations as required to obtain representative air quality sampling coverage. A separate strobe and horn unit is to be similarly provided inside the room, as well as outside any additional entrance door(s). Preferred installation for these panels/devices is flush or semi-recessed mounting, and must meet Texas Accessibility Standard (TAS) requirements. At 19.5% O2 level and lower, the detection system shall activate the strobes. Additionally, at 17.0% O2 level and lower, the detection system shall activate the horns, allow the shut-off valve to close, and signal the BAS alarm. Once a normal oxygen level is again detected, the system is to reset, stopping the alarm and returning the shut-off valve to a powered open state.

K. Design and planning for routing of vacuum insulated piping shall be accomplished early-on in a Project, with assistance from a consultant with cryogenic expertise, and with close participation by Owner. Consideration is to be given to line slope, distances between end points, cryo-vent locations, need for expansion/flex of the piping, and piping design relative to environmental placement (heat gain potential). Route piping in shaded, sheltered or conditioned space where possible. Vacuum insulated piping segment lengths are to be limited such as to afford access, service, and replacement after the building is fully occupied. Where ceilings are present and the space above is not conditioned, locate piping below ceiling level a sufficient distance as to accommodate test connections or other appurtenances on the piping. All valves are to be vacuum insulated. Each piping freezer service point shall be designed to accommodate two to four freezers as design dictates. Cryo-vents shall have emergency powered 120 volt exhaust heaters and shall be routed to the outside of the building or to general exhaust ductwork. Provide one L5-20-R receptacle and one critical alarm point terminated in an RJ45 receptacle for each space designed to receive an auto-fill freezer. Each 20 amp circuit may serve up to four freezers. Provide auto-fill freezer power and critical alarm outlets in a ceiling utility panel. Provide one 5-20R receptacle and one critical alarm point terminated in an RJ45 receptacle flush-mounted at 66” AFF for each space designed to receive a manual freezer. 5-20R receptacles may be designed in quad configuration. RJ45 receptacles may be designed in duplex configuration. Locate the electrical distribution panel for the LN2 freezer room outside, and in close proximity to the room, such as in the entry alcove. All electrical devices which serve the LN2 system, including receptacles, critical alarm, and safety devices, shall be circuited on emergency power.

L. Provide lighting per Owner Design Guideline D5020, with alternating ceiling fixtures on emergency circuiting, designed to provide even lighting level on loss of normal power. Provide 60-80 foot candle light level, not to exceed lighting power density requirements of ANSI/ASHRAEIESN A 90.1.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. If vacuum insulated (liquid nitrogen) piping is not to be installed during an early construction phase, indicate final pipe routing and provide PVC piping as a place holder, with explanation/instructions for all trades to maintain it, as well as access space around it, undisturbed.

B. Require an initial schematic Shop Drawing submittal which indicates general intent for routing as related to placement of any cryo-vents, drops, traps, freezer service points and/or other appurtenances. Additionally, require that the final, detailed submittal for the entire system, complete with system isometric and component/spool fabrication drawings, is to be provided electronically and approved, without changes, prior to starting fabrication.

C. Require as-built drawings in electronic form, preferring AutoCAD compatibility when possible, to include complete system piping isometric drawings and a full set of the scaled component and spool drawings prepared by the manufacturer for use in fabrication.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications Divisions 20-28. Refer to Master Construction Specification 43 62 23.

B. Refer to Owner’s Interior Finishes Standards for finish materials and colors to be used.

C. Provide cryogenic oxygen detection system controller panel and transmitters by GfG Instrumentation Inc.: 4421-1-X, based on multi-channel controller panel, with #2210009 ZD 21 oxygen transmitters and #1301-007 horn and strobe unit(s), quantities as required to enunciate alarm inside and immediately outside the room at all doors.

D. Provide EPO button by Square D, #XB5AT42, or approved equal.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser

	09-15-11	Initial Adoption of Element	
Rev. 1	03-15-12	Miscellaneous revisions, throughout the document, to requirements for exhaust system, EPO button, oxygen detection system/components, circuiting/receptacles at freezers, doors, and emergency power.	JRC/KS
Rev. 2	10-30-12	Changed O2 level (percent) at which the detection system activates the horns, shut-off valve, and BAS alarm. Paragraph 2.01 J.	JRC/KS
Rev. 3			

END OF ELEMENT Z4050

Z4055 Liquid Nitrogen Tank Storage Rooms

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for rooms containing portable liquefied nitrogen supply cylinders and tanks at The University of Texas MD Anderson Cancer Center (Owner). Refer to Owner’s Design Guideline Element Z4050, Liquid Nitrogen Freezer Rooms, for guidelines for rooms with liquefied nitrogen vessels containing biological material.

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Design of liquid nitrogen (LN2) supply storage rooms shall comply with applicable requirements of NFPA 55, latest edition adopted by Owner, as well as requirements contained in this Design Element. Deviations from this standard must be approved in writing by Owner’s Environmental Health and Safety department.

B. Access to the room shall be provided by an outward opening 36” active leaf door with lite, in combination with an 18” inactive leaf. Provide exit device hardware at the active leaf, and card reader for secure entry.

C. Finishes for rooms located in research, as well as patient care areas, shall include a colored fluid-applied epoxy flooring with integral 4” coved base, semi-gloss interior latex paint at walls, and 2’x2’ lay-in fissured acoustical tile ceiling. Walls shall be of concrete masonry unit or drywall construction. Where drywall is used, provide a 0.60 vinyl/acrylic panel wainscot to 60” A.F.F. at all walls.

D. Where containers subject to shifting or upset will be stored, provide a means for securing them to walls, or by other means.

E. LN2 supply storage rooms shall be used only for the storage of LN2, and where required, compressed air. Where other types of compressed gasses require storage, they shall be located in separate rooms.

F. LN2 supply storage rooms shall be climate controlled to the same design temperatures as other normally occupied spaces. Rooms shall operate at a negative pressure in relationship to the surrounding area. Exhaust ductwork shall be galvanized and routed to the general exhaust air system. The exhaust system shall operate, at a minimum, during the time the room, and building in which it is located, is occupied. Owner approval is required for designs where the exhaust system will not operate at all times.

G. Provide a manual shutoff switch for supply/exhaust air to the room, located adjacent to the main entry door. The switch shall be the break-glass or equivalent type, and be labeled “*WARNING: VENTILATION SYSTEM EMERGENCY SHUT-OFF*”.

H. The location of exhaust and supply air openings shall be designed to provide air movement effectively across all portions of the floor or room to prevent the accumulation of vapors. Locate the bottom of exhaust air grilles within 12” of the floor. Balance all exhaust grilles to equal velocity. Supply air grilles shall be placed in the ceiling. The minimum quantity of air to be exhausted from the room, whether occupied or unoccupied, shall be 6 AC/hr. or 1 cfm/sf., whichever is greater.

I. Provide an oxygen (O2) detection system with multi-channel controller panel, non-latching alarms, and multiple O2 transmitters having zirconium oxide sensors. The controller panel is to contain a red strobe and 85 dB horn, and shall send an alarm signal to the Building Automation System (BAS). The controller panel shall be mounted outside the room above the main entrance door at an easily visible location. Oxygen sensors, mounted at 42” AFF, shall be provided throughout the room at locations as required to obtain representative air quality sampling coverage. A separate strobe and horn unit is to be similarly provided inside the room, as well as outside any additional entrance door(s). Preferred installation for these panels/devices is flush or semi-recessed mounting, and must meet Texas Accessibility Standard (TAS) requirements. At 19.5% O2 level and lower, the detection system shall activate the strobes. Additionally, at 17.5% O2 level and lower, the detection system shall activate the horns and signal the BAS alarm. Once a normal oxygen level is again detected, the system is to reset, stopping the alarm.

J. Provide lighting per Owner Design Guideline D5020. Selected light fixtures shall be circuited to emergency power to meet basic egress requirements. Provide 25 to 35 foot candle light level, not to exceed the lighting power density requirements of the latest adopted ANSI/ASHRAE/IESNA 90.1 Standard for “storage space”.

K. Coat hooks and a 3 foot long shelf shall be provided along one wall. Owner-provided signage at door shall read: “*CAUTION: LIQUID NITROGEN STORED IN THIS AREA- ASPHYXIANT HAZARD*”. The sign shall also include emergency contact and phone number.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Require a Shop Drawing submittal which describes oxygen detection components and indicates detection system relationship to other building systems.

B. Fully detail means for securing loose cylinders to wall.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specifications Divisions 20-28.

B. Refer to Owner's Interior Finishes Standards for finish materials and colors to be used.

C. Provide cryogenic oxygen detection system controller panel and transmitters by GfG Instrumentation Inc.: 4421-1-X, based on multi-channel controller panel, with #2210009 ZD 21 oxygen transmitters and #1301-007 horn and strobe unit(s), quantities as required to enunciate alarm inside and immediately outside the room at all doors.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	06-14-12	Initial Adoption of Element	
Rev. 1	06-28-12	Added EH&S approval in 2.01A; revised 2.01E; Deleted special chase location requirement in 2.10F; Reformatted 2.01H; Revised 2.01J; Added 2,01K.	JRC
Rev. 2			
Rev. 3			

END OF ELEMENT Z4055

Z4060 Controlled Environmental Rooms

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for low temperature controlled environmental rooms at The University of Texas MD Anderson Cancer Center (Owner).

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Locate the Controlled Environmental Room (CER) per lab program plan, allowing for 4” insulated walls in addition to architectural enclosure walls as may be necessary. Room is to have a 4” insulated ceiling at 9’-0” above room floor, and a 2” insulated floor placed in a slab depression to avoid the need for a ramp. A door threshold plate may account for up to 1/4” positive transition from finished floor elevation outside to finished floor elevation inside the room. Where a depressed slab cannot be provided, a ramp and landing which is TAS (Texas Accessibility Standards) compliant shall be provided outside the door to the room. Allow for a 4” deep control panel to be mounted on the outside of the CER adjacent to the door (at least 18” from door, if on the strike side). The design for access to the CER, including door approach clearance from exterior side, door hardware, and door operating force/sweep period, etc. shall comply with TAS.

B. Locate condenser equipment in an approximately 8’ x 10’ room having a lay-in ceiling 9’-0” above room floor. It is preferable that this equipment room be adjacent to the CER. However, it may be up to 30 feet from the CER and not necessarily on the same level. A single equipment room this size may serve condenser equipment for up to two (2) CER. Provide a curb and/or cove around each equipment room, as well as a ¼” high raised threshold at the door to mitigate the affect of water migration to adjacent spaces, should a leak occur.

C. When required by the building program, locate refrigeration package dehumidifier cabinet on top of the CER and provide service access ladder to, and lighting for, this space.

D. Provide fresh air ventilation of 15 CFM +5/-0 CFM for each CER from building HVAC systems while maintaining the CER pressure neutral. Building supply air shall be ducted to the process air inlet side ductwork of any dehumidifier, or alternatively, to 4” room connection(s) provided by the CER fabricator. Building exhaust air shall be ducted to 4” room connection(s) provided by the CER fabricator.

E. Provide ventilation as required for each condenser equipment room from building HVAC systems while maintaining the room pressure neutral. Consider providing this ventilation via fan and coil units which may be incidental to the design of adjacent space. Design for heat loads such as for personnel and lighting, but not for air cooled condenser coil heat rejection, as these coils are included in the refrigeration package only as an emergency backup means of cooling.

F. Provide closed loop chilled water heat dissipation for CER condenser equipment. The CER loop shall be served by redundant N+1 plate heat exchangers connected to the source (i.e., TECO) chilled water system upstream of any building heat exchangers and shall have provision to circulate domestic cold water on loss of source chilled water service.

G. Provide electrical support for the CER which includes, and is not limited to, panel space, circuits and equipment disconnects for the control panel and condenser equipment outside the room, lighting of the space above the room, and surface mounted metal raceway and receptacles inside the room. Weather-resistant type covers shall be provided on all wiring devices within the room. Provide a fire alarm system strobe device inside the CER mounted at a height to comply with TAS requirements.

H. Provide emergency standby electrical power for all systems critical to the operation of the CER, including and not limited to the CER's control panel, refrigeration units, chilled water circulating pumps, dehumidifier unit, lighting, receptacles located inside the room, and all convenience receptacles located in the condenser equipment room.

I. Provide a low oxygen sensing and alarm system having horn and strobe unit mounted both inside and outside of the CER.

J. BAS connections shall be provided for the CER critical alarms which include, and are not limited to personnel emergency alarm, oxygen sensor alarm, mechanical failure alarm, and an independent (installed by controls contractor) thermal sensor for reporting room temperature inside the CER.

K. Fire suppression shall be provided within, as well as above the insulated ceiling of the CER.

L. Provide plumbing support for the CER including, but not limited to, domestic hot and cold water and lab waste. Provide a hose bib and a floor drain in each condenser equipment room. Condenser room floor drain shall be connected to the sanitary waste system. Plumbing piping shall not be routed within, but may penetrate through insulated walls.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Indicate where the CER vendor is responsible for placing conduit in insulated walls to support installation of surface mounted metal raceway, or data drops by Division 26, fire alarm strobes by Division 28, or pass-through openings by CER vendor.

B. Indicate that all required penetrations are to be coordinated with the CER contractor.

PART 4 - PRODUCTS

4.01 GENERAL

A. Refer to Master Construction Specification 13 21 00 and Divisions 20 - 28.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	3-31-11	Initial Adoption of Element	
Rev. 1	09-15-11	General revisions throughout document per REF request.	KS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4060

PART 1 - GENERAL

1.01 OVERVIEW

A. This document provides design and construction criteria for bicycle storage rooms at The University of Texas MD Anderson Cancer Center (Owner).

PART 2 - DESIGN CRITERIA

2.01 GENERAL

A. Adhere to the 2012 Texas Accessibility Standards (TAS) of the Elimination of Architectural Barriers Texas Government Code, Chapter 469, and 2010 ADA Standards for Accessible Design (SAD) for accessibility aspects of the design. In cases where requirements of the two Codes differ, the more stringent of requirements which provides compliance with TAS, shall be used.

B. The storage room shall be located at, or near the building exterior, and shall have direct access to the exterior. Avoid locating the exterior entrance near “blind” spots for vehicular traffic. Owner preference is for a design which locates this room near the majority of exterior bicycle racks provided on-site.

C. Locate toilet/shower/locker facilities within the storage room, or in close proximity.

1. As a minimum, provide a single-user unisex toilet and men’s and women’s shower rooms each with 3-foot x 3-foot accessible shower and lavatory.

2. Provide a minimum of ten (10) 12-inch x 18-inch x 42-inch (offset design) laminate-covered, phenolic resin lockers.

3. Confirm with building program or Owner’s Project Manager if a larger number of these facilities is required.

D. Provide 4-foot wide aisles minimum, with 5-foot width preferred, as measured between bicycles or between bicycle and wall.

E. Storage room and toilet/shower/locker facilities shall be climate controlled to the same design standards as other normally occupied spaces. Locate the thermostat that controls these areas within the bicycle storage room.

F. Provide a centrally located floor drain in the storage room and in toilet(s).

2.02 ENTRANCE

A. Door(s) used for bicycle access to the storage room shall be 3-foot 6-inches wide and be power operated.

1. Provide a continuous hinge and 36-inch high x full-width kick plates.

B. Provide a closer and 12-inch high kick plates at storage room entry door(s) which are not used for bicycle access.

2.03 FINISHES

A. Storage room finishes shall typically include epoxy painted walls, painted concrete floor with resilient base, and 2-foot x 2-foot lay-in acoustical tile ceiling.

1. Use of durable material, such as concrete masonry units or impact rated wallboard, is preferred for walls.

B. Toilet and shower room finishes shall include ceramic tile walls, base, and floor, with 2-foot x 2-foot lay-in acoustical tile ceiling (at toilet) and epoxy painted gypsum board at ceiling (at shower rooms).

C. Provide corner guards on all outside corners within the storage room.

2.04 EQUIPMENT AND AMENITIES

A. Provide vertical type, self- supporting bicycle racks as required.

1. Confirm quantity with building program.
2. Wide-tire bicycles, in addition to standard type, shall be accommodated. Owner will confirm wide-tire size and quantity.
3. Refer to Part 4, Products for information on bicycle rack.

B. A full length wall-mounted mirror shall be provided in the storage room.

C. As a minimum, two (2) benches and two (2) 3-foot x 4-foot tack boards shall be provided within the storage room.

D. Provide one wall mounted coat hook for every four bicycles. Distribute hooks evenly within the space.

2.05 SECURITY

A. Entry door(s) to the storage room shall be provided with card reader access.

B. A ceiling mounted security camera shall be provided at an optimal location within the room.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

A. Obtain approval from Owner’s Project Manager/Planner Designer for all finish schedules prior to issuance of Construction Documents.

B. All finishes should reflect the standard finish application for the specific building in which the bicycle storage room is located.

PART 4 - PRODUCTS

4.01 GENERAL

A. For all projects (renovation and new), refer to Owner's Interior Finishes Standards. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/interiors.html

B. For renovation projects, refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

4.02 PRODUCTS

A. Provide Saris Cycling Group (Saris.com), series 8000, lockable, vertical bicycle storage racks. Stack Rack series may also be required depending on ability of 8000 series to accommodate wide-tire bicycles.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	03-05-13	Initial Adoption of Element	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4065

PART 1 - INTRODUCTION

1.01 OVERVIEW

A. The Houston Main Campus is broadly defined as the MD Anderson Cancer Center located within the greater Texas Medical Center campus. The MD Anderson Cancer Center Houston Campus is comprised of the North, Mid, South, and East Campuses. In addition, MD Anderson owns or leases facilities off campus, including the Fannin Holcombe Building. These campuses are briefly described and graphically represented within this Element.

1.02 NORTH CAMPUS

A. The North Campus is comprised of several sites: the north side of Holcombe Boulevard (also known as North of Holcombe or Main Hospital) and the south side of Holcombe Boulevard, north of Brays Bayou. The western edge is Fannin Street and the eastern edge is bounded by Brays Bayou east of Braeswood Boulevard.

B. The North of Holcombe site contains the original MD Anderson Cancer Center facilities. Until very recently, the majority of facility growth occurred on the North of Holcombe site. As a result, this site is very dense and opportunities for additional facility growth will require a more stringent enforcement of highest and best use and / or multi-institutional collaboration.

1.03 MID CAMPUS

A. The Mid Campus is bordered by Brays Bayou to the north, Fannin Street to the west, Old Spanish Trail to the south and the current Texas Medical Center Brown Lot to the east.

B. Its central location to the North and South Campuses provides an opportunity to locate functions that contribute to the synergy and connectivity of all four campuses.

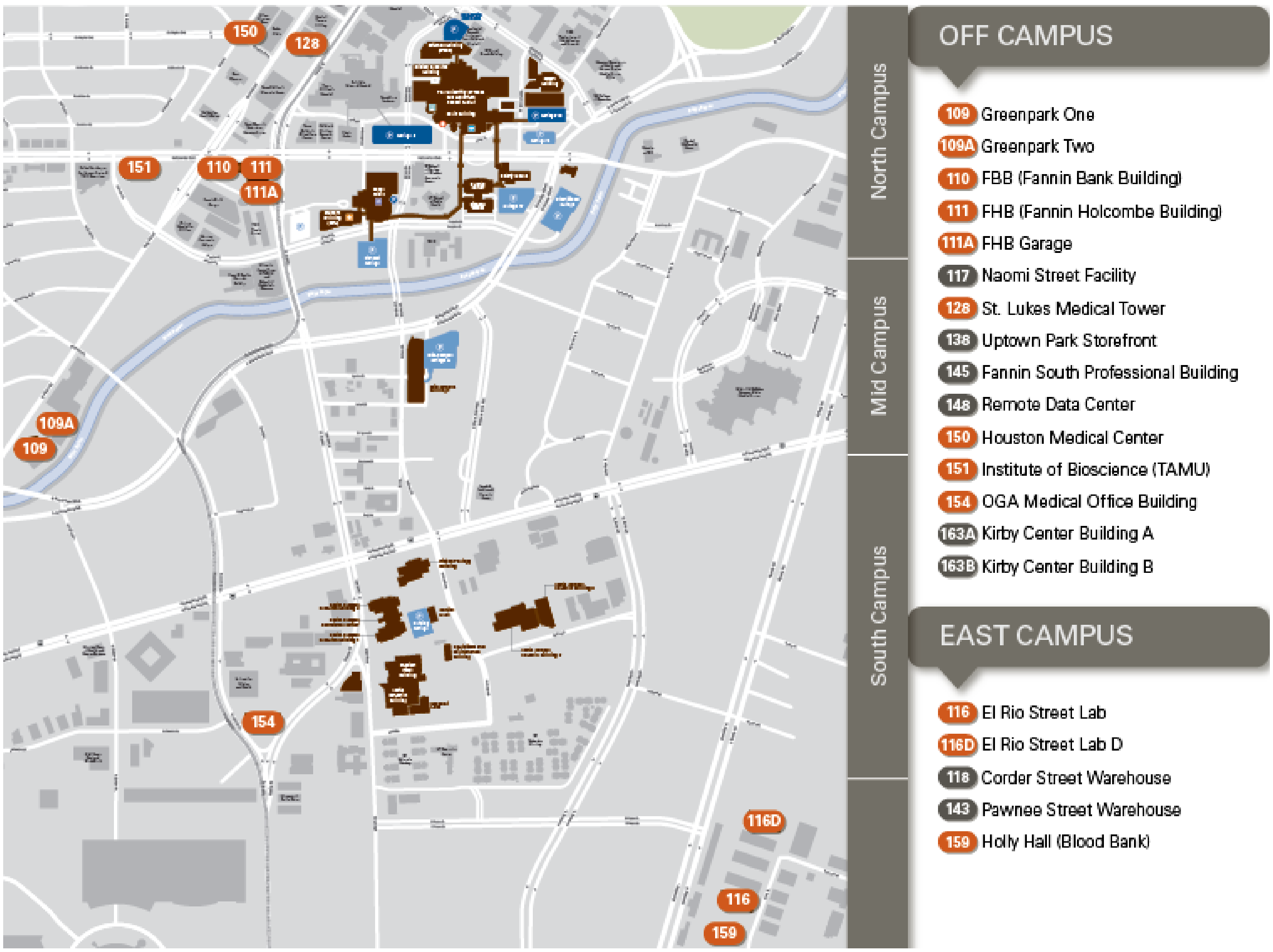
1.04 SOUTH CAMPUS

A. The South Campus is bordered by Old Spanish Trail to the north, Fannin Street / Knight Road to the west, El Paseo to the south and Cambridge Street to the east.

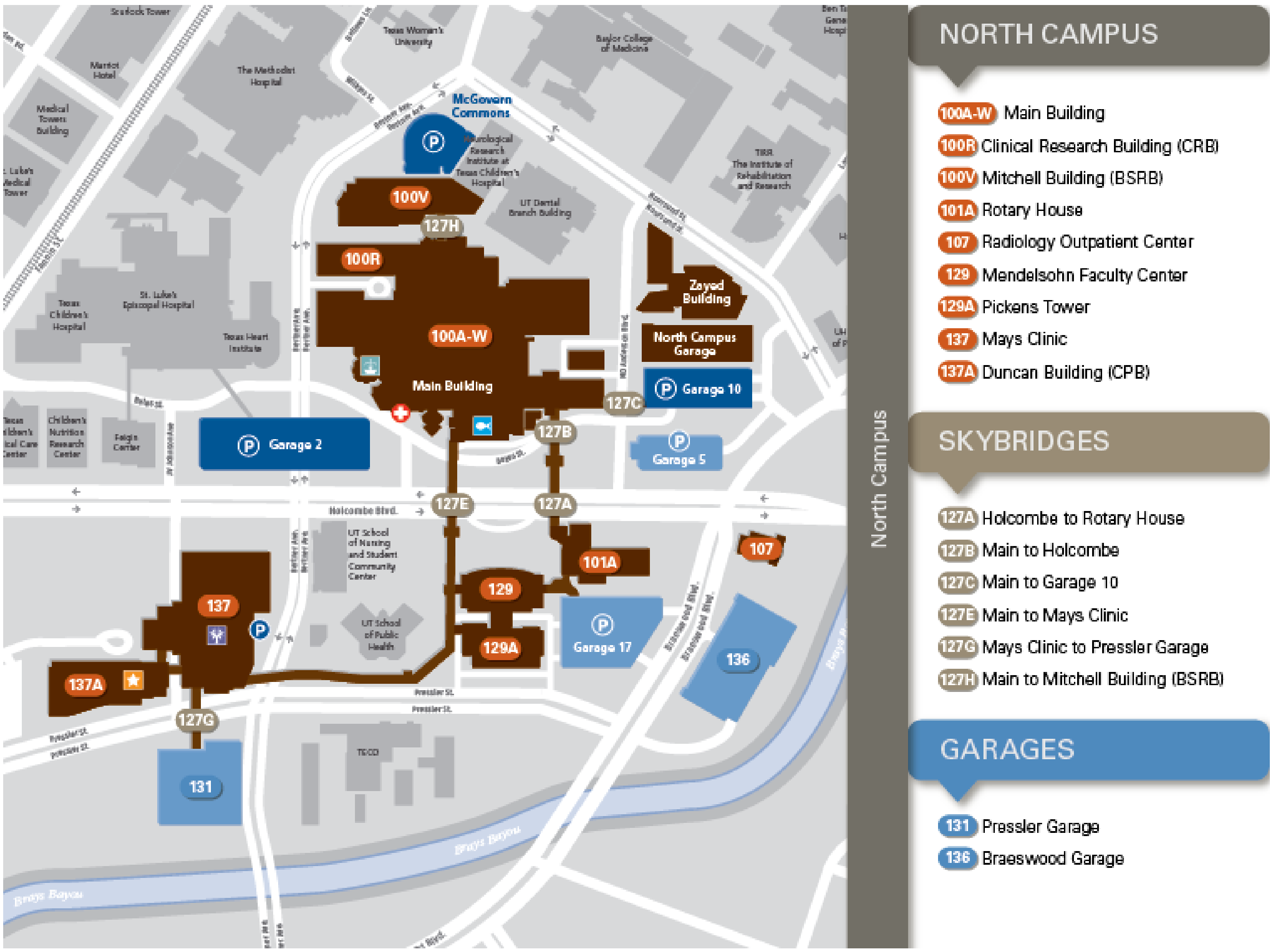
1.05 EAST CAMPUS

A. East campus buildings include support facilities and the El Rio Street Lab buildings.

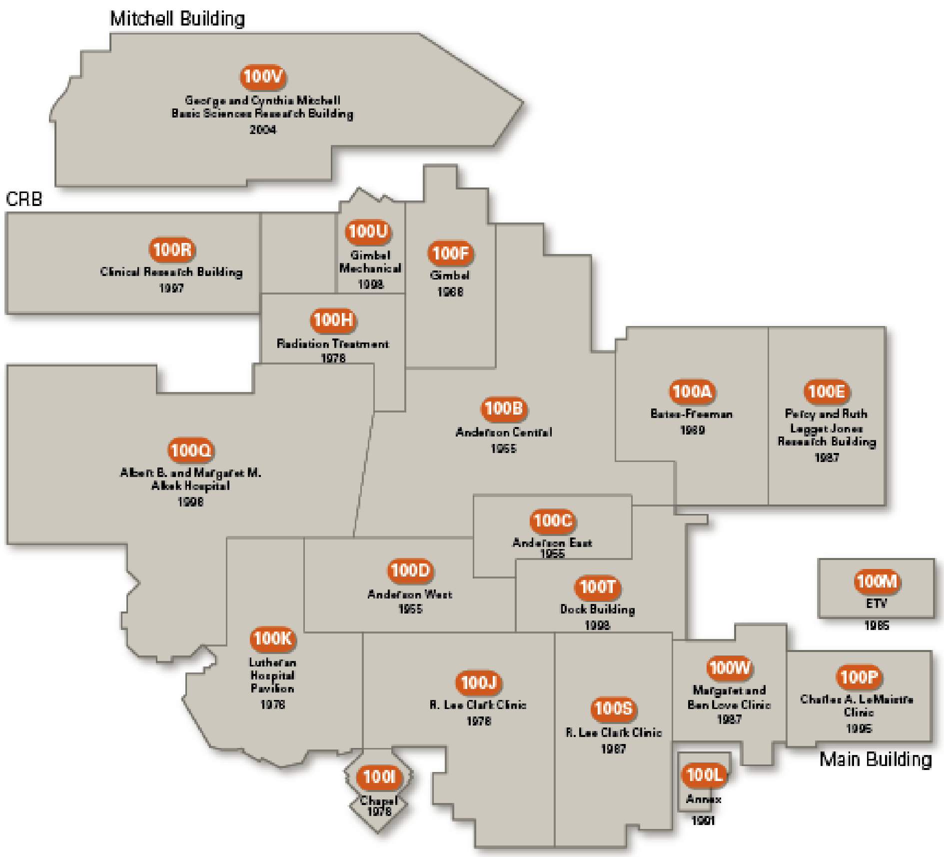
PART 2 - HOUSTON MAIN CAMPUS - ALL BUILDINGS



PART 3 - NORTH CAMPUS - ALL BUILDINGS



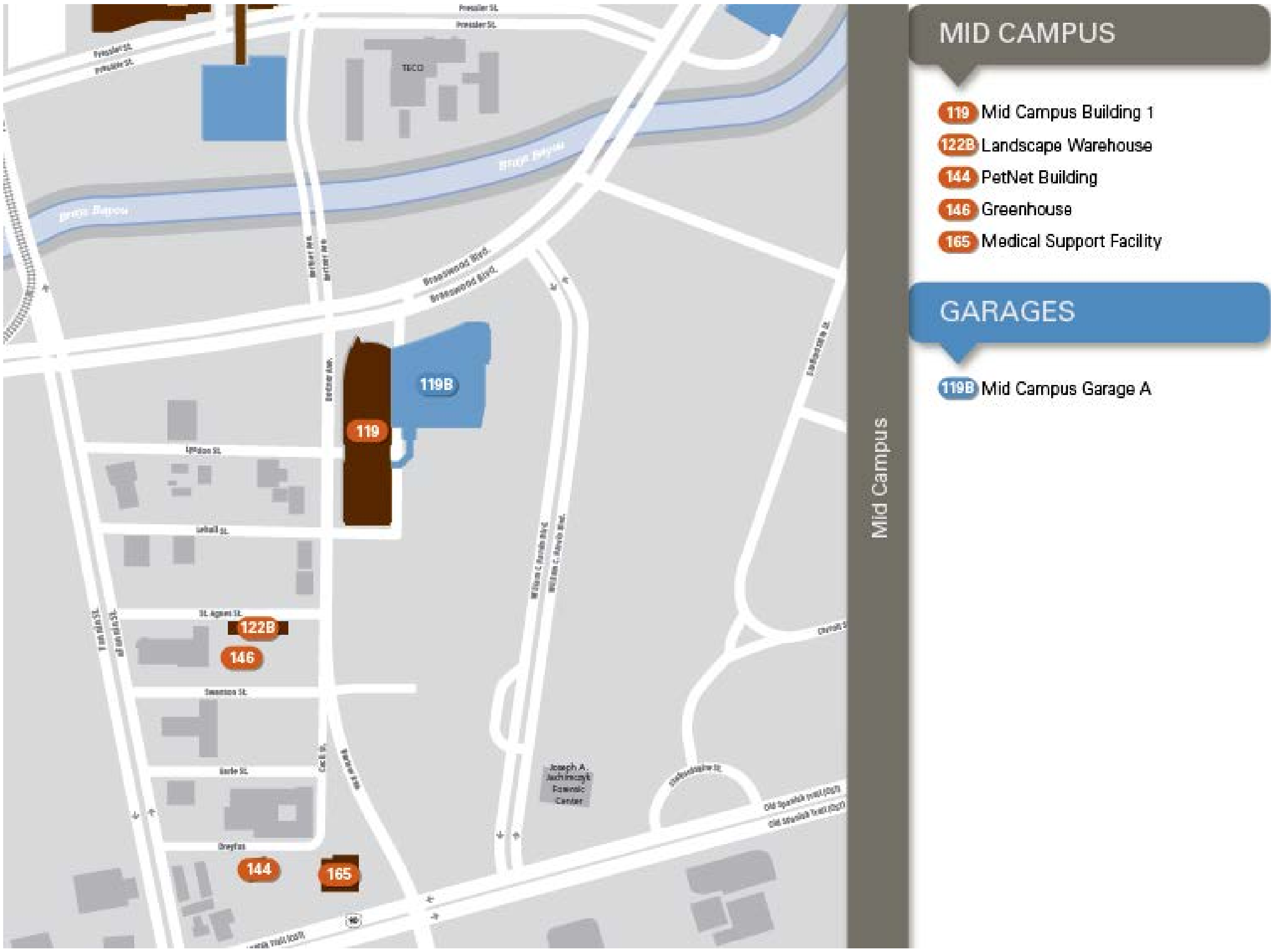
PART 4 - NORTH CAMPUS - MAIN BUILDING



MAIN BUILDING, CRB and MITCHELL BUILDING

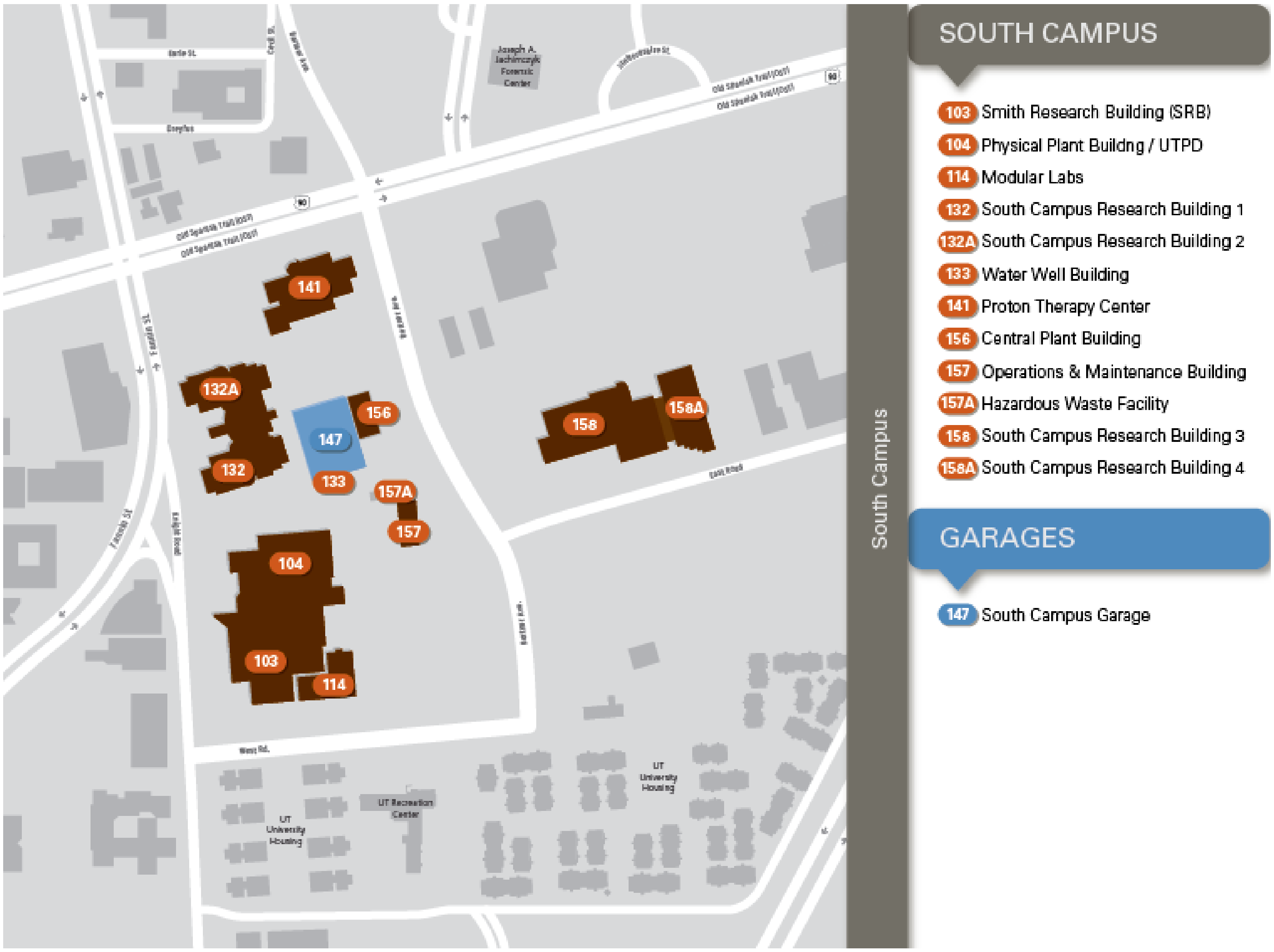
- 100A Bates-Freeman
- 100B Anderson Central
- 100C Anderson East
- 100D Anderson West
- 100E Legget Jones Research Building
- 100F Gimbel
- 100G Cyclotron
- 100H Radiation Treatment Center
- 100I Chapel
- 100J Clark Clinic (The Aquarium)
- 100K Lutheran Pavilion
- 100L Annex (Integrative Medicine Center)
- 100M ETV
- 100N Incinerator Control Building
- 100O Contractor Work Building
- 100P LeMaistre Clinic
- 100Q Alkek Hospital
- 100R Clinical Research Building (CRB)
- 100S Clark Clinic (The Aquarium)
- 100T Dock Building
- 100U Gimbel Mechanical
- 100V Mitchell Building (BSRB)
- 100W Love Clinic

PART 5 - MID CAMPUS

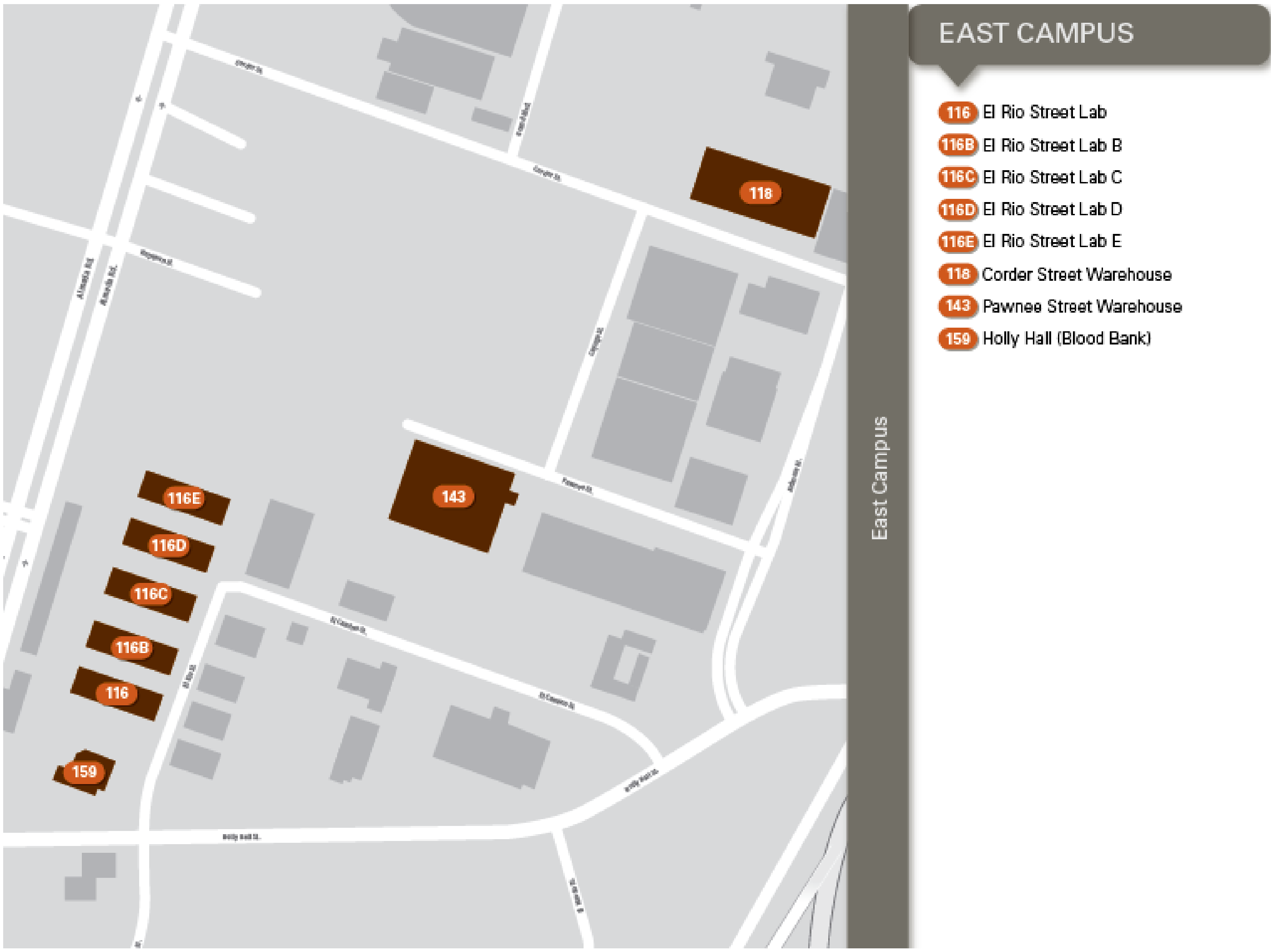


Z5000 Houston Main Campus Key Maps

PART 6 - SOUTH CAMPUS



PART 7 - EAST CAMPUS



PART 8 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	11-01-07	Initial Adoption of Element	
Rev. 1	06-11-13	Updated main campus key maps	DOS
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z5000

End of Owner's Design Guidelines