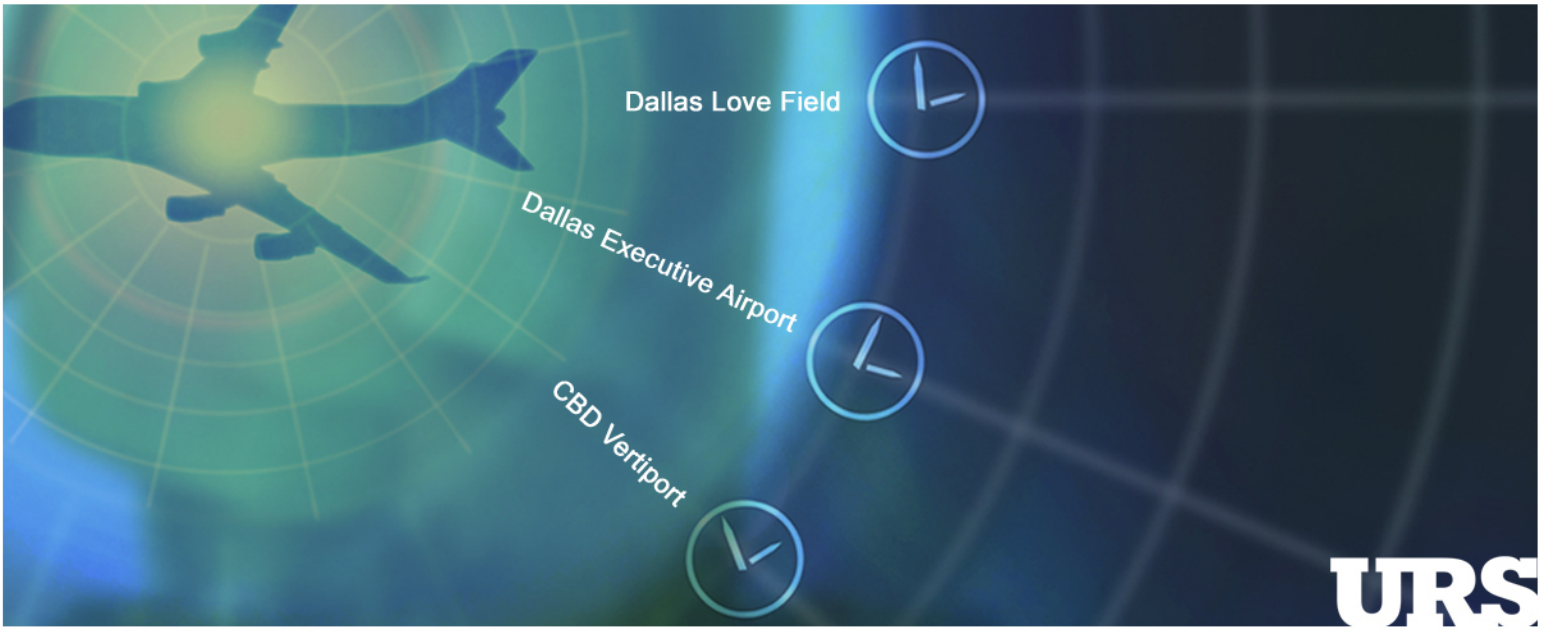
City of Dallas
Airport System

# 09 design and standards manual (DSM)

October 2009

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# SECTION 1: GENERAL OVERVIEW

The General Overview portion of the Design Standards Manual is intended to provide an overall introduction to the Airports owned by the City of Dallas and managed by the Department of Aviation. As well as Safety, Security, and Federal, State and City requirements under which all work shall be performed.

| | | | | File Links/References |
|---|---|---|---|---|
| Section 1: General Overview | Chapter 1 | Introduction | 1.1 Purpose of this Manual<br>1.2 Document Precedence<br>1.3 The City of Dallas Airports | |
| | Chapter 2 | Security and Safety Requirements | 2.1 Security<br>2.2 Safety | |
| | Chapter 3 | Procurement and Purchase Practice | 3.1 General<br>3.2 City of Dallas Business Procurement Services Department | |
| | Chapter 4 | Codes, Regulations and Standards | 4.1 General<br>4.2 Accessibility<br>4.3 Applicable Codes, Regulations and Standards<br>4.4 Dallas Green Building Requirements<br>4.5 TSA Design Standards<br>4.6 U.S. Customs and Border Protection Design Standards | • City of Dallas Building Construction Codes<br>• An Overview of LEED, Green Building Programs and Recommendations for Next Steps<br>• Summary of Ordinance Requirements<br>• Green Building Ordinance<br>• Ordinance No.27131 Overview for Small Commercial Buildings |

# CHAPTER 1: INTRODUCTION

## 1.1 Purpose of this Manual

### 1.1.1 General

The purpose of this Design and Standards Manual is to identify general policies and procedures for the development of the City of Dallas Department of Aviation's aviation facilities in order to achieve consistency in design and construction. An electronic copy of the Design and Standards Manual and other supporting documentation will be provided to all Design Consultants providing architectural and engineering design services to Tenants of the City of Dallas (City) or direct service to the Department of Aviation (DOA) at City owned aviation facilities. The requirements of this Design and Standards Manual apply primarily to larger multidisciplinary projects. Smaller projects may be subject to a less rigorous administrative process which will be more clearly defined at the time of contract negotiation.

### 1.1.2 Design Services

Design Consultants provide design services to Department of Aviation (DOA) through two basic methods as follows:

- Through qualifications based selection for projects managed by the Public Works & Transportation Departments in coordination with the DOA.
- When retained by a tenant or tenant's contractor to provide specific design services for tenant funded improvements.

### 1.1.3 Content Overview

This Manual provides the Design Consultant with:

- An overview of the process for introducing the Design Consultant to the proposed Project including the anticipated Scope of Work with the purpose of providing the information necessary to negotiate a Contract for Professional Services
- An overview of the procedures required by DOA for the design of new, renovated or reconstructed facilities including the construction administration procedures
- The processes and level of effort required to satisfy the DOA's performance standards for professional services

## 1.2 Document Precedence

The requirements of this manual are not intended to supersede the requirements of Federal, State, local guidelines, applicable codes and standards, nor to instruct the Design Consultant to use less than the highest level of professional judgment. Where the instructions or direction established herein is in conflict with applicable codes, standards and requirements or is not consistent with the Design Consultant's professional judgment, the Design Consultant shall promptly identify the conflict and notify the DOA in writing for resolution.

## 1.3 The City of Dallas Aviation Facilities

The City of Dallas (City) owns and operates three aviation facilities which serve the greater Dallas area as follows:

### 1.3.1 Dallas Love Field

Dallas Love Field (DAL), owned and operated by the City of Dallas, is located inside the boundaries of Shorecrest Drive on the northwest, Lemmon Avenue on the northeast, Mockingbird Lane on the southeast and Denton Drive on the west. This area comprises approximately 1300 acres and includes commercial and municipal tenants. The FAA controls much of the aircraft operation within the fence line. Dallas Love Field is classified as a medium hub commercial service airport with over 3.5 million annual enplanements and serves as the primary hub and corporate headquarters for Southwest Airlines. The airport is served by three runways, with Runway 13R-31L the longest at 8,800 feet, and several instrument approach procedures. Although it primarily serves as a commercial service airport, Dallas Love Field has a significant General Aviation (GA) component and is home to 400 aircraft including 316 jets. Love Field experiences approximately 230,000 annual operations.

### 1.3.2 Dallas Executive Airport

The City of Dallas changed the name of Redbird Airport to Dallas Executive Airport (RBD) in 2002 and became effective on May 1 of that year. Dallas Executive Airport is located on a 1,040-acre site in southwest Dallas, 6.5 miles south of the central business district. The airport is surrounded by four major thoroughfares: Westmoreland Road to the west, Ledbetter Boulevard (Loop 12) to the north, Hampton Road to the east, and Redbird Lane and the Marvin D. Love Freeway (U.S. Highway 67) to the south/southeast. Dallas Executive Airport has been designated by the NPIAS as a reliever airport to Dallas / Fort Worth International Airport and Dallas Love Field. Dallas Executive Airport is one of 22 reliever airports designated for the State of Texas, and one of 13 located in the Dallas / Fort Worth Metroplex region. Commercial Operation that meet specific requirements set by the City of Dallas are allowed to operate out of RBD.

### 1.3.3 Central Business District (CBD) Vertiport

The Dallas Vertiport (49T) is owned by the City of Dallas and operated through the Department of Aviation. The CBD Vertiport is an elevated aviation facility located in Dallas at the south end of the Convention Center. The facility has approximately 169,000 square feet of flight deck, a dedicated automobile parking lot, a full service lobby to include a conference room and a pilots waiting area. Both rotor aircraft and tilt-rotor aircraft, such as the Osprey V-22, can be accommodated at the facility. The CBD Vertiport may be used by anyone operating a rotor type aircraft. It is primarily utilized by law enforcement, media, traffic watch, individuals owning and operating their own aircraft, private charters as well as corporate aviation departments of private companies.

# CHAPTER 2: SECURITY AND SAFETY REQUIREMENTS

## 2.1 Security

DOA has established mandatory security procedures for all Consultants and Contractors which define operating guidelines for work being performed within the secured areas of the City's aviation facilities. The objectives of these procedures are intended to cover all security functions related to vehicle and equipment operations and personal identification while on the airports. Those guidelines are defined by the Air Operations Area Construction Rules and are located in Appendix A.

## 2.2 Safety

The objective of the Department of Aviation safety policy is to achieve an accident-free project; therefore, safety must be an integral part of each project. The achievement of this objective is possible only through planning and maintaining safety awareness in all phases of the day-to-day work operations during design and construction. Specific safety requirements and standards governing Design Consultants and construction contractors are contained in each City of Dallas design and construction contract.

# CHAPTER 3: PROCUREMENT AND PURCHASE PRACTICES

## 3.1 General

The Design Consultant shall fully adhere to the following policies for Projects that are funded through the City of Dallas

### 3.1.1 Full and Open Competition

The City is committed to acquiring contract supplies and services by full and open competition through the use of established procedures in accordance with established policies. Design Consultants are encouraged to strive for open competition for required materials and services as well.

### 3.1.2 Brand Name or Equal Requirements

When it is determined to be impractical or undesirable to develop a generic specification, three brand names should be specified to convey the general style, type, character and quality of the article desired. Unless otherwise provided for in the specification, the naming of certain brands, makes or manufacturers does not restrict vendors to these specific brands or manufacturers named. To the extent possible, the characteristics of the item being requested that are the most important to the DOA, including salient features, should be identified. Any article DOA, in sole discretion, determines to be the equal of that specified, considering quality, workmanship, economy of operation and suitability for the purpose intended, may be accepted. The burden of proof of product equality lies with the supplier or installer of the product and not with DOA.

### 3.1.3 Proprietary Specifications

In certain instances, a specific product, because of performance, maintenance or compatibility characteristics may be identified as the only acceptable product for a particular use in a project. In all such cases where a sole product is specified, prior approval for use of the product must be obtained from the DOA and the City Attorney's Office.

## 3.2 City of Dallas Business Development and Procurement Services Department

### 3.2.1 City of Dallas Good Faith Effort – M/WBE

**3.2.1.1** The Business Development Services office is responsible for the ongoing development and implementation of the City's Minority and Women-owned Business Enterprise (M/WBE) programs through Outreach and Assistance, Contract Compliance, and Audit Verification.

**3.2.1.2** Procurement administers the City's centralized purchasing system. Procurement is responsible for developing bid specifications jointly with City departments, obtaining bids through advertising and direct solicitation, establishing and monitoring price agreement contracts, and issuing purchase orders. Procurement maintains the register of professional and personal services consultants who are interested in working with the City of Dallas. Procurement, in coordination with Business Development Services (BDS), maintains a register of Dallas M/WBE companies in efforts to facilitate M/WBE participation in the procurement process.

### 3.2.2 Federal Aviation Improvement Projects - DBE

**3.2.2.1** The City of Dallas, as a recipient of funding from the U. S. Department of Transportation (USDOT), complies with the requirements of 49 CFR Part 26 in administering the Disadvantaged Business Enterprise (DBE) Program Plan.

**3.2.2.2** In accordance with the regulation, the City has procedures for the administration of the DBE program in the areas of:

- Annual Goal Setting Procedures
- Project Goal Setting Procedures
- Pre-Bid Procedures
- Bid Opening Procedures
- Waiver Procedures
- Monitoring Procedures
- Reporting Procedures

# CHAPTER 4: CODES, REGULATIONS AND STANDARDS

## 4.1 General

The following section lists a number of codes, regulations and standards to be used by the Design Consultant in the development of design for the project. While this section attempts to provide a thorough survey of applicable codes and standards, it is the Design Consultant's responsibility to research and apply all required codes and regulations to the final design whether or not listed herein.

## 4.2 Accessibility

### 4.2.1 Accessibility Requirements

The DOA requires that its facilities and services be designed to accommodate disabled individuals.

### 4.2.2 Accessibility Guidelines

The DOA requirements are based on the Americans with Disabilities Act Architectural Accessibility Guidelines (ADAAG) incorporated by the Texas ADAAG, the American National Standards Institute (ANSI 117.1), and other related building codes pertaining to accessibility for persons with disabilities.

## 4.3 Applicable Codes, Regulations and Standards

### 4.3.1 Coordination

The Design Consultant is strongly encouraged to contact and coordinate applicable design activity with City Building Officials during all phases of the project for Code information and interpretations. The Design Consultant is required to resolve design and construction problems that arise because of lack of coordination with building safety departments and other municipal/state/federal agencies at no additional cost to the City.

### 4.3.2 Code Links

Depending on the type of project and its location, the applicable building codes for an aviation facility project include but may not necessarily be limited to the information located on the following website:

City of Dallas Building Construction Codes

### 4.3.3 Additional Requirements

In addition, there may be other National, State and local Regulations and Standards which may have application to the project. It is the Design Consultant's responsibility to evaluate such additional requirements and incorporate them in accordance with sound architectural and engineering practice.

## 4.4 Dallas Green Building Requirements

### 4.4.1 Green Building Ordinance

Dallas City Council adopted a resolution for the implementation of the citywide green building program and an ordinance establishing the green building program on April 9, 2008. This ordinance requires buildings 50,000 square feet and larger to be at least 85% LEED certified and/or must achieve a minimum of 22 points under the current LEED rating system.

### 4.4.2 Drawing Submittals

The Design Consultant will submit the drawings and registration forms to the U.S. Green Building Council (USGBC) for compliance review to obtain certification or to the City of Dallas if complying with the minimum green building ordinance required by the City of Dallas.

### 4.4.3 LEED Requirements

The links listed below will guide you to the City of Dallas Green Building Information and LEED Requirements:

http://www.greendallas.net/pdfs/SustainableDallas_101707.pdf
http://www.greendallas.net/pdfs/green_building_ordinance_highlights.pdf
http://www.greendallas.net/pdfs/green_building_ordinance.pdf
http://www.greendallas.net/pdfs/GreenBuilding_Commercial.pdf

## 4.5 TSA Design Standards

### 4.5.1 General

For Project that involve the Design and modification of Baggage Handling Systems (BHS) the Design Consultant shall reference the most current version of the Transportation Security Administrations Planning Guidelines and Design Standards for Checked Baggage Inspection Systems.

### 4.5.2 Discrepancies/ Conflicts with the DSM

If the Design Consultant notes any discrepancies or conflicts between the requirements in the above noted standards and the DSM the Design Consultant shall immediately notify the DOA using the FEEDBACK FORM FOR THE DESIGN AND STANDARDS MANUAL (DSM) found in the Appendix of the DSM.

## 4.6 U.S. Customs and Border Protection Design Standards

### 4.6.1 General

For Projects related to U.S. Customs and Boarder Protection the Design Consultant shall reference the most current version of the U.S. Department of Homeland Security, U.S. Customs and Boarder Protection: Airport Technical Design Standards for Passenger Processing Facilities.

### 4.6.2 Discrepancies/ Conflicts with the DSM

If the Design Consultant notes any discrepancies or conflicts between the requirements in the above noted standards and the DSM the Design Consultant shall immediately notify the DOA using the FEEDBACK FORM FOR THE DESIGN AND STANDARDS MANUAL (DSM) found in the Appendix of the DSM.

# SECTION 2: DESIGN & CONSTRUCTION PROCEDURES

These Procedures are intended to outline for the Design Consultants the necessary steps and deliverables that are to me met at the various phases of a project. These are organized sequentially based on the most common accepted phases in the Design and Construction Process. The Section also contains links to Checklists, Schedules, Forms, and other Documents to aid the Design Consultant in meeting the respective requirements.

| | | | | File Links/References |
|---|---|---|---|---|
| Section 2: Procedures | Chapter 1 | Pre-Design Phase | 1.1 Design Consultant Kickoff<br>1.2 Management and Administration<br>1.3 Environmental and Construction Permitting<br>1.4 Federal Aviation Administration (FAA) Projects | • Air Operations Area (AOA) Construction Rules<br>• Airport Safety Self-Inspection<br>• Painting, Marking, and Lighting of Vehicles Used On an Airport<br>• Ground Vehicle Operations on Airports<br>• Conferences for Airport Grant Projects<br>• Airport Design<br>• Standards for Airport Markings<br>• Operational Safety on Airports during Construction<br>• Standards for Specifying Construction of Airports<br>• Debris Hazards at Civil Airports<br>• FAA Project File System checklist<br>• FAA Safety Plan Checklist<br>• FAA Construction Handbook<br>• FAA Airfield Visual Aid Safety Placard<br>• FAA Project Checklist<br>• FAA Advisory Circular Checklist<br>• NOTAM Example<br>• FAA Closeout Checklist<br>• Environmental Review Checklist |
| | Chapter 2 | Design Phase | 2.1 Working with the Airport Team<br>2.2 Verification of Existing Conditions<br>2.3 Design Review and Approval<br>2.4 Programming Phase<br>2.5 Schematic Design Phase – 30% Submittal<br>2.6 Design Development Phase - 60% Submittal<br>2.7 Construction Documents Phase – 95% Submittal<br>2.8 Bid Documents – 100% Submittal<br>2.9 Bidding Process<br>2.10 Conformed Documents | • Specific Use Permit Application<br>• Zoning Applications<br>• IR-Industrial Research District Link<br>• Programming Checklist<br>• Project Deliverables<br>• Minimum Requirements for Schematic Phase Checklist |
| | Chapter 3 | Construction Phase | 3.1 Pre-Construction<br>3.2 Construction Administration | • Construction Startup Checklist<br>• Facility Impact Request Form<br>• Pre-Construction Meeting Checklist<br>• Construction Administration Checklist<br>• Project Meetings Checklist<br>• Construction Schedule Checklist<br>• Submittals Checklist<br>• FAA Construction Checklist<br>• RFI Checklist<br>• ASI Checklist |
| | Chapter 4 | Closeout Phase | 4.1 General<br>4.2 Substantial Completion<br>4.3 Final Acceptance<br>4.4 Commissioning<br>4.5 Demonstration and Training<br>4.6 Operation and Maintenance Manuals (O&M)<br>4.7 Computerized Maintenance Management System (CMMS)<br>4.8 Construction Operating Rules | • Final Completion Checklist<br>• Equipment Add/ Remove form |

# CHAPTER 1: PRE-DESIGN PHASE

## 1.1 Design Consultant Kickoff

### 1.1.1 Introduction

Following completion of the ranking of competing firms, the Public Works & Transportation Project Manager (PM), in coordination with DOA, will schedule and conduct a kickoff meeting with the number one ranked firm to begin negotiation of a Contract for Professional Services. During this meeting, the Design Consultant will be provided the information necessary to prepare a fee proposal consisting of a written scope of work and man-hour estimate and other material requested as outlined below.

**A.** A detailed project scope including the Project Goals and Special Requirements Statement

**B.** A project schedule identifying major completion milestones from NTP to the completion of construction and occupancy

**C.** A list of special considerations effecting the Design Consultant's scope and time requirements

**D.** Source of funding

**E.** The City's standard form Architectural-Engineering Contract for Design Consultant's review

**F.** Issues involved with the Design Consultants fees for professional services.

**G.** Allowances and allowable costs which may be incorporated into the contract

**H.** Required insurance and minimum limits

**I.** City's policy and expectations related to M/WBE/SBE participation.

**J.** Instructions to the consulting team members so they can apply for necessary badging/keys/parking permits, etc

**K.** Due date for Design Consultant's proposal

**L.** Tentative negotiation schedule

### 1.1.2 Consultant Project Management Services

**1.1.2.1** As the City enters into a contractual relationship with the Design Consultant, it is with the expectation that the services of the Design Consultant and his team will provide the degree of professional support and response necessary to achieve the City's full objectives. The PM will expect the following minimum level of effort from the Design Consultant where not clearly excluded or delineated otherwise in the executed contract.

**A.** Development of a Project Work Plan

**B.** Development of a detailed design schedule

**C.** Design Schedule monitoring and updating of proposed and actual schedule

**D.** Preparation of Monthly Progress Reports

**E.** Management of sub-Design Consultant's work progress, invoices and insurance

**F.** Scheduling and conducting regular design progress meetings including coordinating participant's attendance, recording of meeting minutes and action items including preparation, distribution and corrections as required. Meeting minutes should be distributed within 72 hours following a meeting.

**G.** Development of a Quality Control Plan

**H.** Preparation of construction cost estimates and reconciliation with budget where required

**I.** Assembly and review of all applicable codes and standards which may influence or affect the design of the project including applicable LEED Design Standards

**J.** Organize and participate in facility tours to examine successful design solutions including technology integration, operational efficiencies and observation of effective use of materials and finishes.

**K.** Answer questions and issue addenda during bidding

**L.** Prepare Conformed Documents for construction

**M.** Schedule and conduct periodic construction meetings including coordinating participant's attendance, recording of meeting minutes and action items including preparation, distribution and corrections as required.

**N.** Provide contractor progress payment review.

**O.** Issue Architect's Supplemental Instructions' (ASI)

**P.** Issue response to contractor's Requests for Information (RFI)

**Q.** Make periodic site visits

**R.** Issue inspection reports including comments rendered by PM and other City or DOA staff

**S.** Perform substantial completion and final completion inspections

**T.** Prepare Record Documents

**1.1.2.2** In addition, refer to Design Services Checklist, Project Deliverables, Design Consultant Level of Service Checklist

### 1.1.3 Contract Negotiations

**1.1.3.1** The Design Consultant shall prepare a detailed proposal in accordance with the information gathered at the Project Kickoff Meeting and will submit it to the PM with particular attention to the submittal date noted at the Kickoff Meeting. The proposal shall include:

**A.** A detailed scope of work

**B.** Detailed cost proposal with task/man-hour cost matrix including prime and sub-Design Consultants.

**C.** Proposed schedule

**D.** Reiteration of construction budget

**1.1.3.2** Following a review of the Design Consultant's proposal, the PM will conduct a meeting to review the City's comments and negotiate terms and fees for the work.

**1.1.3.3** The Design Consultant will revise and resubmit the proposal until it is acceptable to the PM and the City.

**1.1.3.4** The Design Consultant shall provide a project directory list for the prime and sub-Design Consultants indicating the following:

**A.** Contact person

**B.** Company

**C.** Telephone/Fax

**D.** Street and Mailing Address if different

**E.** E-mail address

**1.1.3.5** Upon final approval of the contract, the City will issue an NTP to the Design Consultant.

**1.1.3.6** Refer to Consultant/Contractor Kick-off Process for more information.

## 1.2 Management and Administration

### 1.2.1 Communications

All communication regarding matters of contract, interpretation, design submittals and construction phase activities between the City and the Design Consultant is thru the PM unless otherwise instructed in writing.

### 1.2.2 Project Work Plan

**1.2.2.1** The Design Consultant must prepare a Project Work Plan to organize and execute the design and construction related tasks for the Scope of Work. A preliminary draft must be submitted to the PM for review and acceptance before work begins. This plan should include, but not necessarily be limited to the following information:

**A.** A description of each Design Consultant's team member responsibility and work scope

**B.** An outline of the tasks to be undertaken during each phase of the project

**C.** An outline of the procedures for implementing the Quality Control/Quality Assurance Plan

**D.** An outline of CADD Standards to be used for documentation

**E.** A format for sub consultant invoicing

**F.** A format for Design Consultant invoicing

**G.** A sample Agenda for internal team design progress review meetings

**H.** A sample Agenda for client team design progress review meetings

**I.** A sample Action Item List with features to show responsibility and closure of items when complete

### 1.2.3 Design Consultants Invoicing

The Design Consultant may submit invoices for services on a monthly basis. Invoices must be prepared in the required format and accompanied by a Monthly Progress Report as outlined below.

### 1.2.4 Monthly Progress Report

**1.2.4.1** The Design Consultant must prepare a Monthly Progress Report to document the status of the project scope, schedule, and budget which is to be submitted with monthly invoices. Generally, the report will provide the following information:

**A.** Minutes of all meetings in the past month

**B.** Work accomplished in the previous month – information exchanged, and decisions made.

**C.** Work to be accomplished in coming month – a list of subjects or items identified for further discussion and/ or action.

**D.** Action Item List – List of items that need to be tracked separately indicating responsible party and status of completion.

**E.** Updated Schedule – indicating dates of proposed work sessions, review meetings, and progress in relation to design and construction milestones based on the Master Schedule.

**F.** Budget Status – last statement of estimated probable construction cost and progress on activities to maintain budget if required.

### 1.2.5 Project Documentation and Control

**1.2.5.1** The Design Consultant will develop a project filing system format acceptable to the PM and the City and must coordinate the form of all submittals for the project to ensure compatibility with DOA requirements.

**1.2.5.2** In addition, the Design Consultant will be required to develop all documents utilizing computer software acceptable to the City for word processing and drawing preparation including application of CADD Standards acceptable to the PM and City.

**1.2.5.3** The DOA requires use of AutoCad for all work at City owned airports. Preferred file format for all design submittals is CAD and PDF. Reference Appendix B - CAD Requirements for CAD standards. All text documents including Specifications and Narratives are to be in Microsoft Word (Latest Version) and PDF format.

### 1.2.6 Design Consultant's Quality Control/Quality Assurance Plan

**1.2.6.1** As part of basic services, the Design Consultant will be required to prepare and submit for review and approval a Quality Control/Quality Assurance Plan (QA/QC). This plan must address the Design Consultant's organization and methodology for performing the services specified in their Contract with the City of Dallas.

**1.2.6.2** The plan must, at a minimum, address how the Design Consultant will manage the following issues:

**A.** Design Consultant's team organization and how communication and coordination will occur between design disciplines

**B.** The items of work subject to review at each design phase and how Design Consultant will perform independent technical reviews of the team's work, including design calculations, drawings, specifications, and coordination of the work

**C.** Method of documenting the results of independent technical reviews and how the results are presented to the design team at each phase of development

**D.** Team's approach to responding to comments and reconciling action to be taken

**E.** How Design Consultant will audit team's response to assure appropriate action has been taken

### 1.2.7 Construction Cost Estimating and Budgets

**1.2.7.1** Cost estimates prepared for the project shall be presented in the format acceptable to the DOA and the PM.

**1.2.7.2** In addition, the Design Consultant may be asked to prepare an estimate in a functional area format to assess the cost impact of selected elements or portions of the work on the total project.

**1.2.7.3** The Design Consultant will also be required to provide information as may be required to assess the value of work for purposes of determining the potential level of required M/WBE participation during the construction phase of the project.

**1.2.7.4** Estimates should be developed to the level of detail appropriate to the estimates use and include the following minimum level of detail:

**A.** Estimates should be presented using description, quantity, unit of measure, unit rate and extension columns. Unit rates should include material, labor, equipment costs, subcontractor markups including taxes, insurance, overhead costs and profit. Where details/design information exists, materials should be measured, enumerated and shown in the estimate.

**B.** Use allowances where insufficient design has been preformed at the time of the estimate. Reference the City of Dallas General Conditions for Building Construction for the Terms and Conditions regarding Allowances.

**C.** Type of estimate, i.e., Schematic level, Design Development level, etc

**D.** List of documents used for the estimate including document dates and date received for estimating purposes.

**E.** Assumptions/exclusions

**F.** Key criteria/area and control quantities.

**G.** Items/conditions affecting the estimate

**H.** Estimate summary indicating costs for major elements of construction, GC's OH&P, contingencies and escalation.

**I.** Estimate details

**J.** Pricing of alternatives

**K.** Comparison summary with previous estimates indicating major cost variations between estimates

**1.2.7.5** It is important to recognize the Design Consultant does not have the DOA to modify the scope of a project. The Design Consultant is reminded of the obligation under contract to adhere to the established budget. Increases in the total project budget must be approved by the DOA in advance before design can proceed.

**1.2.7.6** In the event a Design Consultant submits an estimate update in which the total estimated construction cost exceeds the net available construction budget; the Design Consultant will submit a written proposal to DOA to bring the estimated cost into conformance with the budget must be attached.

**1.2.7.7** At such time as the DOA retains a third party estimator during the project design phase, the Design Consultant will be required to reconcile these two cost estimates. In the event the reconciled estimate exceeds the available construction budget, the Design Consultant must prepare a written proposal to bring the estimated cost into conformance with the budget.

**1.2.7.8** The Design Consultant is cautioned that under no circumstances shall the Design Consultant reveal or cause the publication of project construction budgets or construction cost estimates to anyone other than the City's authorized personnel.

### 1.2.8 Value Engineering

When applicable, DOA values and encourages the informal application of value engineering principles an all projects. While not applicable for every project, formal value engineering workshops may be considered during the during the design phase of a project which is of a scale and complexity that warrants this level of effort. The Design Consultant should review such opportunities in advance with the PM to determine if a formal value engineering workshop is warranted.

### 1.2.9 Scheduling

**1.2.9.1** The Design Consultant will develop and maintain a Master Schedule for the project including the Design Schedule, Bid Schedule, Construction Schedule, and Occupancy Schedule. CPM Schedules will be prepared per the City of Dallas General Conditions for Building Construction.

**1.2.9.2** The Design Consultant shall periodically update this schedule to reflect changes in the flow, duration and completion dates of design or other critical activities as required for completion of the work in accordance with the established milestones dates.

**1.2.9.3** Schedule changes which extend the time constraints of the Master Schedule must be approved by the DOA in advance before the design work can proceed.

### 1.2.10 Technology Requirements

**1.2.10.1** It is the Design Consultant's responsibility to ensure that the project's technology systems are fully coordinated with DOA requirements and the City's Network Management Services section of the Communication and Information Services Department. The Design Consultant will coordinate all required activities through the PM.

**1.2.10.2** The Design Consultant, working in coordination with the PM should review project requirements with the DOA and City of Dallas Network Management Services at the outset of the Programming Phase and maintain close coordination with their representatives as the design of the various systems proceeds. Depending on the project and airport where work is located, these systems may include, but are not necessarily limited to, the following:

**A.** Passenger Information Paging System (PIPS)

**B.** Flight and Baggage Information Displays (FIDS & BIDS)

**C.** Interface with the Local Area Network (LAN)

**D.** Parking Revenue Control System

**E.** 800 MHz radio system

**F.** CCTV Systems

**G.** PALS

**H.** A/V Systems

**I.** Access to or use of Intranet or Internet websites

**J.** GIS

**K.** Access Control Alarm Management System (ACAMS)

### 1.2.11 Signage Standards

**1.2.11.1** The Design Consultant, working in coordination with the PM, will be required to coordinate signage required in the final design with the requirements of the DOA.

**1.2.11.2** The Design Consultant is responsible for coordinating the design of exterior and interior signage with the existing DOA Signage Program at each airport.

**1.2.11.3** It is important for the Design Consultant to consider that the latest ADA Standards and ANSI 117.1 which apply to signage including text size, font characteristics, contrast, etc., and which will supersede the requirements of the existing signage system.

**1.2.11.4** In addition to the existing signs at each airport, there may be other standards and sources of signs used at the airport that the Design Consultant must consider in completing the design for signage which include:

- City of Dallas Signage Ordinance
- City of Dallas (traffic control and barricade signage)
- FAA Airfield Signage (AC150/5340-1 and AC150/5340-1J )

## 1.3 Environmental and Construction Permitting

### 1.3.1 Environmental Standards and Permitting

**1.3.1.1** Depending on the type of project, the Design Consultant will coordinate and schedule a review meeting with DOA and the City to review design requirements to conform to environmental permitting and hazardous materials remediation needs identified during the "Expectations Meeting" at the beginning of the Schematic Design Phase. The Design Consultant should be prepared to review the design approach and how the proposed solution will satisfy all environmental permitting requirements.

**1.3.1.2** The Design Consultant must, with the PM's concurrence, work in close coordination with the DOA's Environmental Manager to develop a plan for the identification of hazardous materials which may be encountered during construction of the project to insure proper disposal, remediation or encapsulation in a manner prescribed through various federal, state and local regulations.

**1.3.1.3** For projects that involve new construction or changes to the land surface complete the following checklist with the stakeholders and identify all environmental issues which should be addressed with completing your project. Environmental Review Checklist

### 1.3.2 Building Permits

**1.3.2.1** GENERAL
It is the Design Consultant's responsibility to contact and coordinate design activity with the City's Building Inspection Department and Fire Department (Fire Marshal) during all phases of the project for Code information and interpretations. The Design Consultant will schedule preliminary review meetings with the City's Building Inspection Department at the outset of Schematic Design to review status of design and determine required building permits. Reference the City of Dallas General Conditions for Building Construction for the Terms and Conditions regarding Permits, fees and Notices.

**1.3.2.2** COPIES TO THE DOA
The Design Consultant shall copy the DOA on all submittals required for permitting and is required to inform the DOA of upcoming submittals. Exceptions to this requirement shall be clearly defined in the Contract for Professional Services and Coordinated with the DOA.

**1.3.2.3** Fixed Base Operator (FBO) Permitting
FBOs are required to copy the DOA on all submittals and involve the DOA prior to permitting to ensure that all required submittals and permits have been prepared.

**1.3.2.4** AIRSPACE REQUIREMENTS

**A.** All projects at the City's aviation facilities must conform to the requirements of FAA for construction to proceed. Non-FAA funded projects require the Contractor to complete and submit

FAA Form 7460-1 "Notice of Proposed Construction Alteration" at least 60 days prior to the start of the project. In addition, separate forms must be completed and submitted in advance of mobilizing the following:

- Cranes
- Derricks
- Stockpiles of material and equipment
- Earth moving equipment
- Refer to Air Operations Area (AOA) Construction Rules for more information

## 1.4 Federal Aviation Administration (FAA) Projects

### 1.4.1 AIP Funded Projects

**1.4.1.1** Where project funding includes FAA Airport Improvement Program (AIP) grants or grant applications, the Design Consultant shall coordinate completion schedules and composition of design packages with the PM and the DOA to ensure timely and accurate submittals to FAA for design and construction phase services

**1.4.1.2** The Design Consultant should meet with the PM, the DOA and the City if required, as soon after being notified of the assignment as possible. Managing the work for FAA has many time and sequence critical tasks which must be carefully managed.

**1.4.1.3** The Design Consultant will, in coordination with the PM, the DOA and the City if required, schedule and conduct such pre-design, pre-bid and pre-construction conferences as required to ensure that all parties are aware of required design, safety, and construction requirements.

**1.4.1.4** In addition to coordinating the required approvals from the FAA, the Design Consultant is responsible for monitoring and ensuring that project schedule is maintained and required submittals are made in a timely and accurate manner. Design Consultant shall prepare such studies, engineer's reports and other supporting documentation for design review submittals required by the FAA including.

- Development of the Engineers Report
- Daily Construction Reports
- Final Report at completion of construction

### 1.4.2 Design Standards and Administration

**1.4.2.1** ADVISORY CIRCULARS
A partial list of commonly used Advisory Circulars is provided for quick reference. The Design Consultant should always confirm that it is the latest version in use before taking final action.

- AC150/5100-14 Architectural, Engineering and Planning Consultant Services for Airport Grant Projects
- AC150/5200-18 Airport Safety Self-Inspection
- AC150/5210-5 Painting, Marking, and Lighting of Vehicles Used On an Airport
- AC150/5210-20 Ground Vehicle Operations on Airports

- AC150/5300-3A Pre-Design, Pre-Bid and Pre-Construction Conferences for Airport Grant Projects
- AC150/5300-13 Airport Design
- AC150/5340-1 Standards for Airport Markings
- AC150/5345-55 Specification for L-893, Lighted Visual Aid to Indicate Temporary Runway Closure
- AC150/5370-2 Operational Safety on Airports during Construction
- AC150/5370-10 Standards for Specifying Construction of Airports
- AC150/5380-5 Debris Hazards at Civil Airports

**1.4.2.2** PROJECT FILING

The Design Consultant should assist the PM with setting up hard copy FAA files for the project utilizing the FAA Project File System checklist.

**1.4.2.3** ADDITIONAL INFORMATION

- FAA Safety Plan Checklist
- FAA Construction Handbook
- FAA Airfield Visual Aid Safety Placard
- FAA Project Checklist
- FAA Advisory Circular Checklist
- NOTAM Example
- FAA Closeout Checklist

# CHAPTER 2: DESIGN PHASE

## 2.1 Working with the Airport Team

### 2.1.1 Introduction

**2.1.1.1** The Design Phase includes project activities from the issuance of the Design Consultant's Notice-to-Proceed (NTP) through the Bidding of the work and the completion the Conformed Documents.

**2.1.1.2** The description of the Design Consultant's services during the Construction and Closeout Phases are discussed under their respective chapters. The complexity of Projects untaken for the DOA may vary widely and depends on the aviation facilities needs. Because the design process of projects performed for the DOA are multi-faceted and complex, the execution of which may involve design professionals from various disciplines and backgrounds, it is impossible to provide precise instructions that could be equally applied to different types of projects. However, in order to assure consistency in the execution of the work, the DOA provides the following guidelines for reference that should be utilized, as applicable, to each project. Actual Design Consultant's contractual responsibilities are specifically tailored to the unique requirements of each project and are defined in the Contract.

**2.1.1.3** The provisions of the Contract shall govern and take precedence over the contents of this section. There are specific format requirements for all submittal materials required by the Design Consultant's Contract. Refer to Chapter 7 of this Section.

## 2.2 Verification of Existing Conditions

### 2.2.1 Airport Master Plan

The FAA requires an approved Airport Master Plan prior to project startup for all projects which may seek FAA funding and these projects must be identified in the 10 year Capital Improvements Program.

### 2.2.2 Property Zoning

**2.2.2.1** The Design Consultant should be aware that use of selected portions of City owned aviation facilities property are subject to use restrictions through zoning and may require a Specific Use Permit (SUP) from the City's Department of Development Services.

**2.2.2.2** The Design Consultant will be expected to fully research these land use restrictions and requirements and, if necessary obtain the required SUP. In 2009, Dallas Love Field Airport was zoned Industrial Research (IR) District which requires the airport to apply for a SUP for new building construction. The Design Consultant must verify the current zoning status and requirements for the SUP.

**2.2.2.3** Reference the link listed below for the Specific Use Permit Application
http://www.dallascityhall.com/pdf/planning/1sup.pdf

**2.2.2.4** Reference the link listed below for all other applications regarding zoning
http://www.dallascityhall.com/development_services/zoning.html

**2.2.2.5** Reference the link listed below for a direct link to the IR-Industrial Research District Link
http://www.dallascityhall.com/zoning/html/ir_industrial_research.html

### 2.2.3 Record Documents

The City may provide the Design Consultant with available Record documentation and information including survey monumentation and other airport layout data as required however, the City is not to be held accountable for the accuracy of such information and it is the Design Consultant's responsibility to verify all information as noted below.

### 2.2.4 Verification of Existing Conditions

**2.2.4.1** Depending on the project and its scope, verification of existing conditions may require work by a Texas Registered Surveyor including topographic surveys, location of utilities, building and verification of actual building dimensions when necessary. It shall be the Design Consultant's sole responsibility to verify all existing conditions related to the project under consideration including:

- All site related information including existing grades and elevations
- Soil characteristics with respect to drainage and load bearing capacity
- Property boundaries and extent of surface improvements
- Underground features including all utilities
- Accuracy of Record drawings for building structures regarding use of spaces, column locations, existing structural capacity, mechanical systems, electrical systems and other features which may require analysis and modification during the design of the proposed project

**2.2.4.2** Depending on the size and location of the project, aerial mapping may be a desirable method for acquiring topographic data:

### 2.2.5 Aviation Facility Stakeholders

The design requirements for the project assigned to the Design Consultant may be established by several groups and representatives of DOA, aviation facility tenants and the City. These representatives are known as Stakeholders and they will make a significant contribution to determining the functional requirements of the new or renovated facilities. They will also be closely involved in the review and approval process.

### 2.2.6 Stakeholder Identification and Participation

**2.2.6.1** The DOA assisted by the PM, is responsible for identifying and scheduling Stakeholder participation in the development of the project. Stakeholders are those entities within the Divisional structure of the Department of Aviation which have a vested interest in the scope, schedule and budget of every new project. Stakeholders may represent the original project sponsors or entities responsible for maintenance and operation of the completed facility, coordination during construction and the oversight of design and construction standards at the subject aviation facility site.

**2.2.6.2** It is critical that the Design Consultant work with the PM to provide Initiating Department and other Stakeholders appropriate participation in the refinement of the Project Scope and Budget.

**2.2.6.3** The Design Consultant will support the PM to provide the appropriate opportunities for the DOA and other Stakeholders to review and comment on each phase of design to ensure the goals and special needs of the project are fully understood and resolved.

## 2.3 Design Review and Approval

### 2.3.1 DOA Design Reviews

**2.3.1.1** The DOA will provide a thorough review of the Design Consultant's work during the Programming Phase. In addition, the DOA will review design submittals for issues related to suitability of use, maintenance and operations.

**2.3.1.2** However, for most projects, the Design Consultant is responsible for the technical competence required for selection of materials suitable for the intended use and defining details of construction for the work performed during the other phases of design.

**2.3.1.3** Non-Department of Aviation projects must acquire the Aviation Director's approval before starting a project. The project sponsor should schedule a meeting with the Aviation Director and make an informal presentation.

**2.3.1.4** It is the Design Consultant's responsibility to manage the schedule for the work and complete each design phase in according to the Master Schedule. The PM and the DOA will strive to complete the reviews, typically 14 calendar days from date of submittal, unless otherwise determined by the PM.

**2.3.1.5** Written comments of the PM and the DOA will be consolidated and submitted to the Design Consultant for response. Comments received during each design phase must be fully resolved before the work can advance to the next design phase.

### 2.3.2 Independent Technical Review

**2.3.2.1** For a few projects, depending on the scope and aviation facility involved, the DOA may retain another consultant to perform Independent Technical Review (ITR) of design submittals of documents at the completion of the Schematic, Design Development, Construction, GMP/Bid, and Conformed Document phases of design.

**2.3.2.2** Under this arrangement, the ITR team will provide a reviewer representing each discipline involved in the design for these reviews.

**2.3.2.3** It is the Design Consultant's responsibility to manage the schedule for the work and complete each design phase in according to the Master Schedule. The ITR will strive to complete the reviews, typically 14 calendar days from date of submittal, unless otherwise determined by the PM.

**2.3.2.4** Written comments of the ITR will be combined with those of DOA and submitted to the Design Consultant for response. Comments received during each design phase must be fully resolved before the work can advance to the next design phase.

## 2.4 Programming Phase

### 2.4.1 Introduction

The objectives of the Programming Phase are to define the project criteria, formulate the design philosophy, and begin the visualization of design solutions, including alternate schemes for the project. In pursuit of this objective, the Design Consultant shall, depending on project size and complexities consider the following:

- Conduct sufficient project progress meetings to insure every interested party is fully informed an able to review and comment on the process while maintaining the required schedule
- Conduct site visits to similar facilities as needed
- Identify any legal restrictions that would hinder or complicate construction of the project
- Plan methods to address and resolve issues associated with land use of the property, as needed, including floodway/floodplain studies of any kind
- Review the Airport Master Plan to determine conformance with the Master Plan's intend and review exceptions with the PM and DOA
- Include provisions for Public Art Component in the program valued at 1.5% of the estimated construction budget

### 2.4.2 Program Validation

**2.4.2.1** Review the target objectives with stakeholders to finalize specific program goals and objectives:

- Review Master Plan & ALP, if applicable
- Test program assumptions for collocation
- Test the program assumptions for site movement
- Test the program assumptions for technology integration
- Test the program assumptions for security concepts
- Test the program assumptions vertical circulation

**2.4.2.2** Review programmatic relationships and adjacencies with Stakeholders to assist in the development of a schematic design.

**2.4.2.3** Economize sharing of spaces

**2.4.2.4** Transfer functions to future expansion

**2.4.2.5** Before the validation process can conclude, the project requirements in building area and / or volume should be subjected to a conceptual cost analysis and review of the work related to the initial design and construction schedule milestones. Variances with proposed budgets or schedule may require re-evaluation of project parameters to bring the cost or schedule into conformance with the previously established values.

**2.4.2.6** Refer to Programming Checklist for more information

**2.4.2.7** Upon completion of the validation process, the Design Consultant shall prepare a summary of findings to be submitted to the PM which shall, along with any modifications requested by the PM, be included in the final Programming Report outlined below

### 2.4.3 Programming Report

**2.4.3.1** Before the schematic design phase can effectively begin, the program for the project must be refined to ensure the goals and objectives of the DOA and the project Stakeholders are clearly understood and defined. The Design Consultant will be expected to facilitate this process as indicated below:

**A.** The Design Consultant will schedule a meeting with the PM, DOA, stakeholders and others as required for a preliminary programming meeting. The meeting will focus upon the process of

refining and documenting the specific requirements of each stakeholder so the design work can proceed in an orderly fashion. The Design Consultant shall record meeting minutes, distribute for review and comment.

**B.** The Design Consultant shall then prepare a plan to conduct meetings and/or charrettes with stakeholders to acquire the necessary detailed data to prepare a Programming Report. Refer to the Appendix for the Minimum Requirements for Programming Phase Checklist for additional information.

**C.** The Design Consultant shall complete the report including the Program Validation Summary and submit to the PM for review and comment.

**D.** PM will review report for completeness. Design Consultant may be required to reissue the report to incorporate the PM's comments. The PM will then distribute the Programming Report to the appropriate stakeholders.

**E.** The Design Consultant will schedule a review meeting with the stakeholders and make a presentation of the Programming Report and answer questions from the attendees.

**F.** Based on the comments of the DOA, stakeholders and others as required, the PM may request the Design Consultant make adjustments or corrections to the Programming Report or, if acceptable as submitted, direct the Design Consultant to proceed with the Schematic Design Phase.

### 2.4.4 Project Schedule

**2.4.4.1** Depending on the project and its complexity, the Design Consultant shall develop a Master Schedule to be included in the Programming Report which establishes the major schedule milestone dates for execution of the design phase, bidding, construction and project closeout.

## 2.5 Schematic Design Phase – 30% Submittal

### 2.5.1 Description

**2.5.1.1** During the Schematic Design Phase the Design Consultant will be required to provide and organize services to support the PM's requirements related to the DOA's project review and approval procedures.

**2.5.1.2** The Design Consultant will schedule Schematic Design Phase "Expectations" meeting(s) between the PM, DOA, Stakeholders, and others as needed. The Design Consultant will lead the group discussion and assist with the identification of discussion issues. These meetings shall include but not be limited to the following subjects depending on the type of project:

- Electrical maintenance and operations - both airside and landside
- Mechanical maintenance and operations
- Energy maintenance
- Security systems
- All environmental permitting requirements
- Hazardous materials abatement and disposal requirements
- Sustainable Design parameters including LEED requirements
- Hardware and keying

- Signage requirements
- Special technology requirements
- Construction phasing issues
- Temporary signage and maintenance of traffic during construction

**2.5.1.3** Design Consultant will record and distribute meeting minutes and conduct follow up meetings with stakeholders and user groups as required for providing a clear understanding of special concerns related to the design program and special requirements.

**2.5.1.4** Using the information assembled during the Programming Phase and previous discussions with the PM, the DOA and stakeholders, the Design Consultant will begin conceptual development of the project. The purpose of conceptual development is to begin the visualization of the projects components, their relationship to each other and to the airport site and adjacent facilities.

**2.5.1.5** Depending on the project, the conceptual development should also explore alternative concept solutions to satisfy the project requirements and graphically present these so as to permit a direct comparison of the advantages and disadvantages of one approach to another. Each alternative should be illustrated in plan and section. Illustration of restrictions related to Part 77 and Air Traffic Control Tower (ATCT) sightlines should be provided where relationship is critical to the design.

**2.5.1.6** Upon completion of identifying conceptual alternatives to the design of the project, the Design Consultant will prepare a method for evaluating the various concept alternatives with the objective of determining at the preferred concept.

**2.5.1.7** The Design Consultant, in coordination with the PM, will then schedule and conduct a meeting with DOA, Stakeholders and other as required, to conduct an evaluation of the conceptual alternatives with the goal of selecting the preferred concept.

**2.5.1.8** Following this activity, the Design Consultant shall begin development of the Schematic Design Deliverables. The Design Consultant is required to schedule update meetings with the PM, the DOA, Stakeholders and others as necessary to keep all interested parties apprised of the projects progress and conformance to the Program and Stakeholder expectations.

### 2.5.2 LEED Strategy

For projects that are required to meet the LEED goals based on the current requirements of the City of Dallas Green Constructions Ordinance (Reference SECTION 1:4.4 Dallas Green Building Requirements); The Design Consultant shall prepare a LEED Strategy report outlining the overall approach for attaining LEED points sufficient gain the required rating. A copy shall be submitted to the DOA. The strategy will include but is not limited to:

- LEED Category based breakdown of the project outlining general strategies
- For large projects, a breakdown of the projects into appropriate programs to be certified separately (i.e. Building Construction, Interior Fit-out, Tenant Finish-out etc.)
- Tentative LEED Score sheet including potential extra points.
- List of assumptions
- Identification of a Commissioning agent
- Plan for integrating LEED evaluation through out the Design and Construction Process

### 2.5.3 Scheduling

**2.5.3.1** The Design Consultant shall submit a complete detailed Design Schedule which conforms to the constraints of the Master Schedule provided in the Programming Phase. The schedule should include milestone dates for all design submittals, phase sequencing if appropriate, stakeholder review presentations, design reviews and other events which influence the development process and affect completion of each design phase.

**2.5.3.2** If the project has fallen behind schedule during any design phase, the Design Consultant must submit a written plan to bring the progress of the work back into conformance with the Master Schedule.

### 2.5.4 Submittal Requirements

**2.5.4.1** DRAWINGS
The Design Consultant is reminded of the obligation to adhere to the CADD Standards. Drawing sheet size shall be approved by the PM in advance of beginning work including sheet title block format. Deviations from standards will require written approval in advance of submittal.

**2.5.4.2** SPECIFICATIONS
Prepare a Table of Contents for the proposed specifications and include an outline narrative of each section and a tentative product list.

**2.5.4.3** DESIGN CALCULATIONS
Prepare a bound submittal of all design calculations to a level appropriate for the 30% level of design completion showing preliminary load assumptions for the following depending on the type of project:

**A.** The Design Consultant should prepare the information required to illustrate compliance with agreed upon LEED Design Standards and other Sustainable Design Requirements where applicable

**B.** Engineering Calculations for Structural, Mechanical and Electrical Systems

**2.5.4.4** FORM (bound 11x17 w/drawings plus full size drawings?) AND NUMBER OF COPIES

**2.5.4.5** Refer to Project Deliverables for more information

**2.5.4.6** Refer to Minimum Requirements for Schematic Phase Checklist for additional information.

### 2.5.5 Cost Estimating

**2.5.5.1** Design Consultant will prepare the Schematic Phase Cost Estimate. Should the estimate exceed the established construction budget, the Design Consultant must submit a plan to bring the project into conformance with the construction budget.

**2.5.5.2** Should the DOA employ the services of a third party cost estimator, the Design Consultant shall be required to reconcile his estimate with that of the third party estimator.

**2.5.5.3** Should the reconciled estimate exceed the established budget, the Design Consultant must submit a written proposal to bring the project into conformance with the construction budget.

### 2.5.6 Permitting Requirements

**2.5.6.1** Depending on the project, the Design Consultant, in coordination with the PM, should schedule a design progress review meeting with the DOA Environmental Manager to review design provisions for environmental permitting and hazardous materials remediation requirements identified

during the "Expectations Meeting" at the beginning of the Schematic Design Phase. The Design Consultant should be prepared to review the design approach and how the proposed solution will satisfy all environmental permitting requirements.

**2.5.6.2** The Design Consultant must schedule preliminary review meetings with the City's Building Inspection Department and Fire Department (Fire Marshal) to review status of design and required building permits.

**2.5.6.3** The Design Consultant should be aware that City Building Inspectors will not approve an Airport construction project without first receiving notice of approval by the Department of Aviation.

**2.5.6.4** TYPES OF PERMITS
The following is a partial list of the types of permits which may be required for a project depending on its location and the type of construction required:

**A.** Building Construction – includes elevator, fire protection systems, etc.

**B.** Site Planning (includes landscaping)

**C.** Demolition

**D.** Deferred permits for phased construction work or items that have final design required by the contractor

**E.** Signage

**F.** Texas Pollutant Discharge Elimination System (TPDES)

**G.** National Pollutant Discharge Elimination System (NPDES)

**H.** Storm Water Pollution Prevention (SWPP)

**I.** Federal Administration (FAA)

### 2.5.7 Schematic Design Submittal Review

**2.5.7.1** Upon notification from the Design Consultant that the project is ready for the Schematic Phase Submittal, the PM should schedule a final review meeting to verify that the Design Consultant has incorporated the project's requirements including items from the Program Report and issues arising from the Stakeholders in the working charettes during the development of the Schematic Design.

**2.5.7.2** Once the incorporation of all design requirements has been verified, the Design Consultant must submit the documents for review and comment. The PM, the DOA, the Stakeholders and ITR, if applicable, should review the Schematic Design and document their comments within 14 days of receipt of submittal. All comments are forwarded to the PM for consolidation, elimination of redundant comments and are then forwarded to the Design Consultant.

**2.5.7.3** It will then be the Design Consultant's responsibility to review and respond to the review comments within seven (7) calendar days following receipt and incorporate required corrections to the documents prior to the next scheduled submittal.

**2.5.7.4** The PM, after verifying the Design Consultant has responded to the review comments, notifies the Design Consultant, the DOA and Stakeholders by email that work is ready to move to the Design Development Phase.

## 2.6 Design Development Phase – 60% Submittal

### 2.6.1 Description

**2.6.1.1** The Design Development Phase refines the scope of work previously approved in the Schematic Design Phase.

**2.6.1.2** The Design Consultant will schedule Design Development update sessions with the PM, the DOA and Stakeholders to confirm user groups' requirements including but not necessarily limited to the following:

- Complete furniture, fixture and equipment selections
- Systems and office furniture types and brands
- Audio visual and whiteboard requirements
- Casework elevations
- Telecomm/data location and coordination with furniture
- Headcount locations and seating charts
- Break areas and water cooler locations
- Furniture mock-ups as required

**2.6.1.3** Depending on the project, the Design Consultant may schedule a separate meeting with the PM and the DOA Maintenance on Operations representatives for input on building materials, electrical and mechanical systems as well as other issues related to the operations and maintenance of the project.

**2.6.1.4** The Design Consultant will brief the PM, the DOA, Stakeholders and others as appropriate, related to the progress of the design.

**2.6.1.5** The Design Consultant records and distributes meeting minutes for all meetings.

**2.6.1.6** The Design Consultant prepares Design Development deliverables, confirms satisfaction of life safety and other code requirements and refines site design, refines building design and refines systems designs. Refer to Submittal Requirements below for more information.

**2.6.1.7** Prepare exhibits to illustrate verification of avoidance of Part 77 surfaces and ATCT sightlines where applicable.

**2.6.1.8** Depending on the project, the Design Consultant will schedule a meeting with the PM and the DOA to assess and agree on constrains related to the following items:

- Confirmation of construction phasing and maintenance of traffic and/or airport operations
- Identification of long lead items and determination of a procurement strategy for same

**2.6.1.9** Prior to the Design Development Submittal, the Design Consultant will schedule a joint coordination meeting with the entire team. The PM and the DOA shall be invited to attend the meeting. This meeting will address and resolve all outstanding coordination issues prior to the 60% Submittal.

**2.6.1.10** As the project design approaches 60% completion, the Design Consultant will schedule a Design Development presentation to the PM, the DOA, Stakeholder and others. Specific items for review include but are not necessarily limited to:

- Drawings

- Draft Specifications
- Hardware and equipment cut sheets
- Narrative that summarizes the project development to date including areas where additional information is required

### 2.6.2 Submittal Requirements

**2.6.2.1** DRAWINGS
All design drawings shall be at 60% level of completion per Project Deliverables and Design Development Checklist referenced below

**2.6.2.2** SPECIFICATIONS
All divisions in rough draft format

**2.6.2.3** DESIGN CALCULATIONS
Prepare a bound submittal of all final design calculations:

**2.6.2.4** FORM (bound 11x17 w/drawings plus full size drawings?) AND NUMBER OF COPIES

**2.6.2.5** Refer to Project Deliverables for more information

**2.6.2.6** Refer to Minimum Requirements for Design Development Phase Checklist for additional information.

### 2.6.3 Scheduling

**2.6.3.1** The Design Consultant will submit an updated Design Schedule. If the schedule exceeds the time allowed by the Master Schedule, the Design Consultant must submit a written proposal to bring the Design Schedule into conformance with the Master Schedule.

### 2.6.4 Cost Estimating

**2.6.4.1** Design Consultant will prepare the Design Development Phase Cost Estimate. Should the estimate exceed the established construction budget, the Design Consultant will as noted previously, will submit a plan to bring the project into conformance with the construction budget.

**2.6.4.2** Should the DOA employ the services of a third party cost estimator, the Design Consultant shall be required to reconcile his estimate with that of the third party estimator. Should the reconciled estimate exceed the established budget, the Design Consultant must submit a plan to bring the project into conformance with the construction budget.

### 2.6.5 Permitting Requirements

**2.6.5.1** The Design Consultant will meet with the City's Building Inspection Department and Fire Department (Fire Marshal) to review decisions made in the Schematic Phase Permitting Coordination Meeting, review permitting strategy and confirm number of permit packages required based on project phasing requirements, when applicable.

### 2.6.6 Design Development Submittal Review

**2.6.6.1** Upon notification from the Design Consultant that the project is ready for the Design Development Phase Submittal, the PM should schedule a final review meeting to verify that the

Design Consultant has incorporated the project's requirements including items arising from the Stakeholders in the working charettes during the development of the Design Development Phase.

**2.6.6.2** Once the incorporation of all design requirements has been verified, the Design Consultant must submit the documents for review and comment. The PM, the DOA, the Stakeholders and ITR, if applicable, should review the Design Development Submittal and document their comments within 14 days of receipt of submittal. All comments are forwarded to the PM for consolidation and elimination of redundant comments and are then forwarded to the Design Consultant.

**2.6.6.3** It will then be the Design Consultant's responsibility to review and respond to the review comments within seven (7) calendar days following receipt and incorporate required corrections to the documents prior to the next scheduled submittal.

**2.6.6.4** The PM, after verifying the Design Consultant has responded to the review comments, notifies the Design Consultant, the DOA and Stakeholders by email that work is ready to move to the Construction Documents Phase.

## 2.7 Construction Documents Phase – 95% Submittal

### 2.7.1 Description

**2.7.1.1** The Design Consultant finalizes all drawings, coordination of systems, selection of materials, finishes, construction details, site logistics plan (contractor staging) and specifications.

**2.7.1.2** The Design Consultant schedules periodic meetings with the PM, the DOA and Stakeholders to verify all project elements are accounted for, final selection of colors, materials, hardware, utility issues and adequacy of construction staging/laydown areas.

**2.7.1.3** The Design Consultant will record and distribute meeting minutes for each session.

**2.7.1.4** The Design Consultant will work with the PM and the DOA Maintenance and Operations representatives to ensure that adequate provisions are included in the contract documents for Demonstration, Training and O&M Manuals.

**2.7.1.5** Prior to the Construction Documents Phase – 95% Submittal, the Design Consultant will schedule a joint coordination meeting with the entire team. The PM and the DOA shall be invited to attend the meeting. This meeting will address and resolve all outstanding coordination issues prior to the 95% Submittal.

**2.7.1.6** The Design Consultant and PM finalize details related to pre-purchase of long lead or special equipment needs, as applicable.

### 2.7.2 Submittal Requirements

**2.7.2.1** DRAWINGS
All design drawings shall be at 95% level of completion per Project Deliverables and Design Development Checklist referenced below.

**2.7.2.2** SPECIFICATIONS
All divisions in final draft format

**2.7.2.3** WARRANTIES
Refer to SECTION 2:4.3.5 Warranties

**2.7.2.4** DEMONSTRATION AND TRAINING
Refer to SECTION 2:4.5 Demonstration and Training

**2.7.2.5** O & M MANUALS
Refer to SECTION 2:4.6 Operation and Maintenance Manuals (O&M)

**2.7.2.6** DESIGN CALCULATIONS
Update any calculations required as a result of recent changes to system design or loading.

**2.7.2.7** FORM (bound 11x17 w/drawings plus full size drawings?) AND NUMBER OF COPIES

**2.7.2.8** Refer to Project Deliverables for more information

**2.7.2.9** Refer to Minimum Requirements for Construction Documents Phase Checklist for additional information.

### 2.7.3 Scheduling

**2.7.3.1** The Design Consultant will submit an updated Design Schedule. If the schedule exceeds the time allowed by the Master Schedule, the Design Consultant must submit a written proposal to bring the Design Schedule into conformance with the Master Schedule.

### 2.7.4 Cost Estimating

**2.7.4.1** Design Consultant will prepare the Construction Documents Phase – 95% Submittal Cost Estimate. Should the estimate exceed the established construction budget, the Design Consultant will as noted previously, submit a plan to bring the project into conformance with the construction budget.

**2.7.4.2** As in the previous Phase, should the DOA employ the services of a third party cost estimator, the Design Consultant shall be required to reconcile his estimate with that of the third party estimator. Should the reconciled estimate exceed the established budget, the Design Consultant must submit a plan to bring the project into conformance with the construction budget.

### 2.7.5 Construction Documents Phase – 95% Submittal Review

**2.7.5.1** Upon notification from the Design Consultant that the project is ready for the Construction Documents – 95% Submittal, the PM should schedule a final review meeting to verify that the Design Consultant has incorporated the project's requirements including issues arising from the Stakeholders in the working charrettes during the development of the Construction Documents.

**2.7.5.2** Once the incorporation of all design requirements has been verified, the Design Consultant must submit the documents for review and comment. The PM, the DOA, the Stakeholders and ITR, if applicable, should review the Construction Documents Submittal and document their comments within 14 days of receipt of submittal. All comments are forwarded to the PM for consolidation, elimination of redundant comments and are then forwarded to the Design Consultant.

**2.7.5.3** It will then be the Design Consultant's responsibility to review and respond to the review comments within seven (7) calendar days following receipt and incorporate required corrections to the documents prior to the next scheduled submittal.

**2.7.5.4** The PM, after verifying the Design Consultant has responded to the review comments, notifies the Design Consultant, the DOA and Stakeholders by email that work is ready to move to the Bid Documents – 100% Submittal.

### 2.7.6 Permitting

**2.7.6.1** Design Consultant continues with any remaining document preparation required for special permitting such as NPDES and preparation of SWPP.

**2.7.6.2** Upon notification by the PM for the work to proceed to 100% completion, the Design Consultant will prepare and submit the 95% Documents to the City's Building Inspection Department for building permit review and permitting.

**2.7.6.3** The Design Consultant will prepare any additional information or design modifications not already incorporated in the documents as required, avoiding delays in timely acquisition of permits.

## 2.8 Bid Documents – 100% Submittal

### 2.8.1 Description

**2.8.1.1** It is critical that the documents used for bidding the work of the project be as close to 100% complete as possible. Plans placed for bidding which are incomplete will likely create questions for clarification which will require the issuance of Bid Addenda. The 100% documents must be complete, incorporating all of the 95% review comments, and satisfactorily answering questions raised by the PM, the DOA, Stakeholder, ITR Team if applicable and the City's Building Inspection Department Review.

**2.8.1.2** As mentioned at the outset of the manual, the most likely project delivery method for construction services for DOA projects is the CRFCSP Method. If the project is to be constructed under the direction of a CM, the Contract for Construction Services will be negotiated with the CM and this is the submittal that will be given to the CM to begin that process.

### 2.8.2 100% Documents Submittal Review

**2.8.2.1** When the Design Consultant has resolved all the issues arising from the 95% Review and advanced the level of completion of the work to the 100% level of completion, the PM should schedule a final review meeting to verify that the Design Consultant has resolved all review comments and comments from the City's Building Inspection Department Review.

**2.8.2.2** Once the incorporation of all design requirements has been verified, the Design Consultant must submit the documents for review and comment. The PM, the DOA, the Stakeholders and ITR, if applicable, should review the 100% Submittal and document their comments within 14 days of receipt of submittal. All comments are forwarded to the PM for consolidation, elimination of redundant comments and are then forwarded to the Design Consultant.

**2.8.2.3** The PM, after verifying the Design Consultant has satisfactorily addressed all outstanding issues from 100% and other previous reviews, will instruct the Design Consultant to prepare to issue the package for bidding.

## 2.9 Bidding Process

### 2.9.1 Description

**2.9.1.1** ADVERTISEMENT
The Design Consultant will provide the necessary plans and specifications to the PM and DOA for submittal to Purchasing for approval. Upon approval, Purchasing will place the official advertisement

for bids which is also circulated to the Business Development Division, local Chambers of Commerce and M/WBE organizations.

**2.9.1.2** Depending on the terms of the Contract for Professional Services, the Design Consultant may be required to assist the PM, DOA and the City with the distribution of plans to bidders.

**2.9.1.3** PRE-PROPOSAL CONFERENCE

**A.** In order to encourage prospective contractors to submit a responsive and favorable proposal in response to the Request for Proposal (RFP), the City generally holds a Pre-Proposal Conference approximately two to three weeks prior to the due date of the proposals. The conference is held to explain the City's procurement and proposal procedures, contract scope, schedule, special requirements and restrictions such as, fencing, security, safety and operational concerns. As part of the Pre-Proposal Conference, a visit to the project site is usually scheduled. Questions may be asked and discussed by the prospective contractors during the Pre-Proposal Conference and site visit. However, only written questions from the contractors will be formally responded to by the City and an Amendment to the RFP issued when necessary.

**B.** The Design Consultant may be required to organize and conduct the conference on behalf of the City. The PM should request the Design Consultant coordinate and prepare an agenda for the event. The Design Consultant should ensure a sign-in sheet is circulated to record attendees and contact information to so that minutes of the Pre-Proposal Meeting and addenda can be sent to qualified plans holders.

**2.9.1.4** ADDENDA

**A.** Addenda include clarifications, modifications, and/or revisions to the procurement package that generally cover missing information and necessary changes and answers to the written questions of the prospective offerers on the final Construction Documents. The Design Consultant shall prepare the addenda to be incorporated into the RFP Amendments early enough to enable the Contracting Officer to issue an amendment to the prospective offerors at least __ calendar days prior to the proposal due date. The respondents are required to acknowledge any Amendments in their proposals.

**B.** Addenda prepared by the Design Consultant after issuance of the Contractor Proposal Solicitation shall include a revised Cost Estimate and Schedule of Prices reflecting the cost changes for each addendum. Estimates shall meet the requirements of the 100% Construction Document Submittal Estimate.

**2.9.1.5** BIDDING OPENING AND AWARD

**A.** If the Design Consultant is to conduct the bid opening process the PM should meet with Design Consultant to ensure that preparations are made for the bid opening including preparation of an agenda and sign-in sheet. Provisions for monitoring the time when the bid period is closed to late bid arrivals.

**B.** The PM should ensure the Design Consultant reviews the bid for conformance with the requirements of the Invitation to Bid and other matters of the form of the bid noting any irregularities or non-conforming items in each bid. The Design Consultant should prepare a letter to the City making an unqualified recommendation of the lowest responsible bidder.

## 2.10 Conformed Documents

### 2.10.1 Description

**2.10.1.1** Following Construction Procurement for the project, the Design Consultant will incorporate all addenda and other information required into the bid documents and clearly identifies the package as the "Conformed Documents".

**2.10.1.2** All modifications to the bid documents must be clouded and numbered with a description of the addition, deletion or change entered into the revision block on each sheet including the date as required.

**2.10.1.3** During the bidding of the work, additional comments may also have been received from the Permitting Review process and must be incorporated into the Conformed Documents.

### 2.10.2 Conformed Documents Review

**2.10.2.1** When the work is completed and verified by the PM, the Design Consultant will submit the Conformed Documents for review and comments. The PM, the DOA, the Stakeholders and ITR, if applicable, should review the Conformed Documents and document their comments within 14 days of receipt of submittal. All comments are forwarded to the PM for consolidation, elimination of redundant comments and are then forwarded to the Design Consultant.

**2.10.2.2** The PM, after verifying the Design Consultant has satisfactorily addressed all outstanding issues from Conformed Documents Review, will instruct the Design Consultant to prepare the package for the contractor's use in construction.

# CHAPTER 3: CONSTRUCTION PHASE

## 3.1 Pre-construction

### 3.1.1 Building Permits and Licenses

**3.1.1.1** Before construction starts, the City of Dallas must issue the required building permits. The Design Consultant will have issued plans and specifications and other required information to the City's Building Inspection Department for review, along with the applications for the required permits at the completion of the 100% Construction Documents Submittal. All comments received from the Building Inspection Department Review as conditions of permitting must be incorporated into the Conformed Documents.

**3.1.1.2** The Contractor will collect the necessary permits from the Building Inspection Department and have they them properly posted for the construction activity. The City of Dallas will be responsible for payment of all plans reviews and permit fees. The Design Consultant should refer to the Contract for Construction Services should any question arise regarding responsibility for payment.

**3.1.1.3** Reference SECTION 2:1.3.2 Building Permits

### 3.1.2 Pre-Construction Conference

**3.1.2.1** The Design Consultant, in coordination with the PM, will schedule a Pre-Construction Conference as required by the Contract Documents. Attendance at this meeting by the Contractor and their principal Subcontractors is mandatory. The purpose of this meeting is to establish guidelines for the working relationship among the Contractor, utility firms, the DOA and various City Agencies. The agenda should cover the subjects, which must be addressed by both the Design Consultant, PM and the Contractor, as generally outlined below:

**3.1.2.2** In general terms, the Pre-Construction Conference's agenda should address the following items:

- Status of executed contract
- Notice to Proceed confirming start date, Performance Period, Substantial and Final Completion dates as required
- Verify Bonding and Insurance is in place
- List of the Contractor's responsible personnel
- List of the Contractor's proposed Subcontractors
- Emergency Telephone Contacts List
- Critical work sequencing
- Progress schedules
- Schedule of Values and payment request preparation
- Insuring adherence to environmental permitting requirements where applicable
- Submittal of working drawings, shop drawings, project data and samples
- Owner furnished Materials
- Major equipment deliveries and priorities

- Submittal Schedule
- Delivery Schedule
- Safety requirements
- Security Badging and Requirements
- Processing field decisions and Contract Change Orders
- Maintaining record documents
- Owner's use of premises requirements including Airside and Secure access for vehicles and equipment
- Open discussion.

**3.1.2.3** In particular, the Design Consultant and/or PM should address the following:

- Responsibilities and authorities of the Airport's Management Team
- The Design Consultant will provide for the recording and distribution of meeting minutes
- Equal Employment Opportunity (EEO) and affirmative action requirements
- Laws, codes, traffic regulations, permit requirements
- Measures required for termite treatment and control
- Forms required for reporting the discovery or exposure of environmental hazards during excavation and demolition operations.
- Requirements for crane erection and mobilization of equipment
- Dust Control where applicable
- Parking restrictions for contractor's parking
- Processing of Requests for Information (RFIs), Change Orders, Shop Drawings, Working Drawings, Product Data, and Samples
- Monthly Payment Requests
- Partial and final payments
- Media coordination requirements

**3.1.2.4** The Contractor should address the following:

- Contractor's representatives, and briefly describe responsibilities
- Contractor's Organization Chart and Contact List.
- List of Subcontractors and Suppliers
- Contractor's Quality Control (QC) procedures
- Present Preliminary Contract Construction Schedule
- Construction sequencing
- Major equipment deliveries and priorities
- Contractor's Safety Plan
- Maintenance of Traffic Plans
- Preliminary Schedule of Values
- General layout of the Work Site

- Haul routes.
- Noise, emissions, dust, and water pollution control.
- Erosion and sediment control procedures and drawings.

**3.1.2.5** A thorough review of Division 1 specifications should be conducted before completing the planning for the Pre-Construction Conference.

**3.1.2.6** For more information refer to the following:

- Construction Startup Checklist
- Facility Impact Request Form
- Pre-Construction Meeting Checklist

### 3.1.3 Schedule of Values

**3.1.3.1** A Schedule of Values is an expanded, more detailed summary of the Contract Proposal Summary. The Contractor is required to submit a Preliminary Schedule of Values at the Pre-Construction Conference, covering the first 30 days from NTP.

**3.1.3.2** The Design Consultant and PM will review and, within the time period stipulated in the Contract Documents, either comment regarding desired changes or accept the Preliminary version as the final version to be used as the basis of cash flow for the Contract.

### 3.1.4 Project Construction Schedule

**3.1.4.1** The contract documents require the Contractor to submit a 90-Day Schedule and narrative description prior to the Pre-Construction Conference. The Design Consultant, in coordination with the PM, must either accept or direct the amendment of the schedule for re-submittal within the time limits specified in the contract documents.

**3.1.4.2** The Contractor is required to develop and submit a Contract Schedule which includes a CPM Network with associated reports and narrative description within the time limits specified in the Contract Documents.

**3.1.4.3** The Contractor is required to maintain the Contract Baseline Schedule, and submit monthly updates keeping it current with actual progress and make adjustments to reflect changes in planned progress and extensions to contract time.

**3.1.4.4** Reference the City of Dallas General Conditions for Building Construction regarding the Terms and Conditions for the Contractors Constructions Schedules.

### 3.1.5 Submittal Schedule

**3.1.5.1** The Contractor is required to provide an initial list of submittals which is to be attached to the executed Contract for Construction.

**3.1.5.2** A Master Submittal List is required to be submitted within 30 days of contract award, organized according to instructions included in the specifications

## 3.2 Construction Administration

### 3.2.1 Introduction

**3.2.1.1** Construction Administration is the oversight of the construction process to assure that the project is built according to the contract documents, on time, and within the budget. While the Contractor is performing construction, this section addresses construction administration performed by the Design Consultant.

**3.2.1.2** The responsibility for construction administration is under the direction of the PWT PM. The PM oversees the performance of the Design Consultant and contractor in conjunction with the City's Inspectors.

**3.2.1.3** Reference the City of Dallas General Conditions for Building Construction regarding Contract Administration for City funded Projects.

### 3.2.2 Job Progress Meetings

**3.2.2.1** The Design Consultant is responsible to ensure that minutes are recorded and distributed for all job progress meetings. Well organized and managed meetings will keep the job moving forward by focusing the team on actions and decisions; will serve as the forum for coordination with the Project Team, planning for each construction phase of the project; and will build relationships through open communication and demonstrated trust. The PM should refer to the Project Meetings Tasks checklist.

**3.2.2.2** The Design Consultant, in coordination with the PM, will hold weekly Project Coordination Meetings. The Design Consultant will ensure the preparation and distribute minutes of meetings to attendees. The meeting agenda should include:

- Sign-in sheet
- Review of the minutes of the previous meetings
- Field observations, problems, and decisions taken since the last meeting
- Identification of present problems, and planning the resolution of each
- Review of the log of outstanding nonconformance reports, planned corrective actions, subsequent operations impacted, and a schedule for closure of the nonconformance reports
- Contractors Contract Construction Schedule and Work Plan
- Progress Plan for Work in the next work period
- Contractor's look-ahead schedule
- Status of RFIs
- Review of Project safety requirements
- Coordination of occupancy and access requirements
- Status of progress payment requests, change proposals and Change Orders, Submittals, and Requests for Information
- Other outstanding issues

**3.2.2.3** For more information Refer to the following:

- Construction Administration Checklist
- Project Meetings Checklist

- Construction Schedule Checklist
- Submittals Checklist
- FAA Construction Checklist

### 3.2.3 Progress Schedule Update Meetings

**3.2.3.1** The Design Consultant, in coordination with the PM, will hold monthly Progress Schedule Update Meetings to be attended by the Contractors, and applicable Subcontractors as required.

**3.2.3.2** The agenda of the Progress Schedule Update Meetings should include a review of progress made.

**3.2.3.3** The Contractor should update the Schedule of Value quantities as shown in the draft Progress Schedule Update Reports.

**3.2.3.4** Assuming all parties agree on progress of the Work and adjusted Schedule of Values, the Contractor submits the Progress Schedule Update Report and the updated Schedule of Values, which then serve as the progress Payment Request.

### 3.2.4 Submittals

**3.2.4.1** Submittals are required for materials, systems and components specified in the Contract Documents. Submittals will be submitted for approval by the Design Consultant in coordination with the PM. Submittals include but are not limited to the following:

- Product Data
- Shop of Fabrication Drawings
- Color Schedules and color selection charts
- Samples and Mock-Ups
- Certificates
- Photographs and Videos
- Schedules
- Shop Drawings
- Manuals
- Test Reports
- Working Drawings for contractor of fabricator provided design

**3.2.4.2** Submittal requirements are detailed in Division 1 and the technical specifications for each project. Also reference the City of Dallas General Conditions for Building Construction for the Terms and Conditions for Shop Drawings, Product Data, and Samples.

**3.2.4.3** CMMS coordinator shall be notified prior to the addition, removal or temporary removal of systems, subsystems or equipments. Reference SECTION 2:4.7 Computerized Maintenance Management System (CMMS)

### 3.2.5 Verification of Long Lead Procurement Items

**3.2.5.1** The Design Consultant, in coordination with the PM, will meet with the Contractor to identify the long lead items and equipment. The procurement of these items will be tracked in the Contractor's CPM Schedule.

### 3.2.6 Contractor Quality Assurance Plan

**3.2.6.1** The Design Consultant is responsible for preparing construction documents which establish levels of quality that are compatible with DOA's objectives. The City maintains standard format Division 1 specifications which provide the requirements for the Contractor regarding the responsibilities for development and maintenance of a Contractor Quality Assurance Plan (CQAP).

**3.2.6.2** The Contractor must provide a Quality Assurance Plan (CQAP) per the Contract Documents, to include suppliers and subcontractors. Construction will not precede until the Design Consultant, in coordination with the PM, reviews and approves the plan. Generally the plan must define the following:

- Contractor's Management Responsibility
- Contactor's Principal Construction Staff
- Contractor's Safety Representative
- Quality Assurance and Control Personnel
- Contractor's Quality Assurance Manager
- Quality Control Inspectors
- Daily Quality Management Reports
- Means and methods for execution of the work, including proper application and use of associated construction equipment and hardware such as scaffolding
- Product Identification and Traceability
- Receipt of Inspection and Records
- Installation Process Control
- Inspection and Testing Plan
- Nonconformance Reporting and Correction Plan
- Quality Records, Audits and qualified personnel including training plans
- Site Samples and Mock-Ups
- Interface with Design Consultant for on-site reviews

### 3.2.7 Pre-Activity Meetings

**3.2.7.1** Pre-activity meetings should be scheduled by the Design Consultant prior to any cutting, demolition or utility service interruption, etc. and must include the following:

- Contractor, Subcontractors, Suppliers, manufacturers, fabricators, as required
- Operations, Facilities & Services, tenants and other interested parties
- Project Schedule
- Presentation of work plans illustrating existing conditions and back-up work plans, crane plans, traffic control plan, shop drawings, etc

The following subsections are minimum standards developed by the DOA in order to promote the safety, convenience, comfort, and common welfare of the public. Minutes of these meetings will be provided by the Design Consultant and distributed to all parties.

[Provide a list of items requiring Pre-activity Meetings.]

### 3.2.8 Temporary Facilities

**A.** PM ensures that the contractor understands the following:

- Staging – Contractor must get staging area approved by Operations prior to staging equipment or trailers.
- Temporary Water – Water required by the contractor shall be tied into the City system and metered separately from airport facilities.
- Temporary Power – The electric power as required for the contractor's use shall be provided by the contractor. Electrical subcontractor will make arrangements for and install all equipment, poles, meter, wiring, switches, outlets, etc., to provide 480V, 3-phase power and necessary step down transformers for 208V and 120V power for all lighting and power requirements for construction purposes. The general contractor shall provide a separate meter, and pay for all temporary utility costs.
- Temporary Drainage and Irrigation – Responsibility of the contractor.
- Temporary Lighting – Existing lighting levels shall not be diminished from their current levels.
- Temporary Telephone and Data – Contractor shall supply telephones and data for their exclusive use that are not tied into the City system.
- Temporary Field Office – Contractor shall provide trailers, at a location approved by Operations to house their staff and subcontractor(s).
- Signage – No site signage is allowed other than on the contractor's temporary facilities.

### 3.2.9 Inspection (including Special Inspections) and Testing

**3.2.9.1** Testing and inspecting services are required to verify compliance with design and construction specifications and for production of standard products. These services do not relieve the Contractor of responsibility for compliance with the subcontract documents.

**3.2.9.2** Within a given design discipline, the Design Consultant will assign separate special inspectors to different construction materials or processes (e.g., structural systems, mechanical/plumbing, electrical, civil, etc.) as requested by DSD Permit requirements. The PM should verify the availability and participation of a Special Inspector as required by the applicable codes for construction in progress.

**3.2.9.3** STRUCTURAL

**3.2.9.4** ELEVATOR

**3.2.9.5** FIRE SYSTEM INSPECTIONS

### 3.2.10 Monthly Schedule Update Reports

**3.2.10.1** In order for the Design Consultant and PM to fully understand the progress of the work on the Project, the Contractor will provide a Monthly Update Report to be included with the Monthly Pay Application focusing on the following:

- Work completed
- Description of performance relative to schedule (ahead/behind)
- Potential changes in work sequence
- Activities added or deleted
- Impact of Change Orders
- Contract Document issues requiring resolution

### 3.2.11 Monthly Application for Payment

**3.2.11.1** Prior to submission of the contractor's first progress payment application, a Schedule of Values for the entire contract must be submitted and approved per the contract documents. This becomes the basis for all payment applications.

**3.2.11.2** Contractor should submit a draft Request for Progress Payment each month to the Design Consultant and PM.

**3.2.11.3** The Work for which payment is requested on the draft Application for Progress Payment must be field verified. Each month, a site walkthrough should be scheduled to be attended by the Design Consultant, PM, Stakeholders where applicable and the Contractor.

**3.2.11.4** Once the amounts on the draft Application for Progress Payment are validated, the Contractor must submit a notarized final Application for Progress Payment. The Request for Progress Payment is submitted to the Design Consultant and PM.

**3.2.11.5** Insert additional information on process of submittal, review and approval

**3.2.11.6** In the event it is determined that the Application for Progress Payment should be rejected, formal notice to the Contractor must be given.

**3.2.11.7** The PM should refer to Pay Application Checklist for additional information.

### 3.2.12 Retainage Adjustment

**3.2.12.1** When the progress of the work has reached 50% completion, the Contractor may make a written request to have the retainage adjusted from 10% to 5% of all subsequent payments. Before initiating action on Retainage Adjustment, the Design Consultant and PM should review the provisions set forth in the Contract with the Contractor.

### 3.2.13 Project Tracking

**3.2.13.1** CONSULTANT REPORTS
There are three objectives for the Design Consultant's report: to report the progress and quality of the work to the PM and DOA; to report any observed deficiencies; and to assess conformance of completed work on the contract. Daily Inspection Reports

**3.2.13.2** CONTRACTOR DAILY REPORTS
The daily report is the consecutive record of events on the jobsite. Its purpose is to provide a snapshot of the day's activities and conditions. The daily report is completed by the Contractor superintendent or field engineer. It is critical that contractors write each day's construction history and capture the events of the day each day as they happen.

**3.2.13.3** MONTHLY REPORTS

The Contractor will update the monthly report of major construction activities, by trade, with their pay application. The information submitted should be intended for publication and should be kept brief. It is not intended as a forum for issues or contract disputes. The monthly report will include the following:

- A narrative of project status, progress and anticipated activities
- Deviations from the project schedule and corrective actions taken
- Potential change status, submittal status, and an issues/claims log

**3.2.13.4** PHOTOGRAPHS
Project progress photos or videos should be taken to provide photographic documentation of existing conditions, construction progress, claim issues, accident reports, insurance claims and coordination issues.

**3.2.13.5** PERMITTED PLANS AND SPECIFICATIONS
The Contractor will keep the complete set of permitted plans and specifications available for review at the job site at all times work is in progress.

**3.2.13.6** RECORD DOCUMENTS
The Contractor will keep a complete and up-to-date set of record drawings during the project to turn over to Aviation upon project completion a set of Record Drawings of the details of the project as constructed, to aid in future design, construction, and maintenance.

**3.2.13.7** CORRESPONDENCE
Any written correspondence received by the Design Consultant or the City will be opened, date stamped, and routed. Transmittals should identify the recipient, documents being issued and their appropriate revisions, reason for transmittal, and required return dates if applicable.

**3.2.13.8** ELECTRONIC MAIL COMMUNICATIONS
Electronic mail communications (email) that are significant in nature should be followed up with a formal letter reiterating the understanding of the issues discussed in the email. A copy of all email should be printed and filed in the project files. It is important to remember that email is considered a part of project information, which is a matter of public record, and as such, is subject to subpoena. The PM should encourage the Design Consultant to use prudent judgment when creating messages.

### 3.2.14 Safety

**3.2.14.1** Prior to commencement of any work, contractors will prepare a Contractor's Safety Plan. This plan shall be written by the Contractor or contractor for the specific work and hazards of the project and implement, in detail, the requirements for safety and occupational health. This plan must be acceptable to Regulatory Agencies in content and form.

### 3.2.15 Request for Information (RFI)

**3.2.15.1** The Contractor will request information to resolve issues they discover; conflicts, errors, omissions or inconsistencies in the contract documents; conflicts between the contract documents and manufacturers' instruction; a potential change that will effect time and/or money; or when a contractor is unable to determine the intent of the contract documents.

**3.2.15.2** RFIs are initiated only by the Contractor on behalf of the construction team.

**3.2.15.3** The PM must maintain awareness of the impact of an RFI on the Contractor should the answer require additional contract time and or cost.

**3.2.15.4** RFIs must be numbered sequentially and the Design Consultant should maintain an RFI Log the status of which will be reviewed at all Job Progress Meetings.

**3.2.15.5** Refer to RFI Checklist for more information.

### 3.2.16 Architect's Supplemental Instructions (ASI)

**3.2.16.1** When the Design Consultant finds it necessary, or the PM makes a request, the Design Consultant shall issue supplemental instructions to the Contract Documents for the Contractor's information.

**3.2.16.2** ASIs are initiated only by the Design Consultant on behalf of the design team.

**3.2.16.3** The PM must maintain awareness of the impact of an ASI on the Design Consultant should additional services be required.

**3.2.16.4** The PM must maintain awareness of the impact of an ASI on the Contractor should the information cause the Contractor to require additional contract time and or cost.

**3.2.16.5** ASIs must be numbered sequentially and status should be reviewed at Job Progress Meetings

**3.2.16.6** Refer to ASI Checklist for more information.

### 3.2.17 Construction Change Orders

**3.2.17.1** Reference the City of Dallas General Conditions for Building Construction regarding Change Orders for City funded projects.

**3.2.17.2** After the Contract Change Order is executed, the Contractor should promptly perform the following tasks:

- Revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit the progress schedules in Skire.
- Enter the changes into the Project Record Documents.
- After the Change Order is executed, promptly revise the Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item, and adjust the Contract Price.

### 3.2.18 Contract Time Extension

If the Contractor is delayed in the performance of the work that will cause a change in the Date of Substantial Completion due to acts, omissions, conditions, events, or circumstances beyond its control and due to no fault of its own or those for whom the Contractor is responsible, the Contract Times for performance shall be reasonably extended by Contract Change Order.

The PM should refer to the Contract for Construction Services for the conditions upon which notice of delay must be rendered, including time limits thereof. In addition, delay due to adverse weather conditions requires data substantiating that conditions were abnormal for the time they affected the progress of the work.

# CHAPTER 4: CLOSEOUT PHASE

## 4.1 General

During the Closeout Phase, the Design Consultant shall conduct the activities necessary to insure the contractor has completed all work required under the contract for construction, that applications for payment are processed in a timely manner and documentation is in order.

## 4.2 Substantial Completion

### 4.2.1 Prerequisites to Substantial Completion

**4.2.1.1** Acceptance of the work or project may be accomplished in a single time period for the entire work, or a series of time periods for individual parts or areas of the project that have been certified as Substantially Complete on different dates.

**4.2.1.2** The following items or activities must be completed to the satisfaction of the DOA prior to Substantial Completion:

- Approval by City Fire Marshall
- Certificate of Occupancy where applicable
- Elevator Permit
- All building systems demonstrated on accepted
- Draft O&M manuals
- Training complete
- Record documents submitted and accepted
- Test and balance complete
- Landscaping and sitework complete
- Final cleaning complete
- TSA Certification for Baggage Handling Systems (BHS)

### 4.2.2 Closeout Plan

**4.2.2.1** Prior to Substantial Completion, the contractor must prepare and submit for approval a detailed Closeout Plan describing methods and procedures for closing out all open issues. The Design Consultant should review the Closeout Plan with the PM and prepare comments to be forwarded to the contractor for incorporation into the Closeout Plan.

### 4.2.3 Demonstration and Training

The Design Consultant and/or sub-Design Consultants, the PM and others as may be required will review and comment on the organization and format of Training and O&M Manuals required by the Contract Documents to ensure that adequate training and information is provided for DOA staff in managing, operating and maintaining the new building systems and equipment. Refer to:

- SECTION 2:4.5 Demonstration and Training
- SECTION 2:4.6 Operation and Maintenance Manuals (O&M)

- SECTION 2:4.7 Computerized Maintenance Management System (CMMS)

### 4.2.4 Pre-final Inspections

**4.2.4.1** Upon receipt of notice from the contractor that the work is Substantially Complete, the Design Consultant will schedule and conduct a Pre-Final Inspection accompanied by the PM, the contractor and appropriate representatives of the DOA and Stakeholders. Should the project not have reached Substantial Completion by the date set forth in the Agreement with the contractor, the Design Consultant will arrange and conduct with the same parties a Pre-Final inspection to determine the status of completion of the Work.

**4.2.4.2** During the Pre-Final Inspection, the Design Consultant will request all interested parties to make independent lists which shall be consolidated with the Design Consultant's list to create the Substantial Completion Punchlist which shall be transmitted to the contractor for his use in completing the work. The completed Punchlist should be organized as follows:

**A.** The consolidated Punchlist is based on items observed in the initial substantial completion inspection

**B.** Punchlist should be divided by area or room for interior spaces

**C.** Additional punch list sheets should be created for site work, exterior of structures, landscaping, etc.

**D.** Punchlist should also be sorted by trade so each trade contractor can be given their outstanding items rather than the whole list.

### 4.2.5 Substantial Completion

**4.2.5.1** Upon notification by the contractor that the Punchlist has been completed, the Design Consultant will schedule and conduct an inspection accompanied by the PM, the DOA, the contractor and Stakeholders.

**4.2.5.2** When the Design Consultant considers the work, or a designated area of the Work, has reached Substantial Completion, the Design Consultant will prepare a Certificate of Substantial Completion, along with a Punchlist of items to be completed by the contractor before final payment is made.

## 4.3 Final Acceptance

### 4.3.1 Prerequisites to Final Acceptance

**4.3.1.1** Completion of the items listed below is required before the last steps of Final Acceptance can begin:

- Commissioning Activities
- Final Cleaning
- Spare Parts and Tools
- Pre-Completion Submittals

### 4.3.2 Final Inspection

**4.3.2.1** When the contractor considers all work under the Contract has been completed, a written notification will be submitted to the Design Consultant. It should include a certified copy of the Final Punchlist certifying that each item has been completed.

**4.3.2.2** The Design Consultant will schedule and conduct an inspection of the work to verify completion accompanied by the PM, the DOA, the contractor, and the Stakeholders. The contractor should promptly be notified if defects and incomplete Work are revealed. The Design Consultant will make subsequent inspections until the entire Contract Work is satisfactorily completed.

**4.3.2.3** Refer to Final Completion Checklist for more information.

### 4.3.3 Record Documents

**4.3.3.1** When applicable and upon receipt of Record documentation from the contractor, the Design Consultant shall review appropriate documentation and, if in concurrence, submit a report confirming the contractor's construction practices comply with LEED criteria as may be required by the Contract Documents.

**4.3.3.2** When the Design Consultant receives the contractor's record red line mark-ups, the Design Consultant shall provide a complete set of CAD documents, in compliance with requirements of the CADD Standards, which incorporates the contractor's red lines and other information provided.

**4.3.3.3** The Design Consultant shall provide a complete electronic copy of the Specifications including changes which occurred during construction.

**4.3.3.4** The Design Consultant shall return the contractor's red line drawings to the DOA.

### 4.3.4 Ownership of Documents

Upon completion of the work the Contractor shall upon request return all Drawings, Specifications and other documents and their copies that were furnished by the Design Consultant. Refer to the General Conditions of the contract for clarification.

### 4.3.5 Warranties

**4.3.5.1** GENERAL & SPECIAL WARRANTIES
Refer to the City of Dallas General Conditions for Building Construction for Terms and Conditions Regarding General and Special Warranties.

**4.3.5.2** WARRANTIES AND GUARANTEES
The Contractor shall provide warranty/ guarantee documentation for all structures, machinery, systems, subsystems, and equipment. Unless directed otherwise by the DOA or the Design Consultant shall incorporate the standard warranty and maintenance service requirements in the each of the respective MASTERSPEC© MasterFormat 2004 technical specification sections. The Design Consultant shall coordinate all the respective technical specification sections with the relevant Division 01 – General Requirements section of MASTERSPEC© MasterFormat 2004.

**4.3.5.3** WARRANTY COMMENCEMENT DATES
The Design Consultant shall determine the appropriate commencement date for the various warranties in accordance with MASTERSPEC© MasterFormat 2004 and current best practices. For specialized Aviation Facility systems, subsystems, and equipments the Design Consultant shall

coordinate with the DOA to determine the appropriate commencement dates for the warranties. These include but are not limited to;

- Baggage Handling Systems (BHS)
- Control Systems
- Software warranties
- Communication Systems
- Security Systems
- Building Management Systems (BMS)

**4.3.5.4** EXISTING WARRANTIES

The Design Consultant shall include in the respective technical specification section the requirements for systems currently under warranty and instruct the contractor to maintain existing warranties or guarantee new warranties for the total system should the warranties become void due to alterations by the contractor. O & M Manuals must be updated by supplement to reflect any field changes by the Contractor due to changes that were made during the warranty period of the system(s).

### 4.3.6 One Year Walk-through

[Content to be developed]

## 4.4 Commissioning

[Content to be developed]

## 4.5 Demonstration and Training

The Design Consultant shall include in the technical specifications a requirement to provide Demonstration and Training. The Demonstration and Training requirements shall be in accordance with MASTERSPEC© MasterFormat 2004 and current best practices. For specialized Aviation Facility systems, subsystems, and equipments the Design Consultant shall coordinate with the DOA to determine the appropriate requirements for Demonstration and Training. These include but are not limited to;

- Baggage Handling Systems (BHS)
- Control Systems
- Software warranties
- Communication Systems
- Security Systems
- Building Management Systems (BMS)

## 4.6 Operation and Maintenance Manuals (O&M)

The Design Consultant shall include in the technical specification a requirement to provide Operation and Maintenance Manuals. Operation and Maintenance Manuals shall be provided for equipment, systems, and materials specified in the specifications. The particular content and data requirements for each manual shall be identified in the respective specification section and coordinated with specification section 01 78 23 Operation and Maintenance Data (based on MASTERSPEC© MasterFormat 2004).

### 4.6.1 Format

O & M manuals shall be submitted to the DOA formatted as 8-1/2 inch by 11 inch electronic files in Microsoft Word (latest edition). An additional PDF version generated from the submitted Microsoft Word file shall also be submitted to the DOA. The Manuals shall be electronically linked and include a composite index and O & M Manual directory.

### 4.6.2 Emergency Manuals

These will include Types of Emergencies, Emergency Instructions and Emergency Procedures. The Design consultant shall determine procedures and requirements for systems, subsystems, and equipment affected by the emergencies to be considered. The Design Consultant shall coordinate with the DOA to determine the list of emergencies to be considered in each project and meet with the appropriate authorities to develop the policies and procedures.

### 4.6.3 Operation Manuals

These will include descriptions of Systems, subsystems, and equipment indicated in the Contract Documents. Additional content includes but is not limited to the following (Reference Section 01 78 23 Operation and Maintenance Data of MASTERSPEC© MasterFormat 2004 for additional content requirements);

- Operating procedures
- Wiring diagrams
- Control diagrams and sequence of operation
- Piped system diagrams.

### 4.6.4 Product Maintenance Manuals

These will include Product Information of materials in the Contract Documents. Additional content includes but is not limited to the following (Reference Section 01 78 23 Operation and Maintenance Data of MASTERSPEC© MasterFormat 2004 for additional content requirements);

- Source information
- Maintenance procedures
- Repair materials and sources
- Warranties and bonds.

### 4.6.5 Systems and Equipment Maintenance Manuals

These will include Manufacturers' Maintenance Documentation for Systems, Subsystems, and Equipment. Additional content includes but is not limited to the following (Reference Section 01 78 23 Operation and Maintenance Data of MASTERSPEC© MasterFormat 2004 for additional content requirements);

- Source information
- Maintenance procedures
- Maintenance and Service Schedules
- Spare parts list and source information
- Maintenance service contracts

- Warranties and bonds.

### 4.6.6 Specialized Systems and Equipment Maintenance Manuals

In Addition to the requirements for Systems and Equipment Maintenance Manual, for Specialized systems the Design Consultant shall identify the designated subcontractors who shall perform modification, additions or routine diagnostic: The Design Consultant shall identify in the specification the designated sub consultant and the particular requirements for the systems, sub-systems, and equipment. These include but are not limited to;

- Building Automation System (BMS)
- Access Controls
- Communication Systems
- Special Systems
- Fire Alarms
- Flight Information Displays (FIDS)
- Baggage Handling System (BHS)Controls

### 4.6.7 Updating to As-Built Conditions

The O & M Manuals and other related documentation shall reflect 'As-Built' conditions. Existing O & M Manuals must be updated by supplement to reflect any field changes by the contractor, equipment changes and any associated changes to warranties and system operation.

### 4.6.8 O & M Manual Review

The Design consultant shall include in the technical specification a requirement for all O & M Manuals and submitted documentation be reviewed by the Contractor for errors and omissions before being submitted. The Contractor shall then make the necessary correction and submit the O & M Manuals and other documentation to the Design Consultant and DOA for review. The Design Consultant will coordinate with the DOA and send any comments to the Contractor to make amendments to the document before a finalized version is submitted to the DOA. Listed below are some of the items the Design Consultant should be reviewing;

- Correct equipments and components
- Description of System
- Equipment Starting Dates and Procedures
- Warranty Commencement Dates
- Manufacturer and Vendor contact information
- Errors or Omissions in system identification and procedures.
- General usability and structure of documentation.

## 4.7 Computerized Maintenance Management System (CMMS)

### 4.7.1 Introduction

The CMMS is managed through the DOA's CMMS coordinator. The software suite monitors and schedules, but is not limited to, the following;

- Work Orders
- Maintenance Inventory
- Systems Management
- Preventative Maintenance Schedules
- On-Demand Maintenance Orders
- Staff Scheduling and availability
- Status Reports

### 4.7.2 CMMS Software

Currently Proteus V, by Eagle Technologies, is being used at the Airport. The Design Consultant is required to contact the CMMS coordinator and verify the current software being used and the required data format for submittals.

### 4.7.3 Equipment Addition/ Removal Form

Two weeks prior to the installation, removal or temporarily removal of equipment the contractor shall notify the CMMS coordinator and submit an Equipment Add/ Remove form.

### 4.7.4 Submittal Requirements

Contractor shall submit other pertinent equipment documentation to the CMMS coordinator in hard and soft copies. The Design Consultant shall contact the CMMS coordinator for the appropriate format. These include but are not limited to;

- Equipment Description
- Make, Model, and Serial Number
- Design Capacity
- Recommended Preventive Maintenance Tasks and Schedules
- Spare Parts Lists
- Updated Project Schedule
- Warranty Information
- Manufacturers Equipment Manuals
- Manufacturer Certified Service Companies
- Contact information for local or regional representative for Equipment.
- Contact information for local or regional representative for inventory supplier.

### 4.7.5 Building Management System (BMS) Integration

[Content under development and coordinated with BMS section.]

### 4.7.6 LEED Certification

For projects that are to gain and maintain LEED certification, Reference the SECTION 2:2.5.2 LEED Strategy, the Design Consultant shall identify systems that are to meet LEED performance and maintenance requirements. These requirements shall be identified in the LEED Strategy document and a copy shall be sent to the CMMS Coordinator. The Design Consultant shall then schedule a

meeting with the CMMS coordinator to review the necessary changes and updates to the CMMS database.

## 4.8 Construction Operating Rules

[Content to be developed]

# SECTION 3: LANDSIDE DESIGN STANDARDS

These Design Standards are provided to inform the Design Consultant of general requirements for the design of Landside projects at City owned aviation facilities and to identify special requirements which may be unique to particular project types. The Design Standards are organized so that general issues of project design are dealt with first followed by more specialized applications related to specific project types.

| | | | | File Links/References |
|---|---|---|---|---|
| Section 3: Landside Design Standards | Chapter 1 | Airport Layout Plan | 1.1 (Content to Be Added) | |
| | Chapter 2 | Environmental | 2.1 Abbreviations<br>2.2 Permitting Requirements | • Dallas City Code Sec.19-118<br>• small construction sites<br>• TXR150000 Construction General Permit<br>• large construction sites |
| | Chapter 3 | Site Work | 3.1 Abbreviations<br>3.2 Security Site Planning<br>3.3 Survey Control and Data Collection<br>3.4 Site Preparation<br>3.5 Construction Materials<br>3.6 Construction Staging<br>3.7 Utilities<br>3.8 Drainage<br>3.9 Bituminous Concrete Paving<br>3.10 Reinforced Cement Concrete Paving<br>3.11 Fences and Gates | |
| | Chapter 4 | Roads and Bridges | 4.1 Design Criteria References | |
| | Chapter 5 | Structures - Civil | 5.1 (Content to Be Added) | |
| | Chapter 6 | Exterior Lighting | 6.1 (Content to Be Added) | |
| | Chapter 7 | Landscaping | 7.1 General Requirements<br>7.2 Trees, Shrubs and Seeded Lawn Requirements<br>7.3 Irrigation System Requirements | |
| | Chapter 8 | Exterior Signage and Graphics | 8.1 Introduction<br>8.2 Reference Standards<br>8.3 ADA Guidelines<br>8.4 Unified Environment<br>8.5 Common Graphic Elements<br>8.6 Selected Typeface<br>8.7 Standard Typefaces<br>8.8 Letter and Word Spacing<br>8.9 Typographic Restrictions<br>8.10 Arrows<br>8.11 Terminal and Parking Symbols<br>8.12 Symbols<br>8.13 Color | |

# CHAPTER 1: AIRPORT LAYOUT PLAN

The Design Consultant should review the adopted airport Master Plan where the project is located which includes data concerning the systematic development of physical facilities to accommodate current and forecasted activity demands. The Airport Layout Plan (ALP) and the Airport Land Use Plan (ALUP) are of particular importance. The ALP graphically illustrates the concept of development to satisfy the recommendations of the Master Plan while the ALUP identifies recommended use of airport property to satisfy long range facility development.

# CHAPTER 2: ENVIRONMENTAL

The requirements and standards listed below include, but are not necessarily limited to, subjects to be evaluated by the Design Consultant. The application of these requirements will depend on the type of project. It is the Design Consultant's responsibility to determine which requirements apply to the design of the project and to ensure that all environmental reviews, approvals and permits are secured so as to avoid resultant delays if a permitting requirement is not satisfied at the time construction is ready to begin.

## 2.1 Abbreviations

NPDES National Pollutant Discharge Elimination System

PM Project Manager

SWPPP Storm Water Pollution prevention Plan

TPDES Texas Pollutant Discharge Elimination System

## 2.2 Permitting Requirements

### 2.2.1 Asbestos and Lead

Federal and State mandated regulations must be met in full. The Design Consultant shall be responsible for determining if existing facilities should be inspected for asbestos and lead based products and the development of an Abatement Plan by a qualified profession detailing the removal and disposal or encapsulation of these hazardous contaminants and materials.

### 2.2.2 Storm Water

Reference the following City of Dallas codes; Dallas City Code Sec.19-118

### 2.2.3 Construction activities greater than one acre and less than five acres

These must comply with the Texas Pollutant Discharge Elimination System (TXPDES) Permit rules and regulations for small construction sites listed in the TXR150000 Construction General Permit, in addition to Dallas City Code requirements.

### 2.2.4 Construction activities greater than five acres

These must comply with the TXPDES Permit rules and regulations for large construction sites listed in the TXR150000 Construction General Permit, in addition to Dallas City Code requirements.

### 2.2.5 Federal Clean Water Act

This Act is the primary federal law in the United States governing water pollution. The system for granting and regulating discharge permits is called the National Pollutant Discharge Elimination System (NPDES), which regulates both point and non-point sources that discharge pollutants into waters of the United States. Section 404 of the Federal Clean Water Act may have a bearing on a construction project.

### 2.2.6 Storm Water (SWPPP)

A Storm Water Pollution Prevention Plan is used to describe a process though which a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff.

**2.2.6.1** SOURCE
Sources of pollution potentially affecting the quality of storm water discharges associated with industrial activities that are covered under the MSGP-2000 need to be identified.

**2.2.6.2** IMPLEMENTATION
Implementation of practices to minimize and control pollutants in storm water discharges from these industrial activities is to be described.

**2.2.6.3** COMPLIANCE
Compliance with the terms and conditions of the MSGP-2000 must be ensured.

### 2.2.7 Contaminated Sites

In the case of property already owned by the City, redevelopment plans should consider past land use that may have resulted in site contamination. The Design Consultant, in coordination with the PM, shall schedule a meeting with the City to determine how to identify and manage remediation of existing site contamination. Reference the City of Dallas General Conditions for Building Construction for terms and conditions regarding Hazardous Substances encountered at the site.

### 2.2.8 Remediation Sites

### 2.2.9 Air Quality Program

### 2.2.10 Dust Control and Prevention

# CHAPTER 3: SITEWORK

## 3.1 Abbreviations

ASPRS American Society of Photogrammetry & Remote Sensing

ASTM American Society for Testing & Materials

CAD Computer Aided Design

DOA Department of Aviation

NFPA National Fire Protection Association

NOAA National Oceanic & Atmospheric Administration

PCC Portland Cement Concrete

SUE Subsurface Utility Engineering

USDT U.S. Department of Transportation

## 3.2 Security Site Planning

### 3.2.1 Manmade Features

Consider that manmade features such as neighboring buildings can provide a vantage point for weapons, fire, or storm drains and utility tunnels that could enable someone to gain covert access to the property.

### 3.2.2 Public Vehicle Routes

Avoid locating critical facilities in a way that vehicles may have direct routes between public roads and critical facilities.

### 3.2.3 Site Layout

The site layout should neither prevent nor complicate access via public roads for emergency vehicles, nor should it inhibit emergency egress for passengers and/or employees.

### 3.2.4 Access Control

The Design Consultant should selectively place entrances and exits, barriers of various kinds, lighting and landscape in order to limit access and control flow of vehicles and pedestrians.

### 3.2.5 Access Point Design

All access point designs will meet NFPA guidelines and be coordinated with the DOA and Fire Department.

### 3.2.6 Parking Area Visibility

Parking area design will incorporate good visibility throughout, and good visibility from surrounding areas into the parking area for patrols.

### 3.2.7 Parking Area Landscaping

The use of landscaping in surface parking areas will consider maximizing visibility and eliminating hiding places and shadows.

**3.2.7.1** If used, shrubs will not impede visibility in height and trees will bear no branches below 8 feet from ground surface

### 3.2.8 Traffic Calming Features

Consider traffic calming features at entrances and exits on a case-by-case basis to slow the vehicles as they enter and exit to allow adequate time for automobile license plates to be captured by video surveillance.

### 3.2.9 Drive Up Area

The drive up area should be circular or serpentine in design and if possible should provide sufficient stand-off for vehicle traffic from buildings and infrastructure by using barriers (e.g. bollards) to prevent vehicles from driving close to buildings and infrastructure via side walks or other non-designated but possible approaches.

## 3.3 Survey Control and Data Collection

### 3.3.1 Survey Control

While some permanent primary horizontal and vertical survey control may exist at City owned aviation facilities, the creation of additional survey control for use when performing topographic survey and mapping from aerial photography should be evaluated for each new project.

### 3.3.2 Topographic Survey

Topographical field surveys may be required to establish locations and elevations of surface features including paved areas, manholes, drainage inlets, electrical handholes, utilities, and other identifiable surface features within the project corridor and adjacent affected areas. The survey will be conducted to gather detailed data for design purposes and to establish survey control points for the project.

### 3.3.3 Aerial Mapping

Depending on the size and location of the project, aerial mapping may be a desirable method for acquiring topographic data:

**3.3.3.1** Both high and standard flight level photography of the project area should be evaluated. High accuracy photography is required to provide elevations within one-tenth of one foot accuracy. Standard flight photography is performed to provide normal mapping accuracy for areas outside of the main project area, which will be used for conceptual planning purposes.

**3.3.3.2** High accuracy mapping is done to establish existing locations and elevations of non-paved areas, runway and taxiway edge lighting, signage, visible manholes, drainage inlets, structures, electrical handholes, duct markers, utilities, navigation aids and other identifiable surface features within the project, and adjacent affected areas.

### 3.3.4 Accuracy

The national mapping standards and specifications that have been generally accepted throughout the United States to include the U.S. Geological Surveys, U.S. Department of Transportation, American

Society of Photogrammetry and Remote Sensing (ASPRS) and countless state and other government agencies, have all concluded that: topographic maps will produce spot elevations, whereas, 90% of all spot elevations shall be equal to or less than 1/4 of the map contour interval; 90% of all contours shall be accurate within 1/2 of a contour interval; and Horizontal accuracies shall be 1/40th of the original map scale for all drawn/created planimetric features and 1/100th of map scale for all grid or control points.

### 3.3.5 Utility Designating, Locating and Data Management

**3.3.5.1** The project site and adjacent areas must be reviewed for utility locations using established methods of detection. Depths of utilities will be determined by pot holing or soft digging. Pot holing and soft digging is a procedure where a small hole is manually or vacuum excavated to the depth of the utility to verify the horizontal and vertical location and depth of the utility in question.

**3.3.5.2** In areas where the Record information is incomplete, field investigation must be conducted to locate and identify the utilities in question. Existing utilities at ground level should be located when the topographic survey is being accomplished.

**3.3.5.3** Existing utilities that are underground may be located using subsurface utility engineering (SUE) in accordance with American Society of Civil Engineers Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data, CI-ASCE 38.02.

**3.3.5.4** Horizontal and vertical locations of existing utilities such as fiber optic conduits, electrical conduits and lines, communication conduits and lines, waterlines, sanitary sewers, storm drains and catch basins, jet fuel pipelines, and gas lines within the project corridor will be determined in this manner.

### 3.3.6 Designating

Existing underground utilities will be located using geophysical prospecting techniques to determine the existence and horizontal position.

### 3.3.7 Locating

Non-destructive digging equipment, such as vacuum excavation, at critical points along a subsurface utility's path to determine the precise horizontal and vertical position will be employed.

### 3.3.8 Data Management

Upon surveying the utility information obtained by designating and locating, the data will be entered into the computer aided design (CAD) system, allowing the examination of project options and thus the substantial reduction in utility conflicts.

## 3.4 Site Preparation

### 3.4.1 Project Conditions

**3.4.1.1** TRAFFIC

**A.** Plan site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities

**B.** Do not close or obstruct streets, walks, or other occupied or used facilities without permission from DOA and the City.

**C.** Access must be provided for maintenance and emergency vehicles.

**3.4.1.2** PROTECTION OF EXISTING IMPROVEMENTS

**A.** Incorporate barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain in place.

**B.** Protect improvements on adjoining City properties.

**C.** Restore improvements damaged by Work to their original condition as acceptable to DOA or the City

## 3.5 Construction Materials

### 3.5.1 General

In general, all construction materials will conform to all applicable specifications, standards and codes including Federal Specifications for the project. Due to the moderate reactivity of aggregates used for Portland cement concrete (PCC), it will be necessary to add a fly ash component to the mix for longevity of the PCC.

### 3.5.2 Use Of Excavated Materials

A determination will need to be made by a geotechnical engineer as to the desirability of the use of excavated materials by crushing that may be feasibly used in the construction of base and paving materials on roadways or use in structural concrete. Fine and coarse aggregates for concrete shall meet the requirements of ASTM C33. Any areas of silts and clays with a high plastic index that are unsuitable for foundation materials shall be removed.

## 3.6 Construction Staging

A determination of a site or sites for the contractor's staging area must be established during the design phase of work. Possible staging locations for access to the site should be reviewed and evaluated. Additional analysis will be required to determine the optimal location for the placement of concrete batch plant facilities should the scale of the project warrant such a facility.

## 3.7 Utilities

### 3.7.1 Utility Base Map

**3.7.1.1** The Design Consultant will request plans for 'as built' utilities. The Design Consultant will then prepare a utility base map of existing utilities.

**3.7.1.2** The Design Consultant will, through field survey, verify the location of all "as built" utilities and identify any undocumented utilities observed during the field survey.
Utility Survey Requirements, [Content to be developed in the future]

### 3.7.2 Utility Separation

The Design Consultant shall be responsible for determining the minimum separation requirements for utilities as follows:

**3.7.2.1** Separation distances and/or other extra protection may be required to protect water mains from contamination by sanitary sewer mains. This criterion applies to parallel mains as well as crossings.

**3.7.2.2** Horizontal and vertical separation of water mains and sanitary sewer lines

**3.7.2.3** Horizontal and vertical separation of water mains and force main sanitary sewer lines.

**3.7.2.4** Separation required by the FAA

### 3.7.3 Utility Marking Requirements

[Content to be developed in the future]

## 3.8 Drainage

### 3.8.1 Precipitation-Intensity–Duration

**3.8.1.1** Precipitation data shall be based upon NOAA Precipitation – Frequency Atlas II of the Central United States.
Selected isopluvial maps can be found in the [Content to be developed in the future]

### 3.8.2 Design Discharge

The maximum expected discharge from drainage areas shall be computed using the rational method or other applicable procedures as specified in the latest City of Dallas Storm Water design requirements. The Design Consultant should refer to these requirements to determine the limitations for use of the rational method for predicting storm water peak flow and runoff volume estimates for the design of storm drains, minor channels and retention storm water storage facilities.

### 3.8.3 Storm Drain Design

Storm drains shall be designed in accordance with the procedures specified in the City of Dallas Storm Water design requirements.

### 3.8.4 Minimum Velocities

[Content to be developed in the future]

### 3.8.5 Minimum Pipe Sizes

**3.8.5.1** Minimum pipe sizes for the following items shall be determined by the Design Consultant based upon the current requirements of the City:

- **A.** Main line storm drains
- **B.** Catch basin connector pipes
- **C.** Slope drains
- **D.** Underdrains

**3.8.5.2** The proposed storm drain system will be shown in plan and profile along with existing and proposed grades for the pipeline and ground surface above the pipeline.

**3.8.5.3** Proposed catch basins and connector pipes will also be shown in profile. All existing utilities, including water and sanitary sewer that crosses the proposed storm drain shall be shown in plan and profile at their proper elevation.

### 3.8.6 Minimum Pipe Clearance

Minimum clearances for the following items shall be determined by the Design Consultant based upon the current requirements of the City:

**3.8.6.1** Minimum pipe cover of fill over storm drains

**3.8.6.2** Horizontal clearance from proposed storm drains to City of Dallas water and sewer facilities

**3.8.6.3** Horizontal and vertical clearance from proposed storm drains to City of Dallas water and sewer facilities

**3.8.6.4** Horizontal and vertical clearance with other utilities

### 3.8.7 Pipe Material

**3.8.7.1** VITRIFIED CLAY PIPE
Vitrified Clay Pipes are not permitted for use.

### 3.8.8 Corrosion Protection

**3.8.8.1** In all cases, drainage systems shall be designed to include provisions for corrosive protection of facilities against stray currents.

**3.8.8.2** Resistivity and pH testing of the soils shall be required to support pipe design in terms of alternate pipe material selection other than reinforced concrete pipe and high density polyethylene

**3.8.8.3** If resistivity readings fall below 1,500 ohms per cubic centimeter, additional readings shall be made at intervals of not less than 25 feet or more than 100 feet until the limits of the area of low resistance soil are fully defined.

### 3.8.9 Manholes

The Design Consultant shall be responsible for determination of the minimum design requirements for manhole spacing based on pipe size or other limitations as may be required by the City

### 3.8.10 Underdrains and Location

The Design Consultant shall be responsible for determination of the minimum design requirements for underdrain size and location:

**3.8.10.1** Underdrains shall be located in areas where it is anticipated that groundwater may interfere with the stability of side slopes, structure footings and tunnel stability. In general, they may be used, based on geotechnical reports, in the following places:

- **A.** Along the toe of a cut slope to intercept seepage
- **B.** Along the toe of a fill on the side from which groundwater emanates
- **C.** Across the roadway at the downhill end of a cut
- **D.** Along the periphery of any paved area under which groundwater is likely to collect

### 3.8.11 Storm Water Storage

The Design Consultant shall be responsible for determination of the minimum design requirements for all retention facilities including:

- **A.** The maximum depth of water in a retention basin

**B.** The side slope limits of the retention basin

**C.** Permitted storage duration before empty

**D.** Requirements for percolation tests

**E.** Permitted use of dry wells where applicable

### 3.8.12 Slope Protection

**3.8.12.1** Cut slopes shall be protected with intercepting ditches at the top of slope when significant flow may come from the ground surface above. Slope benches shall be sloped toward a ditch running along the bench.

**3.8.12.2** Slopes shall be protected where necessary against erosion from concentrated drainage with down drains.

## 3.9 Bituminous Concrete Paving

### 3.9.1 Quality Assurance

**3.9.1.1** Conformance with USDT FAA Advisory Circular AC 150/5320 6D and any supplemental changes issued relating to Airport Pavement Design and Evaluation.

**3.9.1.2** Standards: Comply with Asphalt Institute's "The Asphalt Handbook," except where more stringent requirements are indicated.

## 3.10 Reinforced Cement Concrete Paving

### 3.10.1 Quality Assurance

**3.10.1.1** Perform work in accordance with ACI-301, Specification for Structural Concrete, latest edition.

**3.10.1.2** Standard for measuring, mixing, transporting and placing of concrete shall be in accordance with ACI-304, latest edition.

**3.10.1.3** Concrete shall comply with ACI-318, Building Code Requirements for Structural Concrete, latest edition.

**3.10.1.4** Conformance with USDT FAA Advisory Circular AC 150/5320 6D and any supplemental changes issued relating to Airport Pavement Design and Evaluation.

**3.10.1.5** Regulatory Requirements: Comply with local governing regulation if more stringent that items specified or drawn.

### 3.10.2 Materials

**3.10.2.1** CONCRETE

**A.** Comply with Section 03300 for concrete materials, admixtures, curing compound, concrete mix design, sampling, testing, forms, reinforcing steel and steel expansion materials.

**B.** The use of fly ash is not permitted

**3.10.2.2** EXPANSION JOINT FILLER

**A.** Exposed Locations: Provide asphalt impregnated fiberboard type complying with ASTM D1751

**B.** Do not use in conjunction with sealants.

### 3.10.3 Mixes

In addition to requirements specified in Section 03300, furnish mix design to produce normal weight concrete consisting of Portland cement, aggregate, air-entraining admixture and water to produce following properties:

**A.** Compressive strength 4,000 psi minimum at 28 days for sidewalks, curbs, and gutters or as otherwise required by the City

**B.** Provide maximum 2" slump with plasticizer use

**C.** Concrete exposed to the weather shall be air entrained

**D.** Submit proposed concrete mix designs for each class or use

### 3.10.4 Installation

**3.10.4.1** CONCRETE PLACEMENT

**A.** Finished grade of concrete shall not vary from specified grade by more than 1/8" in ten-feet.

**B.** Cracks in exterior finished concrete exposed to view are not acceptable.

**C.** On vertical finishes remove fins, patch tie holes, and make joint marks flush with surface.

**3.10.4.2** JOINTS

**A.** Locate expansion joints at 60'-0" maximum for pavement and at 30'-0" sidewalks, curbs and gutters unless noted otherwise.

**B.** Locate control joints at 20'-0" maximum for pavements and 6'-0" maximum for walkways, unless noted otherwise.

### 3.10.5 Concrete Finishes

**3.10.5.1** General: Concrete finished surfaces exposed to view to be uniform in color and appearance.

**A.** Light Broom Finish:[Content to be developed]

**B.** Heavy Broom Finish:[ Content to be developed]

## 3.11 Fences and Gates

Reference SECTION 5:3.33 Airport Fence for Airport Fence and Gate requirements.

# CHAPTER 4: ROADS AND BRIDGES

## 4.1 Design Criteria References

### 4.1.1 Design Standards

All roadway design elements shall be designed in accordance with accepted engineering standards, however, as a minimum, they shall be in conformance to the applicable State and City standards for roadway design

### 4.1.2 Environmental Documents

Design and construction will be consistent with the Department of Aviation's environmental documents that have been approved by the FAA.

### 4.1.3 Existing Conditions

It is anticipated that all pavement and associated infrastructure elements will be replaced in-kind. Specifically, the following design criteria are to remain equivalent to the existing conditions unless otherwise directed:

**A.** Design Speed
**B.** Lane Width
**C.** Shoulder Width
**D.** Horizontal Alignment
**E.** Vertical Alignment
**F.** Grades
**G.** Stopping Sight Distance
**H.** Cross Slope
**I.** Superelevation
**J.** Vertical Clearance

### 4.1.4 Construction Phasing and Traffic Control Plans

Construction phasing plans and traffic control plans shall be generated to ensure, to the extent possible, that the existing level of service be maintained during the construction. Details for signage, barricades, detour configurations, etc, shall be in accordance with local and state design criteria.

# CHAPTER 5: STRUCTURES – CIVIL

[Content to be developed at a later date]

# CHAPTER 6: EXTERIOR LIGHTING

## 6.1 Abbreviations

[Content to be developed]

## 6.2 Lighting General Requirements

The following guidelines shall be used in the design of Exterior lighting Systems.

### 6.2.1 Building Mounted Exterior Lighting

For Building Mounted Exterior Lighting reference Section 4: Terminal Design Standards Chapter for Electrical Requirements.

### 6.2.2 Ground Mounted Pole Lighting

**6.2.2.1** GENERAL
All Light Poles are to be individually fused.

# CHAPTER 7: LANDSCAPING

## 7.1 General Requirements

### 7.1.1 City of Dallas Arborist

All Landscaping shall be coordinated with the City of Dallas Arborist

### 7.1.2 Attracting Birds

Landscaping shall be designed to not attract birds.

### 7.1.3 Detention Pond Location

Detention ponds shall not be located at Bravo 5 and Delta, near RON Parking.

## 7.2 Trees, Shrubs, and Seeded Lawn Requirements

### 7.2.1 Design Criteria

[Content to be developed]

### 7.2.2 Site Line Considerations

[Content to be developed]

## 7.3 Irrigation System Requirements

### 7.3.1 Piping Requirements

Irrigation System Piping must be Schedule 40. Allowable piping material for are:

- PVC
- ABS
- CPVC
- Black Steel

# CHAPTER 8: EXTERIOR SIGNAGE AND GRAPHICS

## 8.1 Introduction

To provide a set of planning standards, requirements and design criteria to be used for all exterior signing applications at the three City of Dallas Department of Aviation's aviation facilities. These guidelines will set forth standards that describe, but the aesthetic, functional and technical design standards for the following sign types:

- Directional Signs
- Informational Signs
- Regulatory and Identification Messages

## 8.2 Reference Standards

The standards and requirements included, but are not limited to the following

- Federal Department of Transportation (DOT)
- Texas Department of Transportation (TxDOT)
- American Association of State Highway and Transportation Officials (AASHTO)
- ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)
- International Air Transport Association (IATA)
- American Association of Airport Executives (AAAE)
- Airports Council International (ACI)
- Air Transport Association of America (ATA)
- American Institute of Graphic Arts (AIGA)

## 8.3 ADA Guidelines

All Airport signage conform, as a minimum, to the Americans with Disabilities Act (ADA) enacted July 6, 1990 as well as all additional federal guidelines that followed there from.

## 8.4 Unified Environment

All Airport signage must be understood as a coherent, unified environment. These common elements are the foundation of the graphic system for airport signing, providing a set of consistent elements shared by all signs.

### 8.4.1 Signage Description, Type and Color Requirements

The following are DOA requirements for the various Airport signs;

| Signage Description | Display Type | Color Group |
|---|---|---|
| Airport Information | Static & Dynamic | 2 |

| | | |
|---|---|---|
| Departures Signage | Static & Dynamic | 1 |
| Arrivals Signage | Static & Dynamic | 1 |
| Transfer Signage | Static & Dynamic | 1 |
| Baggage Signage | Static & Dynamic | 1 |
| Emergency Signage | Static | 3 |

## 8.5 Common Graphic Elements

### 8.5.1 Common Elements

Typefaces, arrows, symbols and colors are common to all Airport signage, as described in the relevant parts of this Section.

### 8.5.2 Sign Layouts

All sign layouts should group graphic elements and provide consistent locations for all graphic elements. As an example, arrows should always be located in "arrow bands" reserved for those terminal/parking symbols are located in a consistent area common to every sign etc.

### 8.5.3 Borders

All roadway signs are required to have a white boarder (with the exception of some regulatory signs). Borders may also be used to define multiple message fields on a single sign face.

### 8.5.4 Message Bands

Black message bands may used to render "parent" or "link" messages on certain signs. Examples of such messages are "Airport Exit" or "Return to Airport", both of which are "Parent" messages on sign panels directing traffic to specific destinations. A single black message band may span one or more message fields-thereby avoiding repetition of parent messages and helping to organize a potentially complex sign installation. Message bands should be used every time such a message is rendered.

### 8.5.5 Exceptions

Exceptions to "Common Element" formats must be avoided whenever possible. When unusual circumstances cannot be accommodated within the standard guidelines, every effort must be made to develop a suitable solution that relates as closely as possible to the graphic system described herein. Any such deviations from these standards, and from those this section, must be clearly identified and submitted for review and approval by the DOA.

### 8.5.6 Overhead Roadway Sign Formats

All primary directional signs on main Airport roadways will be mounted overhead on full-span bridges or cantilever structures.

**8.5.6.1** LAYOUT CONCEPT

Graphics are organized into three horizontal areas, each reserved for a specific use:

- "Parent message" area, used for terminal symbols or link messages,
- Text message area

- Arrow band

When graphics normally appearing in areas 1 or 3 are not required on a specific

sign, the text area is extended to occupy the unused space.

**8.5.6.2** PANEL WIDTHS
Overhead signs are composed of 12' – 0" width modules corresponding to typical roadway lane widths, typical installations will be 12' – 0", 24' – 0", or 36' – 0" wide. An 18' – 0" wide panel, referring to two drive lanes and centered over them may be employed along road segments with 4 or more lanes.

**8.5.6.3** PANEL HEIGHTS
Overhead signs are minimum 8 feet high. Height may be increased in 1 foot increments, depending on message requirements. Typical installations will be 8' – 0", 9' – 0", or 10' – 0" high. Note that all sign panels mounted together on a sign bridge must be the same height.

**8.5.6.4** BORDERS/MESSAGE FIELDS
A narrow, rectangular border appears on every roadway sign. These borders define the message area. When sign messages refer to multiple traffic lanes, a single border may enclose a double or triple-width message area.

**8.5.6.5** TEXT MESSAGES
Text Messages and most other graphic elements are rendered in centered formats on overhead signs. Elements are normally centered over the traffic lane(s) to which they refer.

## 8.6 Selected Typeface

Helvetica has been selected, as the typeface for all exterior signage at DOA Aviation Facilities.

## 8.7 Standard Typefaces

[Content to be added]

## 8.8 Letter and word Spacing

[Content to be added]

## 8.9 Typographic Restrictions

### 8.9.1 Modification of Letter Shapes is Prohibited:

Modification of letter shapes is prohibited. Condensed, extended, slanted, outlined or otherwise distorted type will not be acceptable under any circumstances. Language to this effect shall be included in the specifications for all airport sign projects.

### 8.9.2 Typefaces or Type Weights

Typefaces or type weights not described above may not be used at DOA Aviation Facilities.

## 8.10 Arrows

[Content to be added]

## 8.11 Terminal and Parking Symbols

[Content to be added]

## 8.12 Symbols

[Content to be added]

## 8.13 Color

### 8.13.1 Signage Color

The following are the recommended color groups:

Group 1: Black Text – Yellow Background

Group 2: Dark Blue Text – White Background

Group 3: Red Text – White Background

### 8.13.2 Color Definition

Color Definitions are as follows:

| Color | Hue | Saturation | Brilliance |
|---|---|---|---|
| Yellow | 41 | 255 | 122 |
| Dark Blue | 170 | 255 | 84 |
| Red | 8 | 255 | 122 |

# SECTION 4: TERMINAL DESIGN STANDARDS

These Design Standards are provided to inform the Design Consultant of general requirements for the design of Terminal / Vertical projects at City owned aviation facilities and to identify special requirements which may be unique to particular project types. The Design Standards are organized so that general issues of project design are dealt with first followed by more specialized applications related to specific project types.

| | | | | | File Links/ References |
|---|---|---|---|---|---|
| Section 4: Terminal Design Standards | Chapter 1 | Environmental | 1.1 (Content to be Added) | | |
| | Chapter 2 | Architectural | 2.1 Abbreviations<br>2.2 Temporary Construction<br>2.3 Existing Conditions<br>2.4 Thermal Transmittance<br>2.5 Glazing, Curtain Walls and Storefronts<br>2.6 Terminal Protection and Barriers<br>2.7 Wall Systems<br>2.8 Exterior Wall Finishes | 2.9 Interior Wall Finishes<br>2.10 Roof Systems<br>2.11 Visual Screens<br>2.12 Wood and Wood Veneer Products<br>2.13 Laminated Surfaces<br>2.14 Floor Coverings<br>2.15 Lock Systems<br>2.16 Exit Doors<br>2.17 Public Toilet Rooms | |
| | Chapter 3 | Structural - Building | 3.1 Abbreviations<br>3.2 General<br>3.3 Special Structures<br>3.4 Foundations<br>3.5 Corrosion Protection<br>3.6 Drainage | 3.7 Waterstops<br>3.8 Waterproofing<br>3.9 Modifications to Existing Structural Components<br>3.10 Documentation | |
| | Chapter 4 | Mechanical | 4.1 Abbreviations<br>4.2 Design Coordination<br>4.3 Piping Systems<br>4.4 Heating, Ventilating, and Air Conditioning (HVAC) | 4.5 Plumbing<br>4.6 Thermal Insulation for Mechanical and Plumbing Systems<br>4.7 Utility Meters<br>4.8 Fire Suppression System | • Piping Identification Table |
| | Chapter 5 | Baggage Handling Systems | 5.1 Abbreviations<br>5.2 General Codes and Criteria<br>5.3 Performance<br>5.4 Mechanical Components | 5.5 Electrical Components<br>5.6 Outbound Conveyor Systems<br>5.7 Inbound Conveyor Systems<br>5.8 Testing and Commissioning<br>5.9 Warranties | |
| | Chapter 6 | Electrical | 6.1 Abbreviations<br>6.2 Electrical General Requirements<br>6.3 Equipment Voltage<br>6.4 Emergency and Standby Systems<br>6.5 Equipment Rooms<br>6.6 Equipment Pads | 6.7 Metering of Power<br>6.8 Grounding and Lightning Protection<br>6.9 Power Distribution<br>6.10 Lighting Systems<br>6.11 Vehicle Gates<br>6.12 Fire alarm Systems | |
| | Chapter 7 | Communications/ Special Systems | 7.1 (Content to be Added) | | |
| | Chapter 8 | Interior Signage and Graphics | 8.1 Introduction<br>8.2 Reference Standards<br>8.3 ADA Guidelines<br>8.4 Unified Environment<br>8.5 Common Graphic Elements<br>8.6 Selected Typeface<br>8.7 Standard Typefaces | 8.8 Letter and Word Spacing<br>8.9 Typographic Restrictions<br>8.10 Arrows<br>8.11 Terminal and Parking Symbols<br>8.12 Symbols<br>8.13 Color | |

# CHAPTER 1: ENVIRONMENTAL

[Content to be developed in the future.]

# CHAPTER 2: ARCHITECTURE

## 2.1 Abbreviations

ASTM American Society for Testing and Material
DOA Department of Aviation
IECC International Energy Conservation Code
OSHA Occupational Safety & Health Administration
SBS Styrene Butadiene Styrene

## 2.2 Temporary Construction

### 2.2.1 Protection of Existing Facilities

Temporary construction will be required adjacent to all new construction and/or renovations to existing facilities to ensure the protection of traveling passengers and the general public.

### 2.2.2 Enclosure Construction

Temporary enclosure construction will be required to be self supporting and not have additional bracing that would impede adjacent pedestrian traffic flow.

### 2.2.3 Non-Combustible Construction

All Temporary Construction shall be built out of Non-Combustible material.

### 2.2.4 Minimum Clear Height

All temporary construction enclosures will have a minimum clear height of 8 feet.

### 2.2.5 Requirements for Fully Enclosed Constructions

Where there is construction work overhead, a fully enclosed temporary construction “tunnel” shall be provided. Minimum width: 10 feet, minimum Height: 8 feet. Temporary interior lighting must be provided that complies with the current IESNA standards for Corridor Illumination.

### 2.2.6 Exterior Finish

The exterior finish of all temporary construction enclosures must be painted to match adjacent finishes.

### 2.2.7 Access Doors

All temporary construction access doors must have key access and keys provided to the DOA. Locks shall be equipped with construction cores to assure the Contractor and Airport personnel access to work sites. The Contractor shall furnish combinated key cores to the DOA. After construction work is complete, the Contractor shall remove the construction cores, and install an airport master-keyed lock core That has been specified by the DOA.

## 2.3 Existing Conditions

### 2.3.1 DOA Record Drawings

The Department of Aviation maintains electronic drawings of existing conditions in the form of Record Drawings, which will be provided by the DOA for use by the Design Consultant and/or Tenant for the

development of construction documents. These files represent the latest information incorporated by the DOA; however, all existing conditions may not be completely documented in the Record Drawings. Reference the General Conditions of the Contract for clarification.

### 2.3.2 Field Verification

The Design Consultant and/or Tenant is advised to perform any and all field verification of existing conditions prior to proceeding with proposed improvements. The DOA shall not provide any guarantees of accuracy or completeness of information contained in electronic files. Use of DOA provided files by Design Consultant and/or Tenant shall be considered an agreement to this understanding.

### 2.3.3 Updated Record Drawings

**2.3.3.1** The Design Consultant shall, upon completion of the work, provide updated Record Drawings to the DOA. Reference SECTION 2:4.3.2.3
Record Documents .

## 2.4 Thermal Transmittance

### 2.4.1 Code Requirements

All new construction and /or modifications to the building exterior envelope shall be designed and constructed in accordance with the requirements of the current City of Dallas Building Codes for the overall thermal transmittance of a gross area of the exterior building envelope, such as walls, floors, or roofs/ceilings.

### 2.4.2 IECC Compliance

In addition to the requirements listed above, all new construction and /or modifications to the building exterior envelope the Design Consultant will also be required to comply with the latest version of the International Energy Conservation Code (IECC).

## 2.5 Glazing, Curtain Walls and Storefronts

### 2.5.1 Exterior glazing systems

Landside glazing systems shall match Parking Garage B and new pedestrian bridge curtain wall system and glass. Airside glazing systems shall be of similar appearance, but alternate curtain wall systems and glass may be allowable. All alternate curtain wall systems are to be presented to the DOA for review and approval.

### 2.5.2 Interior glazing systems

All interior storefront systems are to utilize clear glass and anodized aluminum frames. Any deviation shall be approved by the Department of Aviation prior to completion of design

### 2.5.3 Performance Requirements

**2.5.3.1** Provide aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

**A.** Structural loads.

**B.** Thermal movements.

**C.** Movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

**D.** Dimensional tolerances of building frame and other adjacent construction.

**2.5.3.2** Failure includes the following:

- Deflection exceeding specified limits.
- Thermal stresses transferred to building structure.
- Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
- Noise or vibration created by wind and thermal and structural movements.
- Loosening or weakening of fasteners, attachments, and other components.
- Sealant failure.

**2.5.3.3** Wind Loads: In accordance with the current City of Dallas Building Codes.

**2.5.3.4** Seismic Loads: In accordance with the current City of Dallas Building Codes.

## 2.6 Terminal Protection and Barriers

## 2.7 Wall Systems

### 2.7.1 General

Walls shall be of noncombustible materials, such as metal studs, channels, caps, and bracing. Wood framing is not acceptable. Fire resistance rating shall be as required by current City of Dallas Building Code.

### 2.7.2 Exterior Walls

All exterior wall studs shall be galvanized and shall be a minimum of 18 gauge up to 10' in length and 16 gauge for lengths greater than 10'. All field welds shall be coated with two coats of galvanizing paint. Double 18 gauge studs shall be installed on each side of all door openings and areas that will support signs, cabinets, shelves, etc.

### 2.7.3 Interior Walls

All interior wall studs shall be a minimum of 20 gauge. Stud depth shall be determined by bearing requirements and stud length. Double 18 gauge studs shall be installed on each side of all door openings and areas that will support signs, cabinets, selves, etc. Also provide solid blocking at these areas.

### 2.7.4 Metal Stud Splicing

Maximum unsupported length of metal studs at fire rated walls shall be 20 feet. Provide splicing of metal studs in accordance with industry standards.

### 2.7.5 Partition Requirements

All gypsum board shall have a minimum thickness of ⅝". Fire resistance rating shall be as required by current City of Dallas Building Codes.

### 2.7.6 Moisture /Water Resistant Wallboard

All walls encompassing or within toilet rooms and exterior walls in the below grade portions of buildings shall be constructed cement core board or wallboard panels specifically designed as moisture, water resistant, and mold resistant with properties conforming to ASTM 3273

## 2.8 Exterior Wall Finishes

### 2.8.1 General

Exterior walls shall be of noncombustible materials, such as metal studs, channels, caps, and bracing. Wood framing is not acceptable. Fire resistance rating shall be as required by the current City of Dallas Building Codes.

### 2.8.2 Terminal Protection

[Content to be developed]

### 2.8.3 Grade Level Finishes (Airside)

The following are acceptable exterior finish materials. Other material options will need to be submitted to the DOA for review and approval:

**A.** Unit Masonry Assemblies - grouted solid to a height of 4'-0" for impact damage protection

**B.** Composite Metal Wall Panels

**C.** Exposed Concrete

**D.** Aluminum, and glass glazing systems

**E.** Stucco.

### 2.8.4 Grade Level Finishes (Landside)

The following are acceptable exterior finish materials. Other material options will need to be submitted to the DOA for review and approval:

**A.** Composite Metal Wall Panels

**B.** Aluminum and glass glazing systems

**C.** Exposed Concrete

### 2.8.5 Above Grade Level Finishes (Airside)

The following are acceptable exterior finish materials. Other material options will need to be submitted to the DOA for review and approval:

**A.** Composite Metal Wall Panels

**B.** Exposed Concrete

**C.** Aluminum, and glass glazing systems

### 2.8.6 Above Grade Level Finishes (Landside)

The following are acceptable exterior finish materials. Other material options will need to be submitted to the DOA for review and approval:

**A.** Composite Metal Wall Panels

**B.** Exposed Concrete

**C.** Aluminum, and glass glazing systems

## 2.9 Interior Wall Finishes

### 2.9.1 General

In passenger terminals and concourses, all wall coverings, shall meet the applicable provisions of the current City of Dallas Building Codes. A certified document of test data compliance from a testing laboratory shall be furnished to the PM for approval prior to installation.

### 2.9.2 Wall Finishes

The minimum design criteria for interior wall finishes shall include, but not be limited to the following:

**A.** Washable

**B.** Solid Surface Wall Panels / Systems must be a minimum 8 feet tall in public areas

### 2.9.3 Non-Permitted Wall Finishes

The Department of Aviation will not permit the following materials to be used for new construction or renovation projects. Exceptions will be reviewed on a case-by-case basis

**A.** Glued applied Solid Surfacing Materials directly on walls.

**B.** Fabric Wall Panels within the reach of the Public.

### 2.9.4 Paint, Fire Resistance, and Environmental Requirements

All paint shall meet the requirements of the National Fire Protection Associated (NFPA) Code and Standards for the flame spread and smoke density. Paint processes shall meet environmental standards for ventilation as established by OSHA. All paints, solvents, rags, and other painting refuse shall be disposed of properly off of Airport property according to State and Federal environmental regulations. Evidence of such compliance shall be furnished to the PM before painting begins.

## 2.10 Roof Systems

### 2.10.1 Existing Roofing Systems

Roofing system will conform to the requirments established in the Love Field Modernization Program (LFMP):

**A.** Main Terminal: Thermoplatic Olefin (TPO) single-ply roofing membrane. Fully adhered system Minimum roof insulation value of R-30 rated. Color, White.

**B.** Old Control Tower (West Concourse): Carlisle single ply membrane

**C.** Air Cargo Building:

### 2.10.2 Investigation of Existing Systems

The Design Consultant and/or Contractor must perform field investigation of existing systems, prior to the design or construction of any new work planned.

### 2.10.3 Roof Penetrations

All roof penetrations must be located on a plan, along with all associated details, and submitted to the City of Dallas Building Department for approval prior to the start of construction. All penetrations shall be performed by Manufacturer approved Contractor.

### 2.10.4 Existing Warranties

Roofing warranties on existing systems shall be maintained through any new construction activity.

### 2.10.5 Warranties

Minimum Roof Warranties:

**A.** Material: 30 year

**B.** Additional: 5 year Labor and Material

## 2.11 Visual Screens

### 2.11.1 General

Visual screens shall be erected around all roof-mounted equipment installed or modified on permanent structures. For ground-mounted structures and temporary structures, the application of screens will be on a case-by-case basis depending upon type of building, location of structures, duration, etc.

### 2.11.2 Antennas and Satellite Dishes

The installation of all antennas and satellite dishes must be submitted to the City of Dallas for approval, prior to installation.

## 2.12 Wood and Wood Veneer Products

### 2.12.1 Use of Wood Products

In passenger terminals and concourses, the use of wood and wood composition products shall be in accordance with the current City of Dallas Building Codes. The exception to the use of fire retardant-treated plywood is for structural applications, such as a roof deck. Additionally, fire retardant lumber shall not be ripped or milled.

### 2.12.2 Use of Wood Veneer Products

In passenger terminals and concourses, wood veneer products shall be constructed in accordance with the current City of Dallas Building Codes. The Contractor shall provide a submittal documenting the fire classification of the product prior to construction.

### 2.12.3 Glues

Glues or other adhesives used in the veneer products must have a low or no Volatile Organic Compound (VOC) content.

## 2.13 Laminated Surfaces

In passenger terminals and concourses, cabinets, counter tops, and plastic laminated surfaces shall typically be constructed in accordance with applicable provisions of the current City of Dallas Building Codes.

## 2.14 Floor Coverings

### 2.14.1 General

In passenger terminals and concourses, all floor coverings, including carpet, shall meet the applicable provisions of the current City of Dallas Building Code. A certified document of test data compliance from a testing laboratory shall be furnished to PM for approval prior to installation.

### 2.14.2 Public Areas

DOA requires the use of epoxy terrazzo in all public areas. Public areas requiring epoxy terrazzo flooring include, but are not limited to the following:

- **A.** Main Lobby
- **B.** Ticket Hall
- **C.** Concourses
- **D.** Public Restrooms

### 2.14.3 Passenger Holdrooms

DOA requires the use of Carpet Tile in all holdrooms.

- **A.** 36”x36” Tiles in Large Public Area
- **B.** 36”x36” or 18”x18” Tiles in Small Public areas such as holdrooms

### 2.14.4 Epoxy Terrazzo

The following are the minimum design criteria required for all epoxy terrazzo flooring.

**2.14.4.1** GENERAL
Minimum design criteria;

- **A.** Thin-set Thickness: 3/8 inch
- **B.** Flexible Reinforcing Membrane
- **C.** Primer

**2.14.4.2** EPOXY RESIN
Minimum design criteria required for Epoxy Resin:

- **A.** Hardness: per ASTM D 2240
- **B.** Minimum: Tensile Strength: per ASTM D 638
- **C.** Minimum Compressive Strength: per ASTM D 695
- **D.** Chemical Resistance per ASTM D1308
- **E.** Flammability Ratings: per ASTM D635
- **F.** Thermal Coefficient of Linear Expansion: per ASTM D 696

**2.14.4.3** MARBLE CHIPS
Minimum design criteria required for Marble Chips: Comply with the National Terrazzo and Mosaic Association (NTMA) "Guide for Specification of Epoxy Terrazzo"

**2.14.4.4** DIVIDER AND ACCESSORY STRIPS
Minimum design criteria required for Dividers and Accessory Strips: Angle or T type, 3/8 inch by ½ inch wide

**2.14.4.5** CONTROL-JOINT STRIPS AND ACCESSORY STRIPS: 1-4 inch joint fillers to match adjacent terrazzo finish and color.

**2.14.4.6** CARPET:
The following are the minimum design criteria required for all carpeting.

**A.** 3' x 3' Carpet Tiles

**B.** Flammability Ratings: per ASTM E-84 and NFPA 253

**C.** Minimum Traffic Ratings: Heavy Commercial or Extra-Heavy Commercial

**D.** Minimum Warranty: 10 years

**2.14.4.7** RUBBER FLOORING: DOA will not permit the use or installation of rubber flooring.

## 2.15 Lock Systems

[Content to be developed in the Future]

## 2.16 Exit Doors

[Content to be developed in the Future]

## 2.17 Public Toilet Rooms

### 2.17.1 General

All fixtures, components and systems are to be standard models that the can be ordered and replaced once attic stock has been depleted. The following are the minimum design criteria associated with Public Toilet Rooms:

**A.** All water closets are to be wall mounted to allow for easier cleaning of facility.

**B.** All toilet rooms shall have an accessible plumbing chase for water closets, sinks and urinals.

**C.** Adjacent to all toilet rooms with more than two fixtures per sex, a Family Toilet Room will be required with provisions for baby changing activities

**D.** Each bank of toilet rooms should be located within 200' of a new or existing janitor's closet

**E.** All wet walls of toilet rooms shall be constructed with cement core board.

### 2.17.2 Toilet Partitions

**2.17.2.1** MINIMUM DIMENSIONS
Minimum toilet stall dimensions shall be 5' - 6" deep and 3' - 0" wide. In all toilet rooms, the layout, fixture types and amounts, and dimensions shall meet current code requirements and ADA requirements.

**2.17.2.2** PARTITION MOUNTING

Toilet Partitions are to be ceiling and wall mounted

**2.17.2.3** ADA REQUIREMENTS
The ADA required toilet stall dimensions shall be a minimum 4' - 8" deep x 5' - 0" wide for wall mounted water closets and 4' - 11" deep x 5' - 3" wide for floor mounted water closets.

**2.17.2.4** PARTITION MANUFACTURERS
In public toilet rooms, toilet partitions including doors and hardware shall be Bobrick Phenolic 1080/1180 Duraline Series or an approved equal.

### 2.17.3 Urinal Partitions

Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The layout and dimensions shall meet current code requirements and ADA requirements. In public toilet rooms, urinal partitions, including mounting hardware, shall be Bobrick Phenolic 1085/1185 Wall-Hung Duraline Series or an approved equal.

### 2.17.4 Floor Finishes

[Acceptable floor finishes for Toilet rooms are the following:

- Porcelain Enamel tile size range from 6”x6” to 12”x12”
- Epoxy Resin Terrazzo]

### 2.17.5 Hand Dryer and Paper Towel Dispenser

In public toilet rooms, a minimum of one hand dryer and one paper towel dispenser are required. They shall provide at a minimum of one each for every three lavatories. Hand Dryers must be 10-15 second warm air, rapid drying, high efficiency, self contained electric hand dryers. No other hand dryers will be permitted by the Department of Aviation.

### 2.17.6 Infrared sensors

Hand dryers shall be activated by infrared sensors when the user’s hands are placed below the exhaust port. Dryer must stop automatically when the users’ hands are removed from airflow or after 90 seconds of operation. In non-public toilet rooms hand dryers need not be sensor activated.

### 2.17.7 Minimum Toilet Room Accessories

The following are the minimum accessories which the Department of Aviation requires in all toilet rooms:

**A.** Security Holders - located within each toilet stall
**B.** Toilet Seat Protector Dispensers - located within each toilet stall
**C.** Sanitary Napkin Disposals - located within each Women’s toilet stall
**D.** Carry-On Shelf - located above each Men’s urinal
**E.** Baby Changing Station – one per public restroom
**F.** Full Length Mirrors

### 2.17.8 Basis of Design Components

The following shall be the basis of design components for all new or renovated restroom projects for the Department of Aviation.

**A.** Auto Flushers: Sloan G2 Optima Plus Flushometers

**B.** Faucets: Sloan Optima On-Q, with separate sensor

**C.** Soap Dispensers: Bobrick Lavatory Mounted, Model No. B-8221

**D.** All other accessories, including Paper Towel Dispensers and Waste Receptacles, shall be Bobrick and stainless steel.

### 2.17.9 Unisex Companion Care Toilet Rooms

In the terminal and concourses, one unisex companion care toilet room will be required for each bank of Public Toilet Rooms located within the facility. The companion toilet room shall provide and meet the following requirements:

**A.** All ADA requirements.

**B.** All current City of Dallas Building Codes

**C.** One Lavatory

**D.** One Toilet

**E.** One Baby Changing Facility

**F.** One Bench

### 2.17.10 Janitors Closet

The following shall be the basis of design components for all new or renovated Janitors Closet for the Department of Aviation.

**A.** Minimum 250sqft

**B.** Continuous shelving along longest dimension of Janitors Closet.

**C.** Provide Mop Sink

**D.** Provide Floor Drain

**E.** Provide Hose Bib

**F.** Floor Finishes to be Stained, and Sealed Concrete.

**G.** For Ventilation requirements reference **Error! Reference source not found.**

## 2.18 Conveyance Systems

### 2.18.1 General

Compliance with the ASME/ANSI A17.1 “Safety Code for Elevators and Escalators” and Americans with Disabilities Act (ADA) is required on all conveyance systems.

### 2.18.2 Elevators

All elevator cabs or a minimum of one elevator cab in a bank 81" x 24") with two EMS personnel. Access into the elevator shall be as direct as possible and shall be provided as not to tilt the gurney. Elevators accommodating an emergency gurney and EMS personnel shall access the ground level. The minimum clear interior height of passenger elevators shall be 8' - 0". Any elevator sized to accommodate an emergency gurney shall be marked with the appropriate signage.

### 2.18.3 Firefighter Service

All elevators shall be provided with firefighter service, recall, etc. for fire department use during emergency operations.

### 2.18.4 Special Fire Alarm Interfaces and Fire Protection

Special Fire Alarm interfaces and Fire Protection measures are required for elevator shafts and machine rooms; refer to the DOA Building Codes Manual. Elevator Car Lighting and Ventilation Control: ar lights and ventilation shall be provided with automatic control per ASME 17.1, 204. 7b (2). After the conditions listed in the code exit for five minutes the car lights and ventilation shall be turned off. Interruption of any condition shall cause the lights and ventilation to turn on. Provide a battery operated lowering system for all hydraulic elevators.

### 2.18.5 Escalators

The width of all escalators shall accommodate a 40' wide step. Maximum speed of escalators shall be 90' per minute. All skirting adjacent to escalator treads shall be frictionless stainless steel. Provide a laminated glass barricade or other protection meeting the requirements of USBC Section 1012 to protect against sliding on the escalator platform at the outside of the balustrade for the top and bottom of escalators.

### 2.18.6 Other Special Requirements

The A/E is required to coordinate the following with the Authority during the design phase:

### 2.18.7 Design Redundancy

Design redundancy requirements of public conveyance systems.

### 2.18.8 Conveyance Equipment Monitoring System

All elevators, escalators and moving walkways shall be connected to the Authority's Conveyance Equipment Monitoring System (ACEMS). Elevators shall be delivered with the manufacturers ACEMS compatible interface pc card within the controller; elevator, escalators, and moving walkways shall be provided with the ACEMS network interface modules mounted within a wall mounted enclosure, within the Elevator Machine room with network connection to an Authority network switch.

### 2.18.9 Raceways

Raceways are required for communications and network connections to the Authority's Conveyance Equipment Monitoring System for Elevators, Escalators, and Moving Walkways. Elevator Machine Rooms shall be provided with a minimum of 1½" conduit from the machine room to a communications room. Escalators and Moving Walkways shall be provided with ¾" conduit from each escalator and moving walkway equipment pit to an elevator machine room or communications room.

### 2.18.10 Standby Power Requirements

**2.18.10.1** FIREFIGHTER SERVICE

Firefighter service for elevators such as, recall operation, smoke detector locations, interruption of power, etc.

**2.18.10.2** SPECIAL FIRE ALARM INTERFACES AND FIRE PROTECTION

Special Fire Alarm interfaces and Fire Protection measures are required for elevator shafts and machine rooms; refer to the Authority Building Codes Manual, Appendix 12. Elevator Car Lighting and Ventilation Control: Car lights and ventilation shall be provided with automatic control per ASME 17.1, 204. 7b (2). After the conditions listed in the code exist for five minutes the car lights and ventilation shall be turned off. Interruption of any condition shall cause the lights and ventilation to turn on. Provide a battery operated lowering system for all hydraulic elevators.

# CHAPTER 3: STRUCTURES – BUILDING

## 3.1 Abbreviations

ACI American Concrete Institute

CD Construction Documents

PM Project Manager

## 3.2 General

All structures not subject to vehicular loading shall be designed in accordance with the current City of Dallas Building Codes.

## 3.3 Special structures

Special structures such as exposed fuel storage tanks, potable water tanks, glycol storage, water tanks for fire protection services, and chilled water storage tanks shall be designed to the applicable codes including tank design and fabrication standards. Design Standards include, but are not limited to the following:

- AWWA – American Water Works Association
- API – American Petroleum Institute
- ACI – American Concrete Institute

## 3.4 Foundations

Foundation bearing capacity and elevations shall be verified by a registered Geotechnical Engineer licensed in the State of Texas, and the results coordinated with the PM or Resident Engineer prior to pouring concrete for foundations.

## 3.5 Corrosion Protection

The requirements for corrosion protection of structural concrete parking garage decks, vehicular traffic bridges and ramps, weather exposed pedestrian bridges, and in all associated columns or other vertical supports, tunnels, foundation, and shell of underground structures are as follows:

### 3.5.1 CONCRETE COVER

The minimum concrete cover for pre-stressed concrete shall be 1½" for all members. The minimum concrete cover for mild top reinforcement work shall be 2" for slabs and 3" for beams subject to outdoor environment and/or vehicular traffic. This shall include 2" for formed concrete exposed to earth and 3" for concrete cast directly against earth.

### 3.5.2 WATER/CEMENT RATIO

The maximum water/cement ratio shall be 0.40 for concrete with 28 day compressive strength of 5000 psi or higher. ACI 318 "Requirements for Special Exposure Conditions" shall be followed for structural concrete with 28 day compressive strengths below 5000 psi.

### 3.5.3 EPOXY-COATED REINFORCING STEEL

Epoxy coated reinforcing steel (rebar and welded wire fabric (WWF)) shall be utilized in structural concrete exposed to outdoor elements and earth.

## 3.6 Drainage

The design shall incorporate provisions for adequate drainage of all the exposed decks, floors, etc.

## 3.7 Waterstops

Waterstops shall be installed at all construction joints below ground level.

## 3.8 Waterproofing

Use PVC waterproofing membrane system for underground structures that will be or may be connected to future tunnels. Provide connection and /or termination details to ensure compatibility with, and watertight connections to, PVC waterproofing membrane used for tunnel structures. For structures having no present or future connection to tunnels select waterproofing system which is most appropriate for the ground condition and the life expectancy of the building.

## 3.9 Modifications to Existing Structural Components

Any cut or core through any floor or any structural component of any existing building must be identified in a request at least 72 hours before the core or cut is anticipated to be made. The cut or core shall not proceed without approval of the Design Consultant. In general, and specifically where post-tensioned tendons are present, the non-destructive sub-surface testing prior to permitting any coring or cutting of floors or any structural component shall be required. The testing is intended to locate and avoid damage to reinforcing steel, post-tensioned tendons, and/or concealed utility lines. The party requesting the cut or core shall propose in their request the appropriate means to provide such testing as part of the request. The results of such tests are subject to prior approval by the Design Consultant before any demolition, cutting, or coring.

## 3.10 Documentation

The information and requirements that the Design Consultant shall provide and specify include the following:

### 3.10.1 Temporary Structures

Construction Documents shall state the Contractor is responsible for design, installation, monitoring and maintenance of temporary bracings, support of excavations and support systems during construction. The construction documents shall require the Contractor to hire a Professional Engineer, licensed in the State of Texas, to design, sign, and seal the final design documents and calculations for temporary bracings, support of excavations and support systems. The Contractor shall be prepared to provide immediate corrective actions if necessary. The Design Consultant shall clearly define and specify requirements for safe and satisfactory performance of these systems including protection of surrounding facilities at project sites. Design criteria and parameters provided by the Design Consultant shall include requirements for instrumentation system and monitoring program. The listing of the parameters shall be comprehensive and defined as the minimum requirements.

### 3.10.2 Design Criteria

The minimum design criteria and parameters (Design loads, surcharges and lateral ground pressure diagrams) for the anticipated conditions at the site based on the results of subsurface investigations and the Design Consultant interpretation of the geotechnical data. Parameters shall include anticipated dynamic load conditions; critical effects of rock wedge stability, potential rock mass failure and associated pressures. The Contractor shall be required to verify and review the soil and rock conditions, provide rock mapping and photographic documentation before and during excavation, and evaluate existing conditions to enable adjustment of the support systems without deviating from the limits shown in the CDs.

### 3.10.3 Safety Factors

The minimum safety factors for stability analysis and material properties for design of each type of support system. Contractor shall be responsible to obtain and verify the load carrying capacity of the support system including the adhesion values and other assumptions used in the design.

### 3.10.4 Measurement of Allowable Limits

The allowable deflections, displacements and threshold/limit values are to be measured by instrumentation readings.

### 3.10.5 Schematic Design Documents

A schematic design including drawings showing minimum acceptable dimensions of key components for a workable support scheme based on the specified design criteria and parameters, including a listing of the acceptable construction tolerances. The specifications shall require the Contractor to prepare and submit complete support system calculations and design documents, signed and sealed by a Professional Engineer licensed in the State of Texas.

### 3.10.6 Construction Monitoring and Testing

Construction documents shall clearly indicate the required instrumentation with the monitoring requirements including frequency of readings. The CDs should clearly state the Contractor's responsibility and procedures for continuous and regular readings/monitoring of instrumentation and reporting the recorded data.

### 3.10.7 Ground and Support Contingencies

The requirement that the Contractor shall suspend excavation to take additional readings when needed and/or promptly implement preventive action measures in areas where the specified threshold values and tolerances of ground and support systems have been exceeded. Also include the requirement for the Contractor to prepare and submit a contingency plan with a list of stand-by equipment and materials for the necessary remedial measures to strengthen and stabilize the support systems when excessive movements are detected.

### 3.10.8 Maximum Allowable Heights and Limitations

The maximum allowable height of excavation lifts and limitations for unsupported horizontal length including maximum time duration of cut face exposure during excavation.

### 3.10.9 Personal listing and Qualifications

A listing of required Contractor personnel and qualifications, including a registered geotechnical engineer, and quality control specialist for support systems.

### 3.10.10 Monitoring Instrumentation Requirements

The Design Consultant's design criteria and parameters for the support systems, instrumentation systems, and monitoring requirements shall ensure adequate and reliable performance. The intent is to maximize personnel safety and minimize opportunities for construction disputes.

# CHAPTER 4: MECHANICAL

## 4.1 Abbreviations

AABC Associated Air Balance Council

AMRS Automated Meter Reading System

ANSI American National Standards Institute

AOA Air Operations Area

ASTM Authority Having Jurisdiction

ASME Automatic Tag Reader

ASHRAE American Heating, Refrigerating and Air-Condition Engineers

AWWA American Water Works Association

BFP Backflow Preventer

CADD Computer Aided Design

CFM Cubic Feet per Minute

Db Decibel

DFU Drainage fixture units

DOA Department of Aviation

DFS Dedicated Fire Water System

EMCS Energy Monitoring Control Service

EPA Environmental Protection Agency

EPDM Ethylene Propylene Diene Monomer

FM Facilities Management

FU Fixture Units

GFCI Ground Fault Circuit Interrupter

GPD Gallons per Day

HDPE High Density Polyethylene

HOA Hand-off-Automatic

HTHW High Temperature Hot Water

HVAC Heating, Ventilating and Air Conditioning

HW Hot Water

NAIMA North American Manufacturers Association

NDT Non-Destructive Testing

NEBB National Environmental Balancing Bureau

NICET National Institute for Certification in Engineering Technologies

NFPA National Fire Protection Association

OSHA Occupational Safety & Health Administration

OS&Y Outside Screw & Yoke

PPB Parts per Billion

PVC Polyvinyl Chloride

PSI Pounds per Inch

RTR Recordall Transmitter Register

RPZ Reduced-Pressure-Zone

SCAT Sewage collection & Treatment

SMACNA Sheet Metal & Air Conditioning National Association

VFD Variable Frequency Drives

## 4.2 Design Coordination

### 4.2.1 General

The Design Consultant shall perform a quality control review of all documents for completeness, constructability, and coordination with all building trades. Particular attention shall be given to the following:

### 4.2.2 Plan Coordination

Work shall be coordinated with all disciplines to ensure that size and location of all required chases, soffits, access panel requirements, etc., are indicated on the plans. All ductwork and pipe larger than 12" shall be drawn double-line unless otherwise required by the Design Manual.

### 4.2.3 Sectional Views and Elevations

Sectional views and elevations that clearly define the details and space constraints shall be developed from floor plans included within the construction drawings. All mechanical equipment rooms shall have a minimum of two composite floor-to-ceiling sections with the cutting plane through the major axes that define equipment sizes, piping and ductwork, and their relationship to architectural, structural, and electrical installations. Full, half, revolved, and broken out sections are acceptable. Offset cutting planes are undesirable. Identify the clearances necessary to perform preventive maintenance and space requirements for equipment servicing/disassembly by dimensioning, noting and/or cross-hatching.

### 4.2.4 Mechanical Rooms

All mechanical rooms shall be designed and located to facilitate the removal, transport and replacement of the largest equipment component housed within the room. Mechanical room locations shall be depicted in plan view with expanded details shown by part plan at a scale no less than ¼" = 1' – 0". All ductwork and pipe larger than 6" shall be drawn double line. All mechanical rooms shall be adequately ventilated and provided with telephone jacks, convenience receptacles, hose bibbs, and floor drains. A minimum of one 120 volt duplex convenience receptacle shall be provided for each 400 sq. ft. or portion thereof of mechanical room floor space.

### 4.2.5 Control Sequence of Operations

Show all sequence of operations both graphically and described with text on the contract drawings.

### 4.2.6 Access and Accommodation for Future Equipment

The designated location for future equipment and its service clearance shall be clearly identified on the drawings. If practical, the entire haul path, from the point where the equipment enters the building envelope to the designated location, may also be marked or noted. If an adequately sized opening on the building envelope does not already exist, provisions, such as removable wall and roof panels, shall be made with prior approval of the DOA. In choosing the envelope opening scheme and location, consideration shall be given to hauling access to the building and the reach of cranes and lift-trucks.

### 4.2.7 Special, Tenant or Owner-Furnished Equipment

Special types of equipment, including owner-furnished and contractor-installed materials, shall be coordinated for correct rough-in and attachment requirements.

### 4.2.8 Interferences

Piping, ductwork, equipment, electrical conduits, etc. shall be reviewed for interferences that would prevent proper installation of each system.

### 4.2.9 Clearances

Piping, ductwork and equipment shall have adequate clearance between ceiling construction and the underside of beams, recessed lighting fixtures, and other interferences where space is limited.

### 4.2.10 Accessibility

Piping, ductwork, and equipment, including ceiling mounted devices shall be coordinated with building construction, beams, etc., to provide adequate clearances and accessibility for maintenance. Piping and electrical devices, such as panelboards, switchgear, and similar components, shall be coordinated with other engineering disciplines. Clearances and locations shall be demonstrated graphically, as early as practicable, but not later than 60% Submittal.

### 4.2.11 Penetrations

Mechanical equipment/utility penetrations through floors, walls, and roofs shall be coordinated and identified on the architectural and structural construction drawings. Proper cross-referencing between drawings shall be provided. Details for protection of all penetrations of fire resistive construction are required on plans submitted for a construction permit.

### 4.2.12 Equipment Protection and System Protection

Project specifications shall clearly indicate that all equipment and systems intended for a project shall be properly protected from damage, corrosion, and weather during shipment, in-transit storage, job-site storage, field/shop prep, installation, and checkout until the work is accepted by the DOA. Ends of piping, valves, ducts, and fittings shall be protected from abuse and the entry of moisture. Pumps, motors, electrical equipment, and other equipment with antifriction or sleeve bearings shall be stored in weather-tight structures maintained at a temperature of above 60° F. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. The DOA may, at Contractor's risk and expense, disallow or reject the installation of previously approved equipment, if it is later determined to have deteriorated considerably during the Contractor's custody, such as during shipment, storage, and/or installation.

### 4.2.13 Special Support and Anchors

Piping and ductwork supports, anchors, supports-guides, and pre-insulated versions thereof, which exert force on the structure other than those forces produced by gravity, equipment, and ductwork, shall be detailed on the structural drawings and coordinated with appropriate mechanical and plumbing drawings.

### 4.2.14 Fire and Smoke Dampers

Fire/smoke dampers and access panel requirements shall be properly identified on the mechanical drawings, coordinated with the designated fire/smoke barriers shown on the Architectural floor plans and as required by all applicable codes.

### 4.2.15 Cold Condensate

All cold condensate runoff in mechanical rooms shall be trapped, piped and terminated into funnel type floor drains located adjacent to the equipment served. The floor drain location and drain piping shall be coordinated and installed to avoid tripping hazards.

## 4.3 Piping Systems

### 4.3.1 Piping General

Construction Documents that specify piping shall include a schedule of application. The application schedule may be in tabular or outline format. It shall clearly identify each service, the intended pipe

material, pressure class, fittings, joints, pipe thickness/schedule, special notes, exclusions, options, etc.

### 4.3.2 Lead Free Joints

Lead or lead containing filler-metals shall not be used in joining copper tubing and fittings with brazed or soldered joints in potable water systems. For all new potable water systems, the Contractor shall be required to submit test results certifying the system to have lead free concentrations below 15 parts per billion (PPB) and copper concentrations below 1,300 PPB.

### 4.3.3 Underground Pipe Joints

Threaded joints shall not be used in any underground piping unless otherwise noted in a specific piping system in this manual. Brazed joints shall be required in all underground copper tubing.

### 4.3.4 Insulation for Existing Piping

New insulation shall be provided on existing piping where new connections are made, asbestos insulation has been removed or insulation has been damaged, or is missing. Fill all voids and seal joints between new and existing insulation.

### 4.3.5 Pipe Expansion Joints and Expansion Compensation Devices

Pipe expansion loops, L-bends, Z-bends and pipe offsets shall be provided to compensate for pipe expansion and contraction. If space is limited, metal-bellows, rubber, and packed slip pipe expansion joints and expansion compensation devices may be used with the DOA's written approval.

### 4.3.6 Pipe Wall Thickness

A minimum schedule 40 pipe wall thickness shall be required up to and including 10" steel pipes. The minimum steel pipe wall thickness shall be 0.375" for pipes 12" and larger.

### 4.3.7 Natural Gas Pipelines

[Content to be developed]

### 4.3.8 Domestic Water Pipe Material

**4.3.8.1** DOMESTIC HOT AND COLD WATER

Domestic Hot and Cold Water Lines Shall Meet the Following Requirements: Tubing: Seamless copper tube per ASTM B 88, Type L (interior) or Type K (exterior and interior below the grade slab). Joints: Soldered with copper-phosphorous alloy (95%Tin-5% Antimony) filler metal. Fittings: Cast copper alloy pressure fitting per ASME B16.18 or wrought copper and copper alloy pressure fitting per ASME B16.22.

**4.3.8.2** DISINFECTION

All domestic hot and cold water lines shall be disinfected prior to utilization per the requirement of the International Plumbing Code.

### 4.3.9 Make-Up Water

**4.3.9.1** BACKFLOW PREVENTERS

Backflow preventers shall be provided to prevent cross contamination with potable water lines. Make-up water lines shall meet the following requirements:

**4.3.9.2** MAKE-UP WATER 2" AND SMALLER
Seamless copper tube per ASTM B88, Type L. Joints soldered with 95% tin- 5% antimony filler metal. Cast copper alloy pressure fittings per ASME B16.18 or wrought copper and copper alloy pressure fittings per ASME B16.22. Black or galvanized steel - ASTM A53, Schedules 40 and 80. Pipe joints shall be threaded in accordance with ANSI/ASME B1.20.1.

**4.3.9.3** MAKE-UP WATER 2½" AND LARGER
Black or galvanized steel – ASTM A53, Schedule 40. Pipe joints shall be beveled and butt-welded or threaded in accordance with ANSU/ASME B1.20.1.

**4.3.9.4** UNDERGROUND WATER MAINS
For Underground Water Mains located outside the building footprint, refer to the appropriate Chapters under relevant Landside or Airside Design Standards Section.

### 4.3.10 Irrigation Piping

Allowable piping material for irrigation systems are:

- Ductile Iron
- ABS
- CPVC
- PVC Schedule 40.

### 4.3.11 Heating Hot Water General Requirements

Heating hot water system shall be defined as a system containing water not exceeding 180º F. The heating hot water piping system shall meet the following requirements:

**4.3.11.1** OPERATING PRESSURE AND TEMPERATURE
The operating pressure and temperature shall be determined by the Design Consultant for each project. The minimum design pressure and temperature for the heating hot water system shall be 150 psig at 250º F.

**4.3.11.2** The piping system shall be in strict accordance with ASME B31.9, Building Services Piping Code, except that 2 of the first 6 production welds of each qualified welder shall be randomly selected by the DOA and radiographed and 10% of the remaining shop and field joints shall be randomly selected by the DOA and radiographed. All radiographic examinations shall be performed by an independent inspector who is qualified and certified. All radiographic inspection shall be performed as required per ASME B31.1, Power Piping Code. Acceptance standards shall be per ASME B31.9. The cost of all radiograph examinations shall be the responsibility of the Contractor.

**4.3.11.3** Failure of any field joints will require cutting and re-welding the joint. After the joint is re-welded, one additional weld will be selected by the DOA for a radiographic examination at the Contractor's expense.

**4.3.11.4** The hydrostatic test pressure shall be 1.5 times the design pressure.

### 4.3.12 Pipes 2" and Smaller

**4.3.12.1** BLACK STEEL
ASTM A53, Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Schedule 40. Pipe joints shall be threaded in accordance with ANSI/ASME B1.20.1. (Interior and exterior).

**4.3.12.2** SEAMLESS COPPER TUBE
ASTM B88, Type L, Hard drawn. Pipe joints shall be solder joint, 95%-5% solder composition (Tin-Antimony) per ASTM B32. Interior use only with prior written approval of the DOA.

### 4.3.13 Pipes 2½" Or Larger

**4.3.13.1** BLACK STEEL
ASTM A 53 Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Schedule 40. Pipe joints shall be beveled and butt-welded interior and exterior.

### 4.3.14 Chilled Water System Requirements

The chilled water piping system shall meet the following requirements:

**4.3.14.1** The operating pressure and temperature shall be determined by the Design Consultant for each project. The minimum design pressure and temperature for the chilled water piping system shall be 150 psig at 100º F.

**4.3.14.2** All piping joints shall be radiographed in accordance with the requirements stated in the following three paragraphs. All radiographic examinations shall be performed by an independent inspector who is qualified and certified. Failure of any field joints will require cutting and re-welding the joint. After the joint is re-welded, an additional weld will be selected by the DOA for a radiographic examination at the Contractor's expense.

**4.3.14.3** All piping in buildings (piping on the building side of the isolation valve between the building and the campus distribution system) shall be in strict accordance with ASME B31.9, Building Services Piping Code, except that 2 of the first 6 production welds of each qualified welder shall be randomly selected by the DOA and radiographed and 10% of the remaining shop and field joints shall be randomly selected by the DOA and radiographed. All radiographic inspection shall be performed as required per ASME B31.1, Power Piping Code. Acceptance standards shall be per ASME B31.9.

**4.3.14.4** CENTRAL PLANT PIPING
All central plant piping and all campus distribution system piping shall be in strict accordance with ASMEB31.1, Power Piping Code. For underground direct buried distribution piping only, a radiographic examination shall be required on 100% of all field joints. For all other central plant and campus distribution system piping, 2 of the first 6 production welds of each qualified welder shall be randomly selected by the DOA and radiographed and 10% of the remaining shop and field joints shall be randomly selected by the DOA and radiographed.

**4.3.14.5** HYDROSTATIC TEST PRESSURE
The hydrostatic test pressure shall be 1.5 times the design pressure.

**4.3.14.6** COLD CONDENSATE DRAIN PUMP
Were there is not an appropriate slope for condensate drainage, install a pump on emergency power.

### 4.3.15 Piping 2 Inch Diameter and Smaller

Black Steel - ASTM A53, Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Schedule 80, except that Grade B, Schedule 40 may be used for building services piping in accordance with ASME B31.9. Pipe joints shall be threaded in accordance with ANSI/ASME B1.20.1. Seamless Copper Tube - ASTM B88, Type L, Hard drawn. Pipe joints shall be solder joint, 95%-5% solder composition (Tin-Antimony) per ASTM B32. (Interior use only with prior approval of the DOA).

### 4.3.16 Piping 2½" To 24" Diameter

Black Steel - ASTM A 53 Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Standard Schedule (same as Schedule 40 for 10" diameter and under; for 12" to 24" diameter, wall thickness is 0.375"). Pipe joints shall be beveled and butt-welded.

### 4.3.17 Underground Direct Buried Pipes - All Sizes

**4.3.17.1** Pipes shall be pre-fabricated and pre-insulated ready for installation.

**4.3.17.2** Protective Jacket: Corrosion resistant material encasing the insulation on the pipe.

**4.3.17.3** Where possible, pipes shall be provided with double random length (approximately 40' long) to minimize the number of field joints.

### 4.3.18 Condenser Water (Cooling Tower)

**4.3.18.1** Central Plant condenser water piping shall be in strict accordance with ASME B31.1, Power Piping Code, except that a radiographic examination shall be required for 10% of all shop and field welded joints.

**4.3.18.2** For each qualified welder, 2 of the first 6 production welds in the field shall be selected and radiographed. All radiographic examinations shall be performed by an independent inspector who is qualified and certified. Failure of any joints will require cutting and re-welding the joint. After the joint is re-welded, one additional weld will be selected by the DOA for a radiographic examination at the Contractor's expense.

**4.3.18.3** Condenser water piping, 2" and smaller, shall be black steel ASTM A53, Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Schedule 80. Pipe joints shall be threaded in accordance with ANSI/ASME B1.20.1.

**4.3.18.4** Condenser water piping 2½" and larger, shall be black steel ASTM A 53 Type S (seamless) or Type E (Electric-Resistance Welded), Grade B, Standard Schedule (same as Schedule 40 for 10" diameter and under; for 12" to 24" diameter, wall thickness is 0.375"). Pipe joints shall be beveled and butt-welded. Pipe wall thickness shall be in conformance with ASME B31.1.

### 4.3.19 Refrigerant Piping

Refrigerant Piping - Type ACR hard drawn copper tubing. Minimum 15% silver solder shall be used in joining copper tubing.

### 4.3.20 Equipment Vents

Equipment vents – Schedule 40 black steel or Type L copper.

### 4.3.21 Air-Conditioning Condensate

**4.3.21.1** AIR-CONDITIONING CONDENSATE DRAIN
Type L hard drawn copper. PVC is permitted for condensate drain for rooftop equipment, provided it is properly pitched and supported.

**4.3.21.2** AIR-CONDITIONING CONDENSATE DRAIN PUMP
Were there is not an appropriate slope for Air-Conditioning condensate drainage, install a pump on emergency power.

### 4.3.22 Sanitary Building Gravity Drains

**4.3.22.1** JOINTS
Sanitary building gravity drains above grade slab shall be service class cast-iron, hub/spigot or hub-less type joints.

**4.3.22.2** COUPLINGS
Couplings shall be heavy-duty, type 304 stainless steel. Below grade slab shall be extra heavy class cast-iron, hub/spigot type joints.

**4.3.22.3** MINIMUM SLOPE
All piping shall be provided with a minimum drain slope of ⅛" per foot.

**4.3.22.4** MINIMUM SIZE
The minimum size of a gravity building sanitary drain below grade shall be 3".

### 4.3.23 Vent Piping

Above grade slab vent piping and fittings shall be cast iron hubless type joints with heavy-duty type 304 stainless steel couplings or schedule 40 galvanized steel pipe with drainage fittings.

### 4.3.24 Sanitary Sewer (Buried Exterior)

Sanitary sewer shall be ductile iron, with appropriate type joints, schedule 40 PVC per ASTM D2665 with solvent cement joints per ASTM D2564 or HDPE conforming to ASTM D3350 may be used with prior written approval by the DOA no later than the 60% design submittal.

### 4.3.25 Sanitary Force Mains (Exterior)

**4.3.25.1** MECHANICAL JOINTS
Sanitary force mains shall be ductile iron pipe with mechanical joints, hub/spigot type.

**4.3.25.2** FORCE MAINS
Sanitary force mains shall be ductile iron pipe with push-on joints.

**4.3.25.3** SCHEDULE 80 PVC EXCEPTION
Pipes 3 inches or less may be Schedule 80 PVC with solvent cement joints per ASTM D2564 with prior written approval by the DOA, no later than the 60% design submittal.

### 4.3.26 Sanitary and Storm Force Mains (Interior)

Above grade slab sanitary and storm force mains within facilities shall be a minimum 2" copper piping with soldered joints or schedule 40 galvanized steel pipe with pressure fittings or a grooved joint system, respectively.

### 4.3.27 Storm Building Gravity Drain

Above grade slab cast iron piping shall be service weight with hubless or hub/spigot type joints. Below grade slab cast iron piping shall be extra heavy with hub/spigot type joints. All cast iron pipe and fittings shall be per ASTM A74. Couplings shall be heavy-duty, type 304 stainless steel. All piping shall be provided with a minimum drain slope of ⅛" per foot. Schedule 40 PVC may be acceptable for small buildings, except in an air plenum, with prior written approval of the DOA no later than the 60% Design Submittal.

### 4.3.28 Subsoil Drainage

Piping material for Subsoil drainage shall be perforated PVC.

### 4.3.29 Natural Gas (Interior and Exterior – Above Ground)

**4.3.29.1** NATURAL GAS (INTERIOR)
Schedule 40 black steel, malleable iron fittings. Only welded joints are allowed in concealed spaces.

**4.3.29.2** NATURAL GAS (EXTERIOR)
[Content to be developed in the Future]

### 4.3.30 Natural Gas (Exterior Underground)

All exterior underground natural gas piping shall be provided by Gas Utility Company. Natural gas pipeline material (exterior underground, upstream of meters) is as follows:

**4.3.30.1** Intermediate Pressure System: 30 psi or lower Medium Density Polyethylene (MDPE) ASTM D1513.

**4.3.30.2** Medium Pressure System: 58 to 90 psi – High Density Polyethylene (HDPE) ASTM D2513.

### 4.3.31 Natural Gas Pipeline Installation

**4.3.31.1** PIPES 2" AND SMALLER
Pipes 2" and smaller in diameter shall be provided in roll form.

**4.3.31.2** PIPES LARGER THAN 2"
Pipes larger than 2" in diameter shall be provided in appropriate straight lengths.

**4.3.31.3** PIPE CASINGS
All metal casing pipes for the natural gas lines shall be epoxy coated and shall have cathodic protection. The ends of the casing pipe shall extend beyond concrete/asphalt pavements into grass areas and shall be left open.

**4.3.31.4** BACKFILL MATERIAL
Bluestone dust shall be used as initial backfill material to provide a minimum of 6" encasement around the natural gas pipelines.

**4.3.31.5** UNDERGROUND NATURAL GAS PIPE MARKINGS
For Underground Natural Gas Pipe markings, refer to the appropriate Chapters under the relevant Landside or Airside Design Standards Section.

### 4.3.32 Piping Identification Markings and Color Codes General

**4.3.32.1** Pipe Marker Bands
All piping shall be identified by the use of pipe marker bands. Pipes shall be marked in accordance with the Latest ASME A13.1 standards and color coded as indicated in following Table.

**4.3.32.2** Direction Arrows
Markings shall include arrows indicating direction of flow.

**4.3.32.3** Marking Locations
Markings shall be installed at a minimum of every 20' on straight runs where there are no visibility obstructions. In areas where visibility of pipe is obstructed or numerous other pipes exist, markings

shall be installed as approved to enable a pipeline to be easily traced along its entire path the entire length of the indoor natural gas piping shall be painted yellow.

**4.3.32.4** Underground Utility Piping Legend

Refer to the Utility Chapter under the Section for LANDSIDE DESIGN STANDARDS or AIRSIDE DESIGN STANDARDS for the respective requirements for marking underground utility piping.

### 4.3.33 Piping Identification Legend

| LEGEND | LETTER COLOR | BACKGROUND COLOR |
|---|---|---|
| Chilled Water Return | White | Green |
| Chilled Water Supply | White | Green |
| Compressed Air | Black | Yellow |
| Condensate Drain | Black | Yellow |
| Condenser Water Supply | White | Green |
| Condenser Water Return | White | Green |
| Domestic Cold Water | White | Green |
| Domestic Hot Water | Black | Yellow |
| Drain | White | Green |
| Exhaust | Black | Yellow |
| Fire Protection Water | White | Red |
| Fuel Oil | Black | Yellow |
| Fuel Oil Vent | Black | Yellow |
| Gasoline | Black | Yellow |
| Glycol | Black | Yellow |
| Hi-Temp Hot Water Supply | Black | Yellow |
| Hi-Temp Hot Water Return | Black | Yellow |
| Hot Water Supply | Black | Yellow |
| Hot Water Return | Black | Yellow |
| Industrial Wastewater | White | Green |
| Irrigation | Black | Yellow |
| Make-Up Water | White | Green |
| Natural Gas | Black | Yellow |
| Non-Potable Water | Black | Yellow |
| Vent | White | Green |
| Potable Water | White | Green |
| Pumped Condensate | White | Green |
| Domestic Hot Water - Recirculation | Black | Yellow |
| Refrigerant Liquid | Black | Yellow |
| Refrigerant Suction | Black | Yellow |
| Roof Drain | White | Green |
| Sanitary Sewer | White | Green |
| Secondary Hot Water Return | Black | Yellow |
| Secondary Hot Water Supply | Black | Yellow |
| Secondary Chilled Water | White | Green |
| Softened Water | White | Green |
| Storm Sewer | White | Green |
| Domestic Tempered Water | Black | Yellow |

#### 4.3.34 Piping Installation

For critical areas, a detailed area chart/plan shall be furnished and prominently displayed showing the location(s) of all new or revised piping and valves and sizes thereof. All piping shall be labeled for identification purposes.

#### 4.3.35 Welding Inspector Qualifications

Welding inspections and non-destructive testing shall be performed by individuals who are certified as AWS-QC1 Inspectors. When 100% visual inspection of welding is required, the qualified inspector shall be present on a full-time basis during the welding process.

#### 4.3.36 Welding Acceptance Standards

**4.3.36.1** VISUAL
The Contractor shall be responsible for visual inspection. Visual inspection shall meet the requirements of ASME B31.1, B31.9, and AWS-D1.1, as appropriate for the visual examination for the weldments.

**4.3.36.2** RADIOGRAPHIC
When welds have been either identified in the Construction Documents or randomly selected by the DOA for radiographic examination, the acceptance criteria of ASME B31.1, and AWS D1.1 for radiographic examination will take precedence over the visual examination requirements normally required for those welds as the basis of rejection.

#### 4.3.37 Inspections and Tests by the DOA

The DOA may perform random inspection and supplemental non-destructive testing (NDT) throughout the project. The cost of supplemental NDT will be borne by the DOA. The Contractor shall be responsible for all correction and repair of defects and the re-examination of weld repairs at no cost to the DOA.

#### 4.3.38 Water Treatment General

[Content to be developed in the future]

## 4.4 Heating, Ventilating, and Air Conditioning (HVAC)

#### 4.4.1 General

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below.

#### 4.4.2 Design Conditions

The winter and summer indoor comfort design dry-bulb temperatures shall be 70º F and 75º F respectively, unless otherwise indicated. Indoor summer design relative humidity shall be 50%. Humidification system is generally not required except for special purpose spaces or facilities as so designated. Outside design temperatures shall be as indicated in the current edition of the ASHRAE Handbook of Fundamentals. Outside design conditions shall be as recommended by ASHRAE, 1 and 99% frequency intervals for summer and winter respectively as indicated below:

Summer: 92° F, Dry Bulb; 76° F, Wet Bulb

Winter: 20° F, Dry Bulb

### 4.4.3 Indoor Air Quality

Minimum acceptable indoor air quality, including maximum permissible indoor concentrations of contaminants shall be in accordance with the latest version of ASHRAE Standard 62 - Ventilation for Acceptable Indoor Air Quality.

### 4.4.4 Air Filtration

During planning, new design and renovation design, Design Consultant shall evaluate the need to provide gas phase filtration. Media should be selected for a minimum service life of 12 months under the operating conditions expected. The Design Consultant shall not consider electronic air cleaners. The Contractor is required to verify that the system as installed meets the service life requirement.

### 4.4.5 Outside Opening Protection

Outside air intake openings and exhaust openings shall be protected with screens with opening size of ⅜" minimum and ½" maximum; all screens must be fully accessible for cleaning and replacement.

### 4.4.6 Special Ventilation Requirements

### 4.4.7 Designated Smoking Areas

Per the City of Dallas ordinance there are no Designated Smoking Areas permitted at Aviation facilities.

### 4.4.8 Toilet Rooms

The minimum exhaust from toilet rooms shall be 100 CFM per water closet or urinal, or 2 CFM per sq. ft. of room area, whichever is greater.

### 4.4.9 Janitor's Closets

The minimum exhaust from janitor's closets shall be 100 CFM per service sink or mop sink, or 2 CFM per sq. ft. of room area, whichever is greater.

### 4.4.10 Re-Circulation of Air

Return air systems shall not convey objectionable odors from one occupancy area to another of dissimilar use. Isolation of objectionable odors shall be considered early in the design of air handling equipment with return air systems.

### 4.4.11 Outside Air Ventilation

**4.4.11.1** GENERAL
The Design Consultant shall design outside air-intake systems in a manner that prevents aircraft and other exhausts from both Airside and Landside from being pulled into the system.

**4.4.11.2** CALCULATION SUBMITTAL REQUIREMENTS
Mechanical calculations shall be submitted that detail the basis for determining the quantity of outside air provided. Calculations shall be summarized in a manner that facilitates mechanical code review.

**4.4.11.3** OUTSIDE AIR QUALITY
The outside air quantity shall be sufficient for both building pressurization and occupancy requirements.

**4.4.11.4** OUTSIDE AIR VENTILATION REQUIREMENTS
Outside air ventilation requirements and the location of outside air intakes shall be considered early in design.

**4.4.11.5** OUTSIDE AIR VENTILATION QUANTITY
The calculated outside air ventilation quantity shall provide both for base building and Tenant requirements.

### 4.4.12 Infiltration at Building Entrances

**4.4.12.1** EVALUATION
The designers shall evaluate the effect of infiltration of outside air at building entrances both winter and summer conditions.

**4.4.12.2** EVALUATION CRITERIA
The evaluation shall include the frequency of door opening, the prevailing wind speed and direction, and the adjacency and type of occupants (such as, transient vs. non-transient).

**4.4.12.3** DESIGN CRITERIA
The design shall include architectural arrangements and/or mechanical systems that where required to limit temperature variations to acceptable levels.

### 4.4.13 Electrical Equipment Rooms and Electrical Closets

**4.4.13.1** WITHIN AIR-CONDITIONED SPACE
Where located within buildings that are air-conditioned, electrical rooms and closets containing substations or switchboards and panelboards shall be air-conditioned if practicable.

**4.4.13.2** WITHIN NON AIR-CONDITIONED SPACE
In other locations, the room shall be cooled with mechanical ventilation and ventilation air shall be filtered.

**4.4.13.3** COOLING REQUIREMENTS
Adequate cooling shall be provided for electrical closets that contain transformers or other heat generating equipment.

### 4.4.14 Noise Control

**4.4.14.1** GENERAL DESIGN CONSIDERATIONS
During planning, new design, and renovation design, designers shall consider the anticipated indoor activities and related noises likely to be generated in each space. Noise level recommendations in ASHRAE fundamentals and systems handbooks may be used as a minimum standard.

**4.4.14.2** NOISE MITIGATION
Where necessary, noise reduction features shall be specifically included in the design to obtain acceptable sound levels.

**4.4.14.3** OPERATING AND MAINTENANCE PERSONNEL
Operating and maintenance personnel are, by necessity, present in central plants, mechanical equipment rooms, and other indoor utility rooms for long periods at a time. Designers may be required

to prove to the satisfaction of the DOA that the overall noise level in such indoor locations and adjacent spaces are not objectionable or harmful to personnel, or that effective noise reduction/containment features or accessories have been provided in the design. At such locations consideration shall be given to the treatment of individual noisy equipment or group treatment, especially where multiple equipments may operate simultaneously.

**4.4.14.4** CENTRAL PLANTS
For central plants, designers shall perform a noise level analysis and present alternative schemes for reduction of noise levels to acceptable levels, while also maintaining acceptable maintenance access to equipment.

**4.4.14.5** MAXIMUM SOUND LEVEL
In no case shall the sound level exceed 85 db(a) continuous or 140 db impulse, regardless of the duration of exposure.

### 4.4.15 HVAC Systems Central Plant

Except for facilities in remote areas where service from the central utility plant is not feasible, all heating, ventilating, and air conditioning systems shall be designed to utilize the central plants. All new construction shall be designed based on the premise that high temperature hot water will not be available during the summer months. Central plants at each Airport are designed to produce chilled water and high temperature hot water as follows:

**4.4.15.1** CHILLED WATER
Chilled water is supplied at 42° F with a design return temperature of 60° F.

**4.4.15.2** HIGH TEMPERATURE HOT WATER
Heating hot water systems (approximately 200º F) that are designed for use with air handling equipment that utilizes 100% outside air shall use glycol for freeze protection.

### 4.4.16 Heating Hot Water and Chilled Water Coils

**4.4.16.1** MINIMUM TUBE WALL THICKNESS
Heating hot water (approximately 180° F) and chilled water coils shall be provided with a minimum tube wall thickness of .025".

**4.4.16.2** NUMBER OF FINS
The number of fins per inch shall not exceed 12.

**4.4.16.3** CHILLED WATER COILS
Chilled water coils shall be selected with coil circuiting that avoids heat transfer degradation due to laminar flow.

**4.4.16.4** TUBE VELOCITIES
Full load tube velocities of minimum 3' per second should be selected while avoiding excessive water pressure drops.

### 4.4.17 End-Of-Run Bypasses

**4.4.17.1** CHILLED WATER SYSTEMS
Where end-of-run bypasses are used in chilled water systems, flows shall be regulated so as to not significantly diminish the system return water temperature.

**4.4.17.2** HOT WATER SYSTEMS

Where end-of-run bypasses are used in high temperature hot water systems, flows shall be regulated so as to not significantly increase the system return water temperature.

### 4.4.18 Water for Heat Rejection

**4.4.18.1** USE OF POTABLE WATER
The use of potable water for heat rejection in water-cooled refrigeration equipment is not normally permitted. When permitted, such water shall not be returned to the Airport potable water system.

**4.4.18.2** CONNECTION TO BUILDING CENTRAL SYSTEMS
Connection to the building central chilled water system may be allowed for cooling equipment condensers, such as refrigerators, ice-makers, yogurt machines, etc.

**4.4.18.3** COOLING TOWER LOCATIONS
The use of chilled water or potable water for heat rejection, and the locations selected for cooling towers, shall be subject to approval of the DOA.

### 4.4.19 Air Handling Systems

The minimum supply air temperature for air handling systems shall be 50° F DB unless written approval for an alternate supply air temperature is obtained from the DOA, no later than the 60% Design Review Meeting.

### 4.4.20 Electric Resistance Heating

Electric resistance heating shall not be used for either the primary or back-up system without written approval from the DOA, no later than the 60% Design Review Meeting.

### 4.4.21 Welding in High Temperature Hot Water Systems

**4.4.21.1** WELDERS QUALIFICATIONS
Each welder and welding operator assigned to work on high temperature hot water systems shall be qualified in accordance with the applicable requirements of ASME B31.1, B31.3, B31.4, B31.5, or B31.8.

**4.4.21.2** WELDING INSPECTOR QUALIFICATIONS
For Welding Inspector Qualifications and Welding Acceptance Standards, refer to Section XXX, Paragraph XX.X.

### 4.4.22 Heat Exchangers

**4.4.22.1** PLATE TYPE HEAT EXCHANGERS
Horizontal stainless steel plate type heat exchangers are preferred for use in chilled water systems. Horizontal plate type heat exchangers are required for medium temperature heating hot water (HW) to heat hot glycol solution heat transfer applications. High temperature hot water shall not be used to heat glycol solution.

**4.4.22.2** SHELL AND TUBE HEAT EXCHANGERS
Shell and tube heat exchangers are required for the High Temperature Hot Water (HTHW) to Hot Water (HW) service. The HTHW to HW heat exchanger designed capacity shall be 75% of the calculated heating load. The design and installation of the heat exchanger shall comply with following applicable requirements:

- City of Dallas Boiler and Pressure Vessel Safety Act

- ASME Boiler and Pressure Vessel Code, Section VIII.

**4.4.22.3** SELECTION CRITERIA
The heat exchanger shall be selected for the expected thermal cycling based on heating load variation. The need for anchors and isolation of the HTHW and hot water piping near the point of connection to the heat exchanger shall be evaluated by the designer to ensure that excessive stress is not transferred to the heat exchanger or piping.

**4.4.22.4** TUBE/SHELL DESIGN CONDITIONS
The minimum design pressure and temperature of HTHW (tubeside) shall be 450 psig at 380° F. The tube material and thickness shall be suitable to meet the design criteria. The heat exchanger shall be located such that the tube bundle may be removed/ repaired without disassembly/ removal of piping and wall. The clear space for tube bundle removal must be shown on plans. The minimum design pressure and temperature of secondary hot water (shellside) shall be 150 psig at 250° F.

**4.4.22.5** SHELL PROTECTION
The heat exchanger shell shall be protected with a pressure relief valve with pressure relief piping extended to an outdoor location that does not cause a hazard, as approved by the DOA. The heat exchanger shell shall be provided with a (minimum) 3-inch flanged connection for the pressure relief valve. Pressure relief piping shall have welded joints. The design and installation of the heat exchanger and pressure relief piping shall conform to ASME B31.1 “Power Piping Code”.

**4.4.22.6** PRESSURE RELIEF VALVE AND PIPING
The pressure relief valve and piping shall be sized to relieve the full tube rupture flow to outdoor per ASME Boiler and Pressure Vessel Code, Section VIII, Paragraph UG-133(d) interpretation VIII-89-85. Design calculations for the relief valve and piping shall be provided. The routing of the pressure relief piping and the termination location shall be considered early in the facility design process.

**4.4.22.7** CONTROL SYSTEM
The heat exchanger controls shall be provided and installed by Trane ES Building Control Systems, and shall be interfaced with the existing Airport EMCS system.

**4.4.22.8** TEMPERATURE REGULATION OF SECONDARY HOT WATER
The secondary hot water supply temperature shall be controlled to the set point by a normally closed automatic temperature control valve in the HTHW return piping from the heat exchanger. This automatic temperature control valve shall be sized specifically for the intended application. Over sizing of the temperature control valve (such as, installation of a line size valve) shall be avoided to prevent a large temperature fluctuation resulting from an unstable valve operation. The valve actuator shall be sized and selected with adequate torque to close off against the operating differential pressure not less than 110 psig between HTHW supply and return mains.

### 4.4.23 Safety Controls and Alarms

**4.4.23.1** AUTOMATIC ISOLATION VALVE
As a safety measure, an additional normally closed automatic isolation valve is required in the HTHW supply pipe at the heat exchanger. The function of this valve is described below under “Software and Hardwired Safeties”. The valve actuator shall be sized and selected with adequate torque to close off against the maximum operating differential pressure between HTHW supply and return mains. The following safety features shall be provided:

**4.4.23.2** SOFTWARE SAFETIES
The following software safeties are required;

**A.** These software safeties shall not be overridden when the EMCS is operated in "Operator Priority" mode.

**B.** A Maximum rate of opening of automatic temperature control valve in HTHW return pipe shall be full stroke of valve stem in 30 minutes (adjustable) to prevent thermal shock under all operating conditions.

**4.4.23.3** AUTOMATIC TEMPERATURE CONTROL VALVE

The automatic temperature control valve in HTHW return pipe and the automatic isolation valve in HTHW supply pipe shall close under the following conditions:

**A.** Lack of operation of either secondary hot water pumps (lead pump and standby) as sensed by pump starters.

**B.** Lack of operation of either secondary hot water pumps (lead pump and standby) as sensed by pump differential pressure switch such as, pump coupling failure.

**C.** Secondary hot water supply temperature leaving the heat exchanger exceeds the set-point by 10º F (adjustable).

**D.** Secondary hot water supply pressure exceeds 135 psig (adjustable).

**E.** Detection of out range condition for secondary hot water supply temperature transmitter and/or pressure transmitter.

**F.** After valves are commanded closed, the secondary hot water pumps shall operate for a minimum of 5 minutes (adjustable) to remove residual heat from the heat exchanger before they are shut-down.

**4.4.23.4** SOFTWARE ALARMS

The following software alarms shall be programmed into the EMCS system as a minimum:

**A.** High secondary hot water supply temperature immediately leaving the heat exchanger as served by a remote bulb thermostat (binary input).

**B.** High secondary hot water supply temperature immediately leaving the heat exchanger (analog).

**C.** High secondary hot water supply pressure immediately after the heat exchanger (analog).

**D.** Secondary hot water pump(s) on-off status from pump starter auxiliary contacts (binary input).

**E.** Low pressure differential pressure across secondary hot water pump(s) (binary input).

**F.** Expansion tank high pressure (analog).

**G.** Expansion tank low pressure (analog).

**H.** Out of range condition for secondary hot water supply temperature transmitter.

**I.** Out of range condition for the secondary hot water supply pressure transmitter.

**4.4.23.5** HARDWIRED SAFETIES

The following hardwired safeties shall be provided as a minimum. These safeties shall not be overridden by Hand-Off-Automatic (HOA) switches for the secondary hot water pumps in any switch position. The automatic temperature control valve in HTHW return pipe and the automatic isolation valve in HTHW supply pipe shall close under the following conditions:

**A.** EMCS panel failure.

**B.** Loss of power to control system.

**C.** Lack of closure of auxiliary contacts at motor starter on at least one secondary hot water pump.

**D.** High secondary hot water supply temperature immediately leaving the heat exchanger. Provide manual reset.

**E.** Low differential pressure at secondary hot water pump(s).

**F.** Closure of valves by hardwired safeties shall have no effect on secondary hot water pump operation.

**4.4.23.6** LOCAL CONTROL PANEL

A local control panel shall be provided inside the entry door to the mechanical room where the heat exchanger is located. This control panel shall be equipped with "HTHW Shutdown" and "Reset" pushbuttons. Depressing the "HTHW Shutdown" button shall open the hardwired safeties circuit and close the automatic temperature control valve in HTHW return pipe and the automatic isolation valve in HTHW supply pipe in order to test the valve closure function. Depressing the "Reset" button shall close the hardwired safeties circuit and allow the valves to open under the normal sequence of operation.

### 4.4.24 Air-Conditioning Equipment and Power Supply

**4.4.24.1** REFRIGERANT PRESSURE DEVICE

All air-conditioning units, 3 tons or greater, shall be equipped with a high/low refrigerant pressure device with manual reset.

**4.4.24.2** VARIABLE SPEED DRIVES

All central station air-handling system designs shall include a review of the applicability of two-speed motors and variable speed drives with manual override provisions.

**4.4.24.3** CONDENSING UNITS ON GRADE

Air-conditioning condensing units on grade shall be set on a poured concrete slab with a minimum thickness of 4". Pre-cast concrete slabs and extruded polycarbonate pavers are prohibited.

**4.4.24.4** FLOOR MOUNTED AIR-HANDLING EQUIPMENT

Design Consultant shall consider the height requirement to allow proper drainage of condensate from the cooling coil pan in draw-thru air-handling equipment via a condensate trap in relationship to the negative pressure induced by the operation of such equipment. The drainage of the condensate shall not be impaired due to the lack of height between the elevation of the cooling coil pan drain connection and the finished floor. The height of the condensate trap and the concrete pad on which the air-handling equipment is installed shall be clearly shown and specified in Contract Documents.

**4.4.24.5** POWER SUPPLY

Air-conditioning units shall be 480 volts rated, if available. Units over 3 tons shall be 3 phases. Units 5 tons or larger shall be equipped with single-phase, phase-reversal and under-voltage protection. Automatic reset is acceptable. Units greater than 15 tons shall require manual reset. For buildings that have 3 or more air-conditioning units, reset switches shall be located in one designated location in a central control unit designed to allow units to be manually reset in a staged sequence.

### 4.4.25 Rooftop Equipment

**4.4.25.1** GENERAL

Roof-mounted equipment is generally not permitted. Approval for the use of roof-mounted equipment shall be obtained prior to design, when alternative locations for indoor or ground models are not available.

**4.4.25.2** ACCESS

Acceptable access to all roof-mounted equipment shall be provided. Ladders, where provided, shall be OSHA approved.

**4.4.25.3** EQUIPMENT MOUNTING
Vibration eliminators shall be installed on the mountings of all rooftop equipment.

**4.4.25.4** PAINTING OF VISIBLE COMPONENTS
Rooftop equipment, including supports, piping, ductwork, electrical conduit, etc. , that is visible from the street, adjacent parking lots or elevated roadways shall be painted to match adjacent wall surfaces.

**4.4.25.5** CURB HEIGHT
Curb mounted height above the roof shall be a minimum of 12".

**4.4.25.6** CONDENSATE LINES
Condensate lines from all rooftop equipment (AHU, A/C, and chillers) shall be piped according to manufacturer's recommendation but no less than ¾" pipe and shall be terminated at roof drains where practical. Direct discharge of any drain type is not permitted. All condensate drains shall be trapped, and a union fitting shall be provided at each side of the trap. Condensate drain piping on roof shall be securely mounted.

**4.4.25.7** VISUAL SCREENING
Visual screening is required for all roof-mounted equipment. Refer to SECTION 4:2.11 Visual Screens.

**4.4.25.8** CLEARANCES ABOVE ROOFTOP
Rooftop equipment (air-handler units, air-conditioners, chillers, etc.) shall include provisions to raise or install equipment in such a manner that all equipment is structurally supported to provide a minimum 18" clearance above the rooftop. Whenever the mounting height of the equipment above the roof exceeds 7' – 6" measured to top of panel, a grated platform and ladders shall be provided at all locations where maintenance access is required.

**4.4.25.9** PIPING, DUCTWORK, AND UTILITY REQUIREMENTS
All piping, electrical conduits, ductwork, or other utilities shall be run underneath the roof deck and connected to the equipment. In those instances during retrofits, where it proves impossible to connect from below, permission to connect above the roof shall be obtained in writing through the DOA designated construction representative from Facilities Maintenance, and all lines shall be secured and supported a minimum 18" above the roof. Supporting frames shall be cylindrical, metal and rigid, and shall be mounted to the roof structural members and flashed into the existing roof for a watertight seal. Pitch pockets and wood supports are not acceptable. Adequate nighttime lighting equipped with a switch is required for maintenance and repair functions. A frost-proof hose bib, ¾" cold water service with piping supports, and weatherproof GFCI electrical convenience receptacle on a dedicated circuit are required for maintenance.

### 4.4.26 Ductwork

**4.4.26.1** DUCT CONSTRUCTION
All heating, ventilating, and air-conditioning ductwork systems, including basic duct construction fittings, hangers, supports, casings, and exterior components shall be constructed and installed in accordance with the latest edition of SMACNA and ASHRAE standards. Generally, rigid ductwork designed for the purpose of environmental conditioning shall be zinc-coated sheet steel (standard

G60 coating) to conform to specific pressure-velocity classifications as defined by SMACNA Duct Construction Standards.

**4.4.26.2** FLEXIBLE CONNECTIONS
Flexible connections of neoprene-coated flameproof fabric shall be utilized wherever ductwork is connected to rotating equipment, such as fans, air-handling units, etc., that may induce thermal, axial, transverse, or torsional movement.

**4.4.26.3** FLEXIBLE DUCT
Flexible duct shall comply with UL 181 Class 1, shall meet or exceed NFPA 90A-90B rating, and shall have pressure rating of 6-inch wg positive and 1- inch wg negative for duct with diameter up to 12-inch. Maximum length of flexible duct shall be 5 feet. Flexible duct shall not penetrate floor/ceiling assemblies.

**4.4.26.4** DUCT ACCESS OPENINGS
Duct access openings in all main duct feeders in every straight segment shall be provided. For segments longer than 50', an access panel shall be installed a minimum of every 50'. Access opening shall be provided for each duct-mounted device, such as fire dampers. Duct access openings shall be provided on both sides of sound attenuators.

**4.4.26.5** FIRE DAMPERS
Provide fire dampers where ducts pass through firewalls, fire partitions, floor slabs and chases, and comply with all provisions of NFPA Standard 90A and as required by the City of Dallas Building Code.

**4.4.26.6** LINKS
Furnish with 165° F fusible links.

**4.4.26.7** DAMPER LABELS
Label fire dampers with the required class designation and UL label.

**4.4.26.8** EXTERIOR SURFACES
All exterior surfaces of fire dampers shall be primed and have a finish coat of red color enamel.

**4.4.26.9** DIRECTIONAL ARROWS
Provide air-flow directional arrows on all fire dampers.

**4.4.26.10** FIRE DAMPER SIZING
Fire dampers shall be sized so that the damper does not impede airflow or diminish cross sectional area of the duct.

**4.4.26.11** ACOUSTICAL DUCT LINING
Although the use of internal acoustical duct lining is allowed, the extent of its application should be minimized. Serious consideration must be given to the health and maintenance concerns associated with its application, such as the potential for microbial growth and the difficulty in accessing the entire length of the duct interior for cleaning/maintenance purposes. Early design development reports shall address the effort made in minimizing the requirements for internal acoustical lining, if applicable, and a discussion of the alternative noise control measures or devices considered.

### 4.4.27 Valve Requirements

The following minimum requirements for valves shall be met:

**4.4.27.1** MAIN SHUT-OFF VALVES

Main Shut-off valves except High temperature hot water main shutoff valves shall be suitably rated for the intended service and location in the system. In no case shall the rating be less than Class 150 lbs. Valves 2½" or larger shall be flanged, and shall be re-packable while the system is under pressure (except where this feature is unavailable). For heating hot water and chilled water main shutoff valves, capability for tight shutoff shall be considered in valve selection and specification.

**4.4.27.2** HIGH TEMPERATURE HOT WATER VALVES
Rating: Shall be rated at 400° F, 400 psig. Valves shall be back seated to make it possible for valve repacking while system is in service (except where this feature is unavailable). Stem packings and lubricants for valves and gear operators that do not degrade at the maximum service temperature shall be specified. Plug type valves, if used, shall be Nordstrom “Dynamic Balance.” Where a bypass is required on Nordstrom “Dynamic Balance” valves, the valve shall be specified with ports and weld connections in the valve body for a bypass valve.

**4.4.27.3** BUTTERFLY TYPE VALVES (CHILLED WATER AND HOT WATER HEATING SERVICE)
Butterfly valves shall have 416 stainless steel stem, full lug, cast iron body to permit removal of downstream piping, long neck body extended to allow for a minimum of 2" insulation, aluminum bronze disc, bubble tight EPDM seat, infinite position throttling, not less than Class 150, 20º F to 220º F range.

**4.4.27.4** SECTIONALIZING VALVES IN HYDRONIC DISTRIBUTION PIPING
Sectionalizing valves shall be provided in lengthy pipe runs to facilitate removing sections of piping from service without draining adjacent piping. Capability for tight shutoff shall be considered in sectionalizing valve selection and specification.

**4.4.27.5** DIRECTION OF CLOSING
All valves shall be standardized to close when turned in a clockwise direction.

**4.4.27.6** VALVE INSTALLATION
For critical areas, a detailed area chart/plan shall be furnished and prominently displayed showing the location(s) of all new or revised piping and valves and sizes thereof. All valves, types, and location shall be indicated. All valves shall be identified (numbered) with metal tags (1½" x 5"), color coded, and labeled for identification purposes.

### 4.4.28 Energy Management and Control System (EMCS)

**4.4.28.1** GENERAL REQUIREMENTS
The energy management and control system (EMCS) shall incorporate operational sequences that are functional, user-friendly, and of proven reliable technology. All new controls shall match the existing controls type manufacturer. The controls shall be as manufactured and provided by Trane ES Building Systems Control. All sequences of operation, both text and graphics, shall be shown on the contract drawings as required. Generally, a two-way automatic control valve arrangement is preferred unless otherwise approved in writing by the DOA.

**4.4.28.2** SPECIFIC REQUIREMENTS
Year-round automatic heating and cooling sequencing (without requirement for manual changeover) shall be provided. All power logic, elevators, escalators, moving walks, automatic doors, high/low alarms, uninterruptible power supplies are required to be connected to the existing airport Trane ES Building Control Systems. EMCS. Pneumatic operators shall be provided for automatic valves and automatic dampers except for exterior applications or where operators are provided in manufactured equipment. es for VAV terminals or where operators are provided in manufactured equipment.

**4.4.28.3** PNEUMATIC CONTROL TUBING
All exposed pneumatic control tubing shall be seamless hard copper tubing. However, polyethylene tubing may be used up to a maximum length of 1' for final connection. Tubing installed, concealed above ceilings may be annealed copper. All pneumatic dampers and valves regardless of actuator size shall be provided with a gauge tee, petcock, and pressure gauge to indicate branch signal pressure.

**4.4.28.4** THERMOSTATS AND TEMPERATURE SENSORS
HVAC equipment for large public spaces in terminals and concourses shall be controlled by space temperature sensors that shall connect to the EMCS. All other tenant spaces and small public rooms shall be designed with the ability to independently control space temperature.

**4.4.28.5** WALL-MOUNTED THERMOSTATS
Wall-mounted thermostats shall be located 4' – 6" above the finished floor level at suitable locations for sensing the average room temperature. Provide exposed thermometers, concealed adjustments, and lock boxes for all wall-mounted thermostats.

**4.4.28.6** LABELING
Each temperature sensor and thermostat shall be labeled to assist the DOA maintenance personnel and the EMCS operator in identifying the corresponding EMCS equipment that is being controlled.

**4.4.28.7** FREEZE PROTECTION
Except where freeze protection is provided with a glycol solution, hydronic coils exposed to outside air shall have adequate freeze stat devices interlocked with the fan starter. Fan starters shall be manually reset. Provide interface with EMCS for alarm indication.

**4.4.28.8** VARIABLE FREQUENCY DRIVES (VFD)
Communications to VFD's controlled by the EMCS shall be via a Siemens compatible P1 interface. The P1 interface is a VFD manufacturer provided device that is designed to be P1 (a Siemens protocol) compatible. Determine sequence of operation and points of control. All EMCS points shall be via the serial interface, not hardwired. Use separate hardwired interface for safeties, damper end switches (where applicable), and damper open/close in VFD manual or override mode (when applicable).

**4.4.28.9** LIFT STATION PUMP ALARMS
Where there are mechanical drawings and specifications covering EMCS, lift station pump alarm points shall be indicated on the appropriate mechanical drawings. EMCS input/output schedule shall include the alarm and status points from all lift stations.

### 4.4.29 Tests and Balance

**4.4.29.1** GENERAL
The testing, balancing, and adjusting of the heating, ventilating, and air-conditioning systems shall be performed by an independent balancing agency not involved in the design or construction of the system. The balancing firm shall be a certified member of National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC).

**4.4.29.2** COMPLIANCE AND APPROVAL
All tests shall comply with certification agencies, standards and practices, and with the DOA start-up and operational test procedures. The documented results of all required tests shall be approved through the DOA designated construction representative from the Airport Engineering & Maintenance Department prior to acceptance of the project.

**4.4.29.3** ADDITIONAL REQUIREMENTS
All holes drilled for the duct traverses shall be properly sealed to prevent leakage of air. The difference between the actual balance and the design flow rates shall be acceptable whenever the tolerances as set forth by ASHRAE are not exceeded. The balancing Contractor shall provide labeling of set points for all devices, such as VAV boxes, circuit setters, notching of automatic damper rods to indicate blade position, etc.

### 4.4.30 Maintenance Accessibility

**4.4.30.1** GENERAL REQUIREMENTS
All mechanical and electrical equipment and related accessories shall be installed to provide sufficient access and space for ease of accessibility during maintenance operations or component removal or replacement.

**4.4.30.2** MINIMUM ACCESSIBILITY REQUIREMENTS
Minimum accessibility requirements shall not be less than manufacturer's recommendations.

**4.4.30.3** ACCESS PANELS
Access panels that are accessible by the public shall be provided with a cam lock preparation to receive a Best locking system. Reference in Section 4: Terminal Design Standards, Chapter 2, Paragraph 2.14 'Lock Systems'.

### 4.4.31 Smoke Control/Smoke Removal System

**4.4.31.1** GENERAL
When required by the DOA or City of Dallas Building Code, a building/facility smoke control/smoke removal system shall be provided.

**4.4.31.2** DESIGN CRITERIA
All smoke removal systems shall be provided with the capability of manually activated smoke removal either by using the building air handling units or by providing a dedicated smoke exhaust system. The smoke control and smoke removal system design shall be based on minimum 6 air changes per hour.

**4.4.31.3** CODE REQUIREMENTS
The smoke control and smoke removal systems shall meet the following requirements:

- NFPA 92, NFPA 92A,
- ASHRAE Handbook.

**4.4.31.4** AUTOMATIC ACTIVATION
Automatic activation of smoke control/smoke removal systems shall be provided where required by codes. For DOA requested systems (non-code required), activation shall be manual unless otherwise deemed necessary by the DOA.

**4.4.31.5** MANUAL OVERRIDE
Where automatic operation is provided, a manual override feature shall be provided. A manual control panel for the smoke control or smoke removal system shall be provided at a location coordinated with the DOA Fire Marshal during the design. The manual smoke control or smoke removal panel shall be equipped with smoke control or smoke removal system zone graphics and instructions for manual operation. The manual operation shall be by a single toggle switch that shall sequence the smoke zone equipment operation by means of the EMCS control system.

**4.4.31.6** PREVENTION OF UNAUTHORIZED USE

The smoke control panel shall be protected to prevent unauthorized use.

## 4.5 Plumbing

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below.

### 4.5.1 Construction Documents

Plumbing Construction Documents shall include riser diagrams for the building water distribution, storm drainage, and waste and vent systems. The diagrams shall indicate total water supply fixture units (FU) and all main branches coming into and from the main distribution line including existing and future loads; total drainage fixture units (DFU) from all sanitary stacks, including existing and future that will be connected to the building sanitary drainage system; and the maximum projected roof areas (in sq. ft.) including existing and future to be drained into the storm sewer. Toilet rooms shall be shown by part plan at a scale no less than ¼" equal to1'.

### 4.5.2 Existing Utilities

When the Design Consultant is designing connections to existing domestic water, sanitary sewer, and storm drainage systems the Design Consultant shall verify that the existing DOA utility supply or charge lines can meet the increased loads. The Design Consultant shall field verify the sizes of piping for the above systems. Existing drainage piping invert elevations shall be field verified to ensure that the existing infrastructure will allow a code compliant design. During the design the Design Consultant shall provide calculations, including existing and future loads that demonstrate sufficient infrastructure capacity. Drawings shall indicate connection details.

### 4.5.3 Pipe Sizing

Water distribution and sanitary/storm pump discharge piping shall be sized to ensure that the maximum design flow velocity does not exceed 8 fps.

### 4.5.4 Plumbing Chase Requirements

All Plumbing Chases are to meet the following design requirements.

**4.5.4.1** WORKING CLEARANCE
All Plumbing Chases are to have an unobstructed working clearance of 32” to 38” between pipes.

**4.5.4.2** CHASE HEIGHT
All Plumbing Chases are to have a minimum overhead clearance of 80” (6’-8”).

**4.5.4.3** CLEANOUT REQUIREMENTS
Cleanouts at each fixture shall be a minimum 3’ above finished floor. There must be at least one Cleanout at the end of a line.

**4.5.4.4** MINIMUM DOOR WIDTH
Plumbing chases are to have a minimum 2’-8” door for access.

**4.5.4.5** HOSE BIB AND FLOOR DRAIN
A minimum of one hose bib and one floor drain per chase minimum with atmospheric vacuum breaker (this does not have to be frost proof) is required.

**4.5.4.6** TRAPS
Trap Seals shall be used instead Trap Primers unless specifically approved by the DOA.

### 4.5.5 Backflow Preventers (BFP) - Potable Water

**4.5.5.1** POTABLE WATER SUPPLY
All potable water supply or distribution systems within the Airport shall be designed and installed to prevent contamination from any sources.

**4.5.5.2** PRIMARY SERVICE CONNECTIONS
The primary service connections (permanent or temporary) at buildings, facilities, special project sites, and construction sites, shall be provided with a reduced-pressure-zone type backflow prevention device to prevent backflow caused by backpressure and back-siphonage. Unless directed otherwise, provide Watts Model 909, Type RPZ (reduced-pressure-zone) backflow preventer at the primary service connection.

**4.5.5.3** ADDITIONAL BACKFLOW PREVENTION DEVICES
Additional backflow prevention devices of various types and applications may be required downstream of the primary backflow preventer by building codes, health department regulations, equipment and fixture manufacturers, etc., and as dictated by the degree of hazard potential posed by the intended plumbing connection.

**4.5.5.4** PARALLELED SERVICE CONNECTIONS
If a service connection that is required to be fitted with a backflow prevention device is to be paralleled with second or more service connections for any reason such as, to supplement the capacity of the primary connection or for standby, each such direct connection to the primary supply shall also be equipped with a backflow preventer.

**4.5.5.5** FIRE PROTECTION SYSTEMS
Where approval is granted by the DOA to utilize potable water in fire protection systems, a backflow prevention device shall be required at the fire connections to the potable water supply. Watts Model 709 double-check backflow preventer is the only model currently allowed at such connections.

**4.5.5.6** HOSE BIBS
Hose bibs connected to potable water systems shall be fitted with a vacuum breaker device.

### 4.5.6 Backflow Preventers (BFP) - Non-Potable Water

Backflow preventers are not required on non-potable water systems (DFS - Dedicated Fire Water System) except where a cross-connection with a potable water system is specifically approved in writing by the DOA. Any such connection is discouraged and requires specific approval.

### 4.5.7 Backflow Preventers (BFP) – Installation

**4.5.7.1** ACCESSIBILITY
When service connections are made to a primary distribution water line and a RPZ type backflow preventer is required, tenants are required to install these devices in a readily accessible location so that the DOA or other maintenance personnel can access them quickly in the event of an emergency. This includes multi-tenant buildings, as well as terminals.

**4.5.7.2** DRAINAGE SYSTEM
RPZ backflow preventer device requires a drain and care should be used in selecting a device location such that other tenants will not be affected by water damage. Water damage can result from a loss of pressure or a malfunction of the RPZ type backflow preventer device and its drainage system.

**4.5.7.3** LOCATION
Locations where backflow preventers are to be installed shall have adequate access for periodic inspection, testing and maintenance, and shall be shown on the floor plans.

**4.5.7.4** BYPASS LINES
The primary service BFP shall be provided with an additional BFP installed in the bypass line around the primary service BFP to facilitate annual inspection and testing.

**4.5.7.5** INSTALLATION REQUIREMENTS
Backflow preventers at water meter locations shall be installed horizontally after the OS&Y valve, down-stream of the water meter.

**4.5.7.6** CERTIFICATION
The contractor shall be responsible for certification of all backflow prevention devices at end of job. This is an Environmental Protection Agency (EPA) requirement and covered under the Clean Water Act. Certification shall be performed by an individual or a company certified to test such devices. Documentation of individual or company certification shall be provided to the DOA Engineering & Maintenance Department prior to installation.

### 4.5.8 Water Supply Valves

Water service lines shall be equipped with mechanical joint type gate valves manufactured by Mueller Company. Exterior valves, 2" and larger, shall be non-rising stem resilient seat gate valves, UL listed, FM approved and AWWA approved. All main and branch piping of water supply shall include the installation of isolation valves. A curb valve, commonly called a 'corporation cock valve' is not acceptable. All valves shall be standardized to close when turned in clockwise direction.

### 4.5.9 Interior Water Supply Valve

Water service lines inside the building shall be equipped with OS&Y valves for 2-½" and larger.

### 4.5.10 Water Shutoff Valves

Water shutoff valves shall be installed on the water line to all fixtures, including water coolers, sinks and toilets. Valves ½" through 2" shall be bronze ball type valves with two-piece body and minimum class rating of 150. Valves 2½" and larger shall be gate valves, with a Class 250 rating.

### 4.5.11 Water Coolers

All water coolers shall be provided with shutoff valves and precast quick-change cartridge filters capable of removing suspended particles, odors, and dissolved gases. Where inlet water pressure varies more than 10 psig, install pressure-regulating devices. All water bearing materials shall comply with the Safe Drinking Water Act of 1986 and the Lead Contamination Control Act of 1988.

### 4.5.12 Floor Drains and Cleanouts

**4.5.12.1** REQUIRED AREAS
Provide floor drains and cleanouts in Mechanical rooms, Plumbing chases, Public Toilet rooms, and Kitchens/ Food Preparation Areas.

**4.5.12.2** COORDINATION OF LOCATIONS
Locations of floor drains shall be coordinated in advance by the Design Consultant to ensure adequate floor slope.

**4.5.12.3** LOCATION OF CLEANOUTS
Cleanouts shall be installed close to floor drains to assure access for cleaning pipes.

**4.5.12.4** TRAP PRIMERS
Trap Primers shall not be used without approval from the DOA.

**4.5.12.5** DRAWING REQUIREMENTS
The locations and types of all floor drains, cleanouts, and trap primers shall be noted on the drawings.

**4.5.12.6** FITTINGS
Floor drain fittings shall be grouted and sealed to the floor slab.

**4.5.12.7** MINIMUM SPACING OF INTERIOR CLEANOUTS
The cleanouts inside the buildings shall be installed at a minimum of every 50'. Overhead cleanouts shall be avoided.

**4.5.12.8** MINIMUM SIZING OF FLOOR DRAINS
In mechanical rooms the size of floor drains shall be a minimum of 3" and heavy duty when located in traffic areas.

**4.5.12.9** MECHANICAL ROOM FLOOR DRAINS
Mechanical Room floor drains for condensate connection shall be standard duty with funnel collector and located in non-traffic areas.

**4.5.12.10** ACCOMMODATING FIRE SUPPRESSION SYSTEM TEST
An area floor drain shall be provided to accommodate fire suppression systems flow control valve test drain discharge.

**4.5.12.11** SLABS ON GRADE
All floor drains located on levels above slab on grade shall include all necessary precautions to ensure floor slabs are made watertight.

**4.5.12.12** WATERPROOFING MEMBRANE
A minimum 3' diameter waterproofing membrane shall be applied to slabs around and incorporated in the floor drain installations to prevent leakage to floors below. Provide floor drain waterproofing details on Construction Documents no later than the 60% Design Submittal.

### 4.5.13 Vent Pipe Cleanouts

**4.5.13.1** CLEANOUT LOCATION SAT T-Y FITTINGS
A vent pipe extending from a double T-Y fitting that is not mounted over a toilet or urinal shall have a cleanout installed on the vertical vent to enable a direct vertical path to the vertical waste pipe below.

**4.5.13.2** AIR ADMITTANCE VALVES
Air admittance valves are not acceptable.

### 4.5.14 Grease Interceptors

Grease interceptors shall be provided in commercial kitchens and/or bar facilities to remove grease waste prior to the discharge into the sewer system. A preventive maintenance and cleaning schedule shall be furnished as part of the Operation and Maintenance Data Submittal.

### 4.5.15 Oil Separators

**4.5.15.1** LOCATION CRITERIA

Oil separators shall be provided in all areas including hydraulic elevator pits with a potential of oil discharge into storm or sanitary sewer systems.

**4.5.15.2** SUMP PUMPS
All elevator, escalator, and moving walkway pits shall be provided with a sump pump at the bottom of the pits where gravity drains cannot be installed. Drain from the pits shall be discharged into the building sanitary drain indirectly.

**4.5.15.3** ACCESSIBILITY
Oil separator location shall be accessible for maintenance by a cleaning truck from the building exterior. Vents from oil separators shall run independently of other vents through the roof. The size, type, and location of each interior and exterior separator shall be approved in writing by the DOA prior to the 60% Submittal.

**4.5.15.4** DRAWING COORDINATION
Civil, Architectural, Structural and Plumbing Drawings shall be closely coordinated to allow sufficient space for the oil separator and to ensure a passageway for oil separator removal and replacement. Performance specifications for this type structure are not acceptable.

### 4.5.16 Water Closets and Urinals

**4.5.16.1** ACCEPTED TYPES
Water closets and urinals shall be a "Siphon Jet" wall-mounted type unless approved otherwise by the DOA.

**4.5.16.2** MOUNTING HEIGHTS
Comply with ADA requirements.

### 4.5.17 Sensor Operated Flushometers and Lavatory Fittings

**4.5.17.1** INSTALLATION REQUIREMENTS
Sensor operated flushing systems shall be installed on all public toilets, urinals, and lavatories.

**4.5.17.2** AUTOMATED SENSOR CONTROL
Flush valves in public restrooms shall be automatic sensor controlled (12 VDC) with activation indicator lights and manual override mounted in the valve body and power wiring housed in vandal proof flexible tubing.

**4.5.17.3** MANUAL OVERRIDE
Manual override shall work independent of the electronic actuator.

**4.5.17.4** SENSOR RANGE
Sensor range shall be 8" to 36".

**4.5.17.5** PREFERRED MANUFACTURERS
The Manufacturer for the flush valve and lavatory facet shall be Sloan.

**4.5.17.6** POWER SOURCE
All sensor operated flushing systems shall be electrically powered from a standby power source.

**4.5.17.7** MANUALLY OPERATED FITTINGS
Flush valves and lavatory faucets in employee/private restrooms for water closets, urinals, and lavatories under the DOA maintenance responsibility, shall be manually operated.

**4.5.17.8** ACCESS PLATE

An access plate for servicing flush valves shall be provided.

### 4.5.18 Sewage Ejectors (Interior Building and Structures Application)

**4.5.18.1** GENERAL
All interior sewage ejectors fall under the jurisdiction of Sewage Collection and Treatment (SCAT) regulations if flows exceed 2000 GPD.

**4.5.18.2** BASIS OF DESIGN
The basis of design shall be Gorman-Rupp Trash Pumps with Air Bell or approved equal.

**4.5.18.3** SEWAGE EJECTORS
Sewage Ejectors (lift stations) shall be provided with duplex submersible sewage pumps equipped with an automatic alternator.

**4.5.18.4** PUMP PITS
A Quick Disconnect system shall be provided when pump pits are deeper than 4'.

**4.5.18.5** GRINDER TYPE PUMPS
All sewage pumps 2" and smaller shall be grinder type.

**4.5.18.6** CUTTER TYPE PUMPS
All sewage pumps 3" and larger shall be cutter type.

**4.5.18.7** STORAGE HOLDING CAPACITY
Sump pits shall be sized to prevent excessive pump cycling by providing a storage holding capacity a minimum of 2.5 minutes lead pump run time under peak flow. The minimum depth of the sump shall be 3' below the inlet pipe.

**4.5.18.8** DISCHARGE PIPE SIZING
The sewage ejector discharge piping shall be sized for a peak design flow of the duplex pump system. Cleanouts shall be provided on pump discharge piping.

**4.5.18.9** SEWAGE EJECTOR ROOM REQUIREMENTS
Rooms that house sewage ejectors shall be provided with a hose bibb, floor drain, receptacle, and ventilation that is exhausted to the building exterior. Where sewage ejectors are located in structures, such as tunnels, hose bibb shall be provided within 50 ft. from the sump pit to facilitate cleaning and periodic testing of the pumps.

**4.5.18.10** POWER, CONTROLS, AND ALARM SYSTEM FOR FLOWS EXCEEDING 2000 GPD
Power, controls and alarms shall be arranged the same as for exterior lift stations - see the section titled "Sanitary Lift Stations - Exterior Applications" in Chapter X of the Design Manual.

**4.5.18.11** POWER, CONTROLS AND ALARM SYSTEM FOR FLOWS LESS THAN 2000 GPD
Power controls and alarms shall be arranged in accordance with the following.

**4.5.18.12** LEVEL SENSING CONTROLS
Level sensing controls for the pump shall utilize an ultrasonic level sensor – Siemens HydroRanger 200 or approved equal.

**4.5.18.13** HIGH/ LOW LEVEL ALARM FLOATS
A backup float system consisting of a high level alarm float, a high level "pumps on" float and a low level "pumps off" float shall be provided. The high level and low level floats shall start and stop both pumps in case of failure of the ultrasonic sensor. Plans shall indicate the desired setpoints for the level sensor and the floats. For special situations where use of the ultrasonic sensor is not feasible

(such as very small systems), other types of controls may be used, subject to approval of the DOA. The control panel shall be UL listed.

**4.5.18.14** ALARM SYSTEM
Provide as a minimum, "power failure", "high water" and "sensor failure" alarm with local alarm bell, silence button, and indicator lights. Local alarm is not required to operate on loss of power, however, alarm outputs to EMCS shall operate and shall not provide false indications upon power loss. Provide LED type "Power Available" indicator lamp. High water alarm level shall be set at a minimum of 2" below the inlet pipe elevation. Each of the above alarm signals shall be individually connected to the EMCS. The alarm points shall be shown on the documents which show the EMCS I/O points (usually the mechanical drawings).

**4.5.18.15** STANDBY GENERATOR
Where the lift station is not powered from a facility with redundant power feeds and power from a standby generator is available, and connection of the pumping system is practicable, provide power from the standby generator to the pumping system.

### 4.5.19 Sump Pumps (Interior Building & Storm Drainage Structures Application)

**4.5.19.1** GENERAL
Sump pumps for interior storm water shall be duplex submersible pump wet well type equipped with an automatic alternator.

**4.5.19.2** DISCONNECT SYSTEM
A quick disconnect system shall be provided when sump pits are deeper than 4'.

**4.5.19.3** SUMP PIT SIZING
Sump pits shall be sized to prevent excessive pump cycling by providing a storage holding capacity with a minimum of 2.5 minutes lead pump run time under peak flow. The minimum depth of the sump shall be 3' below the inlet pipe.

**4.5.19.4** DISCHARGE PIPE SIZING
The sump pump discharge piping shall be sized for a peak design flow of the duplex pump system. Cleanouts shall be provided on pump discharge piping.

**4.5.19.5** SUMP PUMP ROOM REQUIREMENTS
Rooms that house sump pumps shall be provided with a hose bibb, floor drain, receptacle and ventilation that are exhausted to the building exterior. Where sump pumps are located in structures, such as tunnels, hose bib shall be provided within 50 ft. from the sump pit to facilitate periodic testing of the pumps.

**4.5.19.6** CONTROL AND ALARM SYSTEM
Controls and alarms shall be arranged the same as for interior lift stations with flows less than 2000 GPD - see the paragraph titled "Sewer Ejectors (Interior Building and Structures Application)" in this Chapter of the Design Manual.

**4.5.19.7** STANDBY GENERATOR
Where practicable, provide standby power in situations where loss of pumping would cause flooding with resultant property damage or blockage of egress paths. design flow of the duplex pump system. Cleanouts shall be provided on pump discharge piping. Rooms that house sewage ejectors shall be provided with a hose bibb, floor drain, receptacle, and ventilation that is exhausted to the building exterior. Where sewage ejectors are located in structures, such as tunnels, hose bibb shall be provided within 50 ft. from the sump pit to facilitate cleaning and periodic testing of the pumps.

**4.5.19.8** POWER, CONTROLS, AND ALARM SYSTEM FOR FLOWS EXCEEDING 2000 GPD
Power, controls and alarms shall be arranged the same as for exterior lift stations - see the section titled "Sanitary Lift Stations - Exterior Applications" in Chapter X of the Design Manual.

**4.5.19.9** POWER, CONTROLS AND ALARM SYSTEM FOR FLOWS LESS THAN 2000 GPD
Power controls and alarms shall be arranged in accordance with the following.

**4.5.19.10** LEVEL SENSING CONTROLS
Level sensing controls for the pump shall utilize an ultrasonic level sensor – Siemens HydroRanger 200 or approved equal.

**4.5.19.11** HIGH/ LOW LEVEL ALARM FLOAT
A backup float system consisting of a high level alarm float, a high level "pumps on" float and a low level "pumps off" float shall be provided. The high level and low level floats shall start and stop both pumps in case of failure of the ultrasonic sensor. Plans shall indicate the desired setpoints for the level sensor and the floats. For special situations where use of the ultrasonic sensor is not feasible (such as very small systems), other types of controls may be used, subject to approval of the DOA. The control panel shall be UL listed.

**4.5.19.12** ALARM SYSTEM
Provide as a minimum, "power failure", "high water" and "sensor failure" alarm with local alarm bell, silence button, and indicator lights. Local alarm is not required to operate on loss of power, however, alarm outputs to EMCS shall operate and shall not provide false indications upon power loss. Provide LED type "Power Available" indicator lamp. High water alarm level shall be set at a minimum of 2" below the inlet pipe elevation. Each of the above alarm signals shall be individually connected to the EMCS. The alarm points shall be shown on the documents which show the EMCS I/O points (usually the mechanical drawings).

**4.5.19.13** STANDBY GENERATOR
Where the lift station is not powered from a facility with redundant power feeds and power from a standby generator is available, and connection of the pumping system is practicable, provide power from the standby generator to the pumping system.

### 4.5.20 Exterior Lift Station (Exterior Applications)

**4.5.20.1** GENERAL
Exterior lift stations shall meet the requirements of Sewage Collection and Treament (SCAT) regulations.

**4.5.20.2** SANITARY LIFT STATIONS
Sanitary lift stations shall be duplex submersible pump well type with an automatic alternator.

**4.5.20.3** SUBMERSIBLE SEWAGE PUMPS
A quick disconnect system shall be used.

**4.5.20.4** SEWAGE PUMP SIZING
Each pump shall be capable of handling flows in excess of the expected maximum peak flow or a minimum of two and one half times the average design flow, whichever is greater.

**4.5.20.5** WET WELL
Wet well shall be installed with access hatches, minimum size of 4’ x 4’ and a platform installed above the inlet pipe elevation to accommodate cleaning.

**4.5.20.6** WET WELL SIZING
Wet well shall be sized with a minimum two our safety factor at full peak flow.

**4.5.20.7** GRINDER TYPE PUMPS
All sewage pumps 2" and smaller shall be grinder type.

**4.5.20.8** CUTTER TYPE PUMPS
All sewage pumps 3" and larger shall be cutter type.

**4.5.20.9** LIFT STATION ROOM REQUIREMENTS
Lift stations shall be provided with power receptacle and switching to allow connection of portable generator in case of normal power failure

**4.5.20.10** POWER REQUIREMENTS
Lift station control panel enclosures shall be NEMA 4 when the panels are located in an outdoor environment.

**4.5.20.11** LEVEL SENSING CONTROLS
Level sensing controls for the pump shall utilize an ultrasonic sensor. The ultrasonic level transmitter shall be a redundant means for high and low water alarm notifications as well as for lead and lag pump commands.

**4.5.20.12** HIGH LEVEL ALARM AND PUMP VERIFICATION
High water level alarm shall be set a minimum of 2" below the inlet pipe elevation. The alarm signal remote notifications shall be sent to the EMCS.

**4.5.20.13** PORTABLE GENERATORS
If a portable generator is required it must meet SCAT regulations.

## 4.6 Thermal Insulation for Mechanical and Plumbing Systems

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below.

### 4.6.1 Pipe, Duct, and Equipment Insulation

**4.6.1.1** GENERAL REQUIREMENTS
Pipe, duct, and equipment insulation shall be suitable for the range of temperature, service, and environment to which they will be subjected. Insulation thickness shall be in accordance with the economic thickness standards published by the North American Insulation Manufacturers Association (NAIMA).

**4.6.1.2** INSULATION MATERIAL
Insulation material, finish, jackets, and accessories shall comply with all applicable Federal standards, ASTM and NFPA standards. Full-round insulation and special insulation inserts at pipe support-guides shall not only possess the required compressive strength, but shall also permit the pipe to expand and contract without stress or wear to the pipe or insulation.

### 4.6.2 Installation of Insulation and Accessories

Installation for the intended application shall be as recommended by the manufacturer of each type of mechanical insulation and accessories. Construction Documents must include an insulation application schedule tabulated or outlined to clearly identify for each service, condition, and location, the intended insulation type, thickness, vapor barrier type, jacket type, finish tapes, and accessories.

All mechanical and plumbing piping insulation shall be protected with aluminum jacket in mechanical rooms, baggage handling areas, tunnels, utility corridors, parking structures, and also in other areas where insulation is exposed to physical damage. Aluminum protective jacket is not required in areas, other than as indicated above, where piping is installed above ceilings or where the invert elevation of the exposed piping is 10' – 0" or higher above the finished floor.

### 4.6.3 Refrigerant Line Insulation

Air-conditioning refrigerant lines shall be insulated with flexible elastomeric cellular insulation, Armaflex or equal, a minimum ½" thick. All insulation joints shall be butted and glued with a manufacturer's recommended adhesive.

### 4.6.4 Insulation Requirements for Plumbing Piping

All water piping shall be properly insulated. Horizontal runs of roof drainage systems, exposed and concealed, including roof drain sump, sump connectors, and horizontal sloped connectors run to leaders shall be insulated. Sanitary piping in ceiling space used as air plenum shall be insulated to prevent condensation. All water and sanitary piping exposed to sub-freezing temperatures shall be properly insulated and electrically heat traced. When heat trace is installed, provide local monitoring, audible/visual alarm with silencing switch, and four additional dry contacts for future interfacing with a computerized facility automation system.

## 4.7 Utility Meters

### 4.7.1 Natural Gas Meter Installation

Contractors shall arrange for the installation and metering of natural gas by the xxxxxxx Gas Company. All gas meter systems shall be provided with a temperature and pressure compensation device. Provide a permanent meter bypass pipe and bypass valve to facilitate meter removal for maintenance or periodic testing without interruption of gas service. Provide a strainer upstream of the meter and bypass connection. The following valves shall have a locking provision: main shutoff, bypass valve, and the service valve immediately downstream of the meter. A common pressure gauge is required downstream of both the meter and its bypass pipe. The regulator shall be located upstream of the meter. On large meters, such as turbine type, a Reynolds Recor Model 323 PT LVC recorder shall be provided for remote reading capability. Construction drawings shall show the gas meter piping arrangement and detail.

### 4.7.2 Remote Reading

Meters shall have capability for remote reading.

### 4.7.3 Standard Meters

The Design Consultant shall coordinate with Engineering & Maintenance Department at the Airport for the standard meter types and installation configuration to be used. The acceptable meter type and installation configuration shall be incorporated into the Contract Documents.

### 4.7.4 Domestic Water Meters

Building Service Entrance General: A Badger Recordall, Turbo Series Utility type water meter shall be installed for 2" water service lines and above. The meter shall be installed according to manufacturer recommendations. A Badger Recordall bronze disc water meter shall be installed for under 2" lines. A Badger Read-o-Matic remote reader shall be installed outside of the exterior building wall in the event

the Airport Engineering & Maintenance Department does not have direct access to the water meter. Water meter and backflow preventer (BFP) piping assemblies shall be located within 5' of the exterior building wall at the point of the water service entry in the heated space of the buildings or structures. Meter location shall be shown on the drawings (Plans and Details) and approved as early as practical, but no later than the 60% Design Submittal. Provide a permanent meter bypass pipe and valve to facilitate meter removal for maintenance or periodic testing without interruption of water service. Provide a strainer upstream of the meter and its bypass connection. The bypass fitting or any other obstruction in the pipe shall not be allowed within five pipe diameters upstream of the meter. Water meters shall read in gallons. Meters shall be installed horizontally for accuracy and permit easy reading. Meter location shall not be more than 5 feet above finish floor and shall not be located behind shelving, displays, or above dropped ceilings. Permanent installations require an RTR with remote or integral module AMRS. A telephone line hookup may be used with the Badger Access Plus AMRS. It is imperative that a submittal for review be approved by the Utilities Branch office prior to the procurement and installation of these automatic meter reading systems. Refer to Chapter xx of this section for requirements for communications conduit. Drawings shall show the water meter and BFP's piping arrangement and details including all necessary dimensions to demonstrate adequacy of space clearances and accessibility for maintenance.

## 4.8 Fire Suppression System

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below.

### 4.8.1 General Requirements

In addition to those fire protection systems required by the City of Dallas Building Code, fire suppression system shall be provided for all buildings. Buildings in which fire suppression systems will be installed shall comply with all Federal, State or local governing codes and regulations, including the Americans with Disabilities Act, insurance carrier requirements and any additional DOA requirements as specified in this manual. Fire protection system design shall be coordinated with the DOA Fire Marshal during design process. In existing facilities, installation of new, and/or modification of automatic sprinkler systems, special extinguishing systems or standpipe systems shall not be undertaken unless written permission is obtained from the DOA Building Code Department, DOA Engineering & Maintenance Department and the DOA fire Marshal. If any requirements stated in this chapter are in conflict with the manufacture's instructions for design/installation, the manufacturers' instructions shall be followed. The Design Consultant shall be responsible for notifying the DOA, in writing, of all such circumstances as stated above.

### 4.8.2 Design Requirements

Fire protection system design requirements shall be included in the construction documents. Fire protection system design drawings shall be provided in accordance with DOA procedures. Design drawings shall, at a minimum, include comprehensive floor plans (showing sprinkler head layout, pipe sizes, valve and system test connections, etc.), riser diagrams, and details. Fire Protection symbols and abbreviations used on the drawings shall comply with NFPA 170, Fire Safety Symbols. Hydraulic Calculations shall be provided and shall be based on flow test data obtained by conducting a fire hydrant flow test or data provided by the DOA if current flow test data is already available. The Design Consultant must adjust the flow test data and hydraulic calculations for any elevation differences and friction loss between the test hydrant and the water supply connection point at the base of the system riser, in situations where the flow test hydrant is not located near the building. A water supply curve

shall be prepared based on the lowest water supply static and residual pressures. Pipe velocities shall not exceed 20 feet per second in all sprinkler systems. The Design Consultant shall include the following requirements in construction documents:

### 4.8.3 Shop Drawings and Record Drawings

All fire protection shop drawings and hydraulic calculations shall be signed and stamped by a licensed Professional Engineer who is registered in the State of Texas. All fire suppression system shop drawings and calculations shall be prepared by an individual possessing at least NICET (National Institute for Certification in Engineering Technologies) Level III certification in sprinkler system design. Fire protection drawings and record drawings shall be produced using CADD systems and submitted to the DOA per the requirements of Division 01, found in Section II of this Manual. The drawings shall include all information as required for working plans. The drawings shall show the system as installed, including all deviations from the approved shop drawings.

### 4.8.4 Pre-Work Meeting with Fire Protection System Contractors

Prior to starting work and after the DOA Building Codes/Environmental Department has completed review and approval of fire protection system shop drawings, a meeting will be required between the contractor and the DOA Building Codes/Environmental Department. At this meeting the DOA Building Codes/Environmental Department will distribute approved shop drawings. Any comments that have been generated by the review process will be reviewed with the contractor at this meeting. This meeting will be scheduled by the PM upon notification by the DOA Building Codes/Environmental Department.

### 4.8.5 Fire Hydrant Flow Testing

The adequacy of the water supply shall be determined by the Design Consultant for the Construction Documents and by the Contractor for the Shop Drawings by conducting a hydrant flow test in the vicinity of the facility for which the water supply data is required. This data shall be used by the Design Consultant and/or the Contractor to design the facility fire protection system. The flow test shall be conducted in accordance with NFPA 291 “Recommended Practice for Fire Flow Testing and Marking of Hydrants”. The test hydrant used shall be located at the building site, whenever possible. All flow tests shall be coordinated in advance with the DOA Fire Marshal and the Utilities Services Division. Notice shall be given and approval obtained from the DOA Fire Marshal and the Utilities Services Division, at least three weeks prior to the requested test date. Copies of all flow test reports/results shall be forwarded to the manager of the Utilities Services Division at each airport and the DOA’s Program Design Engineering Fire Protection Group. A form for reporting hydrant flow test data is available at the offices of the Utilities Services Division

### 4.8.6 Water Supply Systems Protection of Potable Water

The potable water supply is utilized for a combined fire/domestic services. All interior and exterior piping connected to the water system shall not only comply with the backflow prevention requirements described in Section III, Paragraph 12.2, but shall also be disinfected and tested in accordance with the xxxxxxx Department of Health Waterworks Regulation and other applicable requirements.

### 4.8.7 Dedicated Fire Water System (Dfs)

Sectional valves in the Dedicated Fire Water System (DFS) lines shall be provided with supervisory switches when possible. All sectional valves below grade shall be provided in valve boxes. Valve boxes shall be cast-iron with bottom section, top section and cover. Cover shall be provided with the

lettering “DFS”. The bottom section base shall be sized to accommodate the valve base/diameter and to allow operation of the adjustable cast-iron extension rod length as required for depth of bury of the valve.

### 4.8.8 Fire Hydrants

Fire hydrants shall be installed in accordance with applicable codes/standards, and shall be located so that fire hose connected to the hydrant shall not impede streets, roadways, etc. A hydrant shall be located within 50' of every fire department connection for buildings within the AOA. Where fire hydrants are located proximate to hangers, terminals and other buildings, the fire hydrant location shall be identified with a reflective sign mounted as specified by the Fire Marshal. All hydrants must be UL-listed, AWWA, or FM approved and shall be color coded per the Post Fire Hydrant Color Code table below. Threads shall meet National Standard Thread requirements. Refer to Exhibits III-15-1, III-15-2, III-15-3, and III-15-4.

# CHAPTER 5: BAGGAGE HANDLING SYSTEM

## 5.1 Abbreviations

AFF Above Finished Floor

AHJ Authority Having Jurisdiction

ATR Automatic Tag Reader

BC Baggage Claim

BIDS Baggage Information Display System

BG Between Guides

BHS Baggage Handling Systems

BMA Baggage Measurement Array

BVS Baggage Viewing Station

CBIS Checked Baggage Inspection System

CBRA Checked Baggage Reconciliation Area

EDS Explosive Detection System

ETD Explosive Trace Detection

FAR Federal Aviation Regulations

FPM Feet per Minute

GUI Graphic User Interface

HMI Human Machine Interface

HVAC Heating, Ventilation, and Air Conditioning

IBB In-Bound Baggage

LEO Law Enforcement Office

MCP Motor Control Panel

MVI Multi-Vendor Interface

NEMA National Electrical Manufactures Association

NFPA National Fire Protection Association

OBB Out-Bound Baggage

OIT Operator Interface Terminal

OLE Object Linking and Embedding

OSB Over-Size Baggage

OSHA Operational Safety and Health Administration

OSR On-Screen Resolution

PFD Power Face Diverter

PLC Programmable Logic Controller

PGDS Planning Guidelines and Design Standards

TAF Terminal Area Forecast

TOB Top of Bed

TSA Transportation Security Administration

SWS Search Work Station

UL Underwriters Laboratories

UPS Uninterrupted Power Supply

VFD Variable Frequency Drive

VPN Virtual Private Network

## 5.2 General Codes and Criteria

**5.2.1.1** BHS equipment shall be designed to meet OSHA, NEMA, NFPA, FAR requirements, as well as all local codes.

**5.2.1.2** For all Baggage conveyor projects involving Baggage Security Screening, obtain and comply with the latest version of the TSA document, 'Planning Guidelines and Design Standards for Checked Baggage Inspection Systems' (PGDS).

**5.2.1.3** Designs shall be based upon key parameters and metrics such as:

**A.** Federal Aviation Administration's Terminal Area Forecast (TAF) and specific airline-user flight schedules

**B.** Airline's Passenger Level-of-Service

**C.** Current and future EDS technology and TSA requirements

**D.** Aviation Facility location and development plans

**E.** Airport and Passenger characteristics

**F.** Aircraft Models

**G.** Passenger Arrival Curves

**H.** Bags per Passenger

**I.** Load Factors

**J.** Gate Utilization

**5.2.1.4** Checked Baggage Inspection Systems (CBIS) shall be designed to be efficient and cost effective. CBISs shall be designed to maximize equipment utilization and minimize systems jams, faults, and errors. All designs shall provide for ample equipment replacement and maintenance clearances while maximizing conveyor layout economy.

**5.2.1.5** The BHS shall be capable of processing standard baggage sizes up to 54" in length, 34" in height and 34" in width respectively. The smallest piece of luggage that a standard BHS must accommodate is 3" high by 3" wide and 12" long; all baggage under these dimensions shall be processed in tubs, provided by the airlines. The maximum weight for standard luggage is 100 lbs;

**5.2.1.6** Where the BHS is to accommodate oversize (O/S) baggage, the bags shall not exceed 72" in length, 42" in height, 42" in width and 150 lbs in weight.

**5.2.1.7** Conveyor right-of-way envelopes shall be no less than 4.5' wide and 4.5' high without catwalk, and 7' wide by 4.5' high with catwalk.

**5.2.1.8** Catwalk spaces shall be considered non-permit confined spaces, when provided as non-full-height egress paths.

## 5.3 Performance

BHS and CBIS shall meet the following performance criteria:

**A.** In the CBIS, baggage spacing (space between head and tail end of adjacent bags) shall be regulated to comply with current EDS technology requirements.

**B.** Belt speeds shall vary no more (incrementally between two belts) than 30% differential from sending to receiving conveyor.

**C.** CBIS/BHS shall transport all baggage from originating locations to security screening areas and then transport cleared bags to makeup, within the user's (airline and TSA) designated time frame. The designer shall model the entire system with EDS which is given by TSA to ensure that the maximum time of a bag in the system is not exceeded.

**D.** CBIS/BHS shall queue bags into security areas to allow for varying processing times and efficiently feed TSA workstations as they become available.

**E.** Configure merges prior to make up units in a manner that does not cause dieback into the security screening matrix.

**F.** The BHS/CBIS shall not have jams in excess of 1%, based on number of checked bags over the course of an hour.

**G.** The maximum percentage of error bags entering the CBRA shall be 2% of the total bags for systems without a reinsertion line and 3% for systems with a reinsertion line, in a 24 hour period of time.

**H.** ATR's misread rate shall not exceed 5% during normal operation.

**I.** BMA's misread rate shall not exceed 5% during normal operation.

**J.** Bag tracking error rate (Lost in track, Added bags, or Missing bags) shall not exceed 0.5%.

**K.** Fail Safe operation activation shall not exceed 0.5% of total bag volume.

## 5.4 Mechanical Components

Conform to the following standards of mechanical components for BHS/CBIS:

### 5.4.1 Baggage Clearance

The standard baggage clearance shall be 36" above Top of Belt.

### 5.4.2 Maximum Incline – Non-Tracked Conveyors

The maximum incline or decline angle for all non-tracked conveyors shall be 18°.

### 5.4.3 Maximum Incline – Tracked Conveyors

The maximum incline or decline angle for all tracked conveyors shall be 15°.

### 5.4.4 Slider-bed conveyor

Slider-bed conveyor construction shall be 39" Between Guides (BG).

### 5.4.5 Oversize Slider-bed conveyor

Oversize Slider-bed conveyor construction shall be 42" BG.

### 5.4.6 Brake Motors

Install brake motors on incline and decline conveyors to keep belts from drifting under load.

### 5.4.7 Motors/Gearboxes

**5.4.7.1** For standard drive units, specify right angle drives as first preference.

**5.4.7.2** Where space is constrained, or drive units will not fit on either side of conveyor, use under-slung drives.

**5.4.7.3** All motors shall have a "C" faced flange and be listed and labeled by the Underwriters Laboratories (UL).

### 5.4.8 Variable Frequency Drives (VFD's)

VFD's shall be utilized on all conveyors upstream of EDS machines, with the possible exception of the take-away conveyors in the public spaces. VFD's shall be utilized on all conveyors within the CBIS portions of the systems. VFD's shall be utilized on all conveyors in any tracking zones.

### 5.4.9 Power Face Diverters (PFD)

PFD's shall have a minimum throughput of 40 bags per minute and at least 5 years of successful operation in conveyor systems.

### 5.4.10 Vertical Diverters

Vertical Diverters shall have a minimum throughput of 30 bags per minute and at least 5 years of successful operation in conveyor systems.

### 5.4.11 Support Structures

Conveyor support structure shall be designed for a minimum of 183 lbs. per linear foot of live load.

### 5.4.12 Catwalks

Catwalk alongside conveyors shall be provided where conveyor TOB elevations are greater than 7'-0" AFF. Catwalk shall be of 30" wide with open grating, and fixed kneeling plates at drive locations. Catwalk shall be provided at locations identified as bag jam points, at control stations, at conveyor access points, and as required by code to properly access and maintain conveyors. Provide ladders and/or crossovers for access to catwalks.

### 5.4.13 Handrails

Handrails shall be provided on all catwalks except where adjacent to conveyor.

### 5.4.14 Equipment Protection

Protect all BHS equipment from damage caused by tug/cart movement using guardrails and/or pipe rails.

### 5.4.15 Conveyor Identification

Each conveyor section shall be permanently and indelibly marked with its respective number as shown on BHS Contractor's shop drawings for conveyor identification. Each conveyor number shall be carefully and neatly painted or stenciled in a contrasting color, nominally 4" high, in a conspicuous location on the conveyor drive. Temporary markings on the conveyors or other equipment shall be made with a medium which is readily removable with water or a readily available commercial solvent, such that they may be removed without requiring refinishing of the surface on which they appear.

## 5.5 Electrical Components

Conform to the following standards of electrical components for BHS/CBIS:

### 5.5.1 E-Stops

E-Stops shall be incorporated into the design at a minimum of every 25' along each conveyor line.

### 5.5.2 Tracking Zones

High resolution, shaft mounted tachometers/encoders shall be provided in tracking zones.

### 5.5.3 Baggage Measurement Array (BMA)

BMA technology with a history of at least 5 years successful operation in conveyor systems shall be provided.

### 5.5.4 Photoelectric Sensors

Photoelectric sensors shall be retro-reflective type with polarized lenses.

### 5.5.5 Integrating into Existing Systems

When a new section of BHS (or CBIS) is being integrated into an existing system, replace the existing PLC with a new control unit to control the entire system. In other words, do not attempt to integrate the new PLC with the existing.

### 5.5.6 EDS Requirements

Meet or exceed the EDS manufacturer's electrical requirements.

### 5.5.7 OIT/ HMI Requirements

One Operator Interface Terminal (OIT)/Human Machine Interface (HMI) shall be provided per Motor Control Panel, to display subsystem diagnostic, maintenance, and control information.

### 5.5.8 Disconnect Switch

Each conveyor motor shall have one heavy duty, 480V, 3 Phase, NEMA 1 disconnect switch and an auxiliary contact to report status of disconnect to PLC for system monitoring.

### 5.5.9 Automatic Tag Readers (ATR)

Each Automatic Tag Readers (ATR) shall be a minimum of ten head array and a history of 5 years of successful operations in conveyor systems.

### 5.5.10 BHS Software and Hardware

BHS Contractor shall provide software and hardware consistent with industry standards such as:

**A.** Windows based software platform.

**B.** Operating system and Graphic User Interface (GUI) shall be user friendly and capable of simultaneously handling multiple programs while incorporating Object Linking and Embedding (OLE).

**C.** Shall not be Proprietary, or 'Sole Source' hardware or software.

### 5.5.11 System Redundancy

PLC System and Centralized Supervisory computers shall be fully redundant to meet the specific functional requirements of the BHS for maintenance information. The controls system shall constantly update the BHS control room's Graphic User Interface(s).

## 5.6 Outbound Conveyor Systems

The following design standards shall be met:

### 5.6.1 Structural Requirements

Meet or exceed structural floor slab requirements per machine, as stated by EDS supplier.

### 5.6.2 Noise Requirements

Comply with TSA and FAA noise requirements for staffed areas.

### 5.6.3 Tug Aisle Clearance

Provide a tug aisle clear height of 8'-0" (minimum) from finished floor to lowest hanger or drive component.

### 5.6.4 Control Station Locations

Make-up unit control stations shall be located within a 16" to 22" arm reach from the perimeter of the unit.

### 5.6.5 Carousel Drive Motor Requirements

Make-up carousel drive motors (primary and redundant) shall be capable of starting the carousel under full load conditions.

## 5.7 Inbound Conveyor Systems

The following design standards shall be met:

### 5.7.1 Claim Unit finishes

Claim Unit finishes which are visible to public eye shall be stainless steel finish.

### 5.7.2 Claim Unit Drive Motor Requirements

Claim Unit drive motors (primary and redundant) shall be capable of starting the carousel under full load conditions.

## 5.8 Testing and Commissioning

Conform to the following standards for testing and commissioning of BHS/CBIS:

### 5.8.1 TSA Certification

TSA certification testing procedures shall be performed as defined in the TSA document, 'Planning Guidelines and Design Standards for Checked Baggage Inspection Systems', latest edition.

### 5.8.2 Functionality Testing

Static and dynamic functionality testing as well as a system throughput test or system 'stress test' shall be performed.

## 5.9 Warranties

### 5.9.1 Warranty Draft

Submit two (2) draft copies of BHS warranty, "Year 2000" compliance warranty and "New Daylight Saving Time" compliance warranty as specified herein for complete operating BHS for review. Submit concurrent with shop drawings and include all specified inclusions.

### 5.9.2 Updating O & M Manuals

O & M Manuals must be updated by supplement to reflect any field changes (by the BHS Contractor), equipment changes to the warranty changes due to changes that were made during the warranty period of the system(s).

### 5.9.3 Warranty Commencement Periods

The warranty period shall be one (1) year from the Final Acceptance of BHS or first day of beneficial use. Refer to the General Conditions for additional requirements.

### 5.9.4 Single Document Warranty

The BHS shall be warranted jointly and severally, on a single document, by the BHS Contractor, Installer, and Manufacturer for complete operating BHS as specified herein and agreeing to repair or replace defective materials and workmanship of the work during the warranty period.

### 5.9.5 Defect during Warranty Period

In the event that defects occur within the warranty period, the BHS Contractor for work under this section shall repair or replace the defective item(s) and assume full costs of labor and materials for such replacement. Replacement item(s) shall be new and meet the requirements of this specification.

Defects due to Defective materials and workmanship are hereby defined to include but are not limited to;

- Operational failure
- Performance below required minimums
- Excessive deterioration or aging
- abnormal wear considering intensity of use
- Unsafe conditions
- Excessive noise or vibration
- Unusual, unexpected and unsatisfactory conditions

Defects beyond the control of the BHS Contractor, Installer, and Designer/ include but are not limited to;

- Acts of nature
- Alterations not performed byt the contractor or associated supcontractors and sub-sub contractors
- Abusive use
- Vandalism

### 5.9.6 Design Failure

In the event that a design failure occurs during the warranty period, BHS Contractor shall redesign/ re-select and replace all components, assemblies, and/or devices utilized in and contributing to the failed design at no cost to The Authority. Submit proposed redesign shop drawings and component data sheets to The Authority for approval. BHS Contractor shall provide a new warranty period upon the correction of such design failure. Components, assemblies, and/or devices shall be considered as design failures if any of the following occurs during the warranty period:

- Inappropriate action of control system components during operational conditions.
- Discovering of an imminent safety hazard or occurrence of an accident during operational conditions.
- Non-compliance with “Year 2000” computer requirements as stated herein.

- Non-compliance with “New Daylight Saving Time” computer requirements as stated herein.

### 5.9.7 Programmable Logic Controller (PLC)

The BHS Contractor or approved representative shall provide training for Programmable Logic Controller (PLC) operations and programming procedures. However, during warranty period, the user shall not modify any PLC operations, PLC programming procedures or PLC programs.

# CHAPTER 6: ELECTRICAL

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below.

## 6.1 Abbreviations

AHJ Authority Having Jurisdiction

ANSI American National Standards Institute

ASME American Society of Mechanical Engineers

CMMS Computerized Maintenance Management System

DOA Department of Aviation

EMT Electrical Metal Tubing

EPA Environmental Protection Agency

GFCI Ground Fault Circuit Interrupter

HVAC Heating, Ventilating and Air Conditioning

LED Light Emitting Diode

NEC National Electrical Code

NEMA National Electrical Manufactures Association

NFPA National Fire Protection Association

PVC Polyvinyl Chloride

## 6.2 Electrical General Requirements

The following guidelines shall be used in the design and specification of Electrical systems and Components.

### 6.2.1 Inspection Requirements

Contractor to have all installed systems inspected and approved by City of Dallas and DOA AHJ inspectors prior to system activation.

### 6.2.2 Panel locations

Contractor is to provide room numbers and locations for all panels that are shown in the panel schedules.

### 6.2.3 Attic Stock

Unless otherwise noted in the Terms and Conditions of a specific contract, the Contractor shall be responsible for providing the DOA with 'Attic Stock'. 'Attic Stock' is defined as an additional 10% of the total number of installed components, intended for replacement. These components include but are not limited to the following:

- Bulbs
- Lenses
- Ballasts
- Fuses
- Controls

## 6.3 Equipment Voltage

The following guidelines shall be used in the selection of utilization voltage for equipment, subject to the availability of the utilization voltage in the building affected.

### 6.3.1 Lighting

- Fluorescent or HID * 277V
- Incandescent ** 120V
- Transformer primary for low voltage incandescent ** 120V or 277V
- LED 120V

* For small tenant areas, small outbuildings, and similar situations where it is not practical to provide 277 volts for lighting, 120 volt lighting may be used, subject to written approval from the Department of Aviation.

** Incandescent lighting is allowed only with written approval from the Department of Aviation.

### 6.3.2 Heating

- Above 5 kilowatts (kW) 480V, 3 phase
- Between 1.5 and 5 kW 277V, single phase or 480V, three phase
- Less than 1.5kW 120V, single phase or 277V, single phase

### 6.3.3 Motors

- Motors 200 HP and above 480V or 4160V, 3 phase
- Motors 1 HP and above 480V, 3 phase
- Motors 1/2 HP and 3/4 HP 480V, 3 phase
- Motors 1/3 HP and below 120V, 1 phase
- Controls 120V

**6.3.3.1** Motors furnished at 277 V single phase as an integral part of HVAC equipment are acceptable for all horsepower ratings.

**6.3.3.2** Utilization voltage for fire pumps shall be approved in writing by the Department of Aviation prior to design.

## 6.4 Emergency and Standby Systems

### 6.4.1 Major Facilities

The requirements of this section shall apply to major facilities. The specific project scope of work may provide additional requirements. The Department of Aviation may revise the requirements stated below to suit the needs of the particular project. Major facilities include but are not limited too:

- Terminal Buildings,
- Concourses,
- Utility Buildings,
- Water Pumping Stations

### 6.4.2 Emergency Electrical Systems

Emergency Electrical Systems (NFPA 70 Article 700, most current version) are those systems required to have automatically supplied power in the event of failure of the normal power supply, for illumination and equipment essential for safety to human life. Emergency loads shall include, but not limited to emergency egress lighting, egress signage, fire alarm and suppression systems, Baggage Handling System fire doors and associated conveyors, and emergency fuel shutoff system.

- Lighting
- Egress Signage,
- Fire alarm and Suppression Systems,
- Baggage Handling System Fire Doors and associated Conveyors, and e
- Emergency Fuel Shutoff System

### 6.4.3 Legally Required Standby Systems

**6.4.3.1** GENERAL
Legally Required Standby Systems (NFPA 70 Article 701, most current version) are those systems intended to automatically supply power to selected loads in order to prevent damage to the facility and to aid in rescue, fire fighting, or evacuation. Legally Required Standby System loads shall include, but not necessarily be limited to:

- Sewage ejector pumps
- Elevators (Where code mandated)
- Vehicle gates
- CMMS
- Storm Water Drain Sump Pumps (Where code mandated)

**6.4.3.2** ELEVATORS SHAFTS/ MACHINE ROOMS
Where the elevator shaft or machine room is sprinkled, elevators shall be supplied with a shunt trip breaker.

### 6.4.4 Optional Standby System

Optional Standby Systems (NFPA 70 Article 702, most current version) are those systems intended to automatically supply power to selected loads that could cause discomfort or serious interruptions. The Design Consultant shall coordinate with the Department of Aviation to determine which loads are required to be on the Optional Standby System.

### 6.4.5 Power Source for Emergency and Legally Required Standby Power Source

Design criteria for emergency and legally required standby power source shall be as follows:

**A.** Diesel-fired generator(s) meeting all EPA requirements for pollutants.

**B.** Maximum of 85 dBA sound level measured at a distance of ten feet from exhaust discharge.

**C.** Fuel storage shall provide a minimum of 10 hours service at full load and meet all NFPA requirements.

## 6.5 Equipment Rooms

All substations, switchboards, transformers, and panelboards shall be installed in dedicated electrical rooms or closets. Outdoors electrical equipment shall be installed in areas protected against physical and water damage. Pipes shall not be routed through electrical rooms or closets. Each electrical room and closet shall have at least one receptacle installed in it. Space shall be provided in electrical rooms and closets for future conduit and equipment.

## 6.6 Equipment Pads

Floor mounted equipment such as switchgear, switchboards, Motor Control Centers, transformers, etc shall be placed on concrete pads a minimum of Four inches above the finished floor.

## 6.7 Metering of Power

### 6.7.1 General

Each substation shall be provided with a secondary meter capable of watt-hour demand readings. All watt-hour demand meters shall have digital readout and pulse output for future remote monitoring.

### 6.7.2 Tenant Metering

Unless otherwise required by the specific lease agreement DOA typically provides normal office lighting and power to Terminal Tenants. Concessions Tenants or Tenants that use power other than for normal office and lighting shall be metered separately. Each tenant shall provide watt-hour digital meters for their tenant space. The meters shall be located in a Department of Aviation electrical room or closet. A spare 2” conduit shall be installed from each metering location to the nearest telephone closet.

## 6.8 Grounding and Lightning Protection

### 6.8.1 Grounding

Manhole and handhole cover frames, if metallic, shall be bonded to the equipment grounding conductor.

### 6.8.2 Equipment Grounding Conductor

A separate equipment grounding conductor shall be provided in all raceway systems containing power circuits, including indoor lighting and receptacle circuits. The ground conductor shall be insulated and color coded green and sized per the most current NEC requirements. A #4/0 ground conductor shall be provided with all power circuits over 600 volts.

### 6.8.3 Grounding Electrode System

Ground rods shall be 3/4” diameter by 10’ long copper or copper clad steel. All underground connectors shall be made using exothermic welds.

### 6.8.4 Lightning Protection

All permanent buildings and structures shall be provided with lightning protection. For stand-alone buildings, a U.L. Master Label shall be provided. For projects that are additions to existing buildings, the Design Consultant shall determine the practicality of obtaining the Master label and shall modify

the design documents accordingly. Lightning protection conductors shall be installed in conduit if routed inside buildings. Lightning protection systems shall be installed in accordance with Lightning Protection Institute 175, NFPA 780, and U.L. 96A.

### 6.8.5 Surge Protectors

All medium voltage transformers and motors shall be protected by properly sized surge protectors.

## 6.9 Power Distribution

### 6.9.1 Power Arrangements

All secondary substations in aviation facility where anticipated load is 1000 kVA or more shall be double-ended secondary selective systems. This shall consist of two primary feeders, two transformer primary over current protective devices, two transformers, and two sets of low voltage switchgear. Secondary selective systems shall be provided with automatic transfer. Quick connects shall be provided at each substation.

### 6.9.2 Equipment

**6.9.2.1** PRIMARY MEDIUM VOLTAGE OVERCURRENT PROTECTION
Where fusing is utilized for transformer primary protection, fusing shall be full range current limiting type. “Under Oil” type fuses shall not be used. On substations, primary switches shall not be interlocked with the secondary main breaker. All bus shall be copper.

**6.9.2.2** TRANSFORMERS WITH MEDIUM VOLTAGE PRIMARY
Transformers shall be delta primary. Transformers secondary shall be Y-connected solidly grounded with neutral terminals. The transformers shall have adequate self-colled capacity for 100% load plus 25% capacity for future growth. Transformers shall have lightning/surge arresters on the primary, on the load side of the disconnecting means. Winding material and internal bussing and connections shall be copper. Dry-type transformers used in substations shall be equipped with a two-stage temperature-sensing device. The first stage shall activate forced air fans and the second stage shall initiate an alarm. For double-ended substations, the fan cooled rating is used in determining the load carrying capacity of the substation where one transformer is out of service. All cable connections to transformer shall utilize compression type connectors where cables are #6 or larger.

**6.9.2.3** TRANSFORMERS – GENERAL PURPOSE DISTRIBUTION
General-purpose distribution transformers shall have adequate self-cooled capacity for 100% load plus 25% capacity reserve for future growth.

**6.9.2.4** LOW VOLTAGE SWITCHGEAR
Secondary low voltage switchgear shall be rated 480 volts, 3 phase, 60 Hertz and shall be free standing, metal enclosed, drawout, ANSI type. The switchgear shall have a main circuit breaker on the secondary of each unit substation transformer. Loads of less than 600 Amps shall be served from distribution panelboards and not directly from the switchgear. A minimum of 20% spare circuit breakers shall be provided. All cubicles shall be complete with buswork, rails, wiring, and circuit breakers.

**6.9.2.5** MOTOR CONTROLLERS
Motor Control Centers shall be used where there are more than two motors, rated at 480 Volts, and located in the same room. Where possible, Motor Control Centers shall be located in the room where the majority of the controlled motors are located. Only mechanical equipment loads shall be powered

from motor control centers. Motor controllers serving motors of 25 HP and larger shall provide phase loss/phase reversal protection. All cable connections to motor control centers or to individual controllers shall utilize compression type connectors where cables are #6 or larger.

**6.9.2.6** PANELBOARDS (POWER AND LIGHTING)
Panelboards shall have copper busses and bolt on type circuit breakers. Each panelboard shall be provided with a minimum of 20% spare circuit breakers. Combination transformer/load centers shall be used only for special applications.

### 6.9.3 Raceways

Raceways shall be provided for all wiring.

**6.9.3.1** RACEWAYS WITHIN BUILDINGS
All Conduits with in building shall meet the following requirements:

**A.** Installed parallel with the building features, except for conduits that run in or under the slab.

**B.** Marked every 40' indicating its use.

**C.** Supported independent of other systems.

**D.** The minimum conduit size shall be 3/4"

**E.** Rigid Galvanized Steel conduits shall be used in elevator shafts, all exterior areas, where exposed within 8' of the finished floor, and other areas where subject to physical damage.

**F.** Rigid Galvanized Steel conduit fittings shall be threaded.

**G.** Conduits run below concrete slab on grade or within concrete slab shall be either Rigid Galvanized Steel or PVC Schedule 40

**H.** Flexible metal conduit may be used for fixture whips to recessed lighting fixtures or for connection to vibrating machinery, such as motors.

**I.** Flexible Metal Tubing length shall not exceed 6'.

**J.** Electrical Metal Tubing may be used where allowed by code except, in elevator shafts, below concrete slab on grade, embedded in concrete slabs, exterior areas, where exposed within 8' of the finished floor, and other areas where subject to physical damage.

**K.** EMT fittings shall be compression type. Cable tray may be used for communications and control wiring. The use of J hooks is not permitted. MC Flexible cable is not permitted.

**6.9.3.2** RACEWAYS WITHIN BUILDINGS FOR CIRCUITS OVER 600V
Where practicable, running of medium voltage circuits within buildings or tunnels shall be avoided. Where medium voltage circuits must be run within a building or tunnel, encase the raceway within the concrete structure of the building or enclose within a concrete or block chase. Where encased in concrete, conduit shall be PVC Schedule 40 or Rigid Galvanized Steel. Where within a chase, conduit shall be Rigid Galvanized Steel.

**6.9.3.3** RACEWAYS UNDERGROUND
All underground conduits shall be PVC or Rigid Galvanized Steel. PVC conduit shall be Schedule 40, minimum. Conduits shall be concrete encased when buried underneath roadways or when used for medium voltage. All empty ducts shall be provided with a nylon dragline for pulling future cables. MC cable shall not be installed in concrete.

**6.9.3.4** MANHOLES AND HANDHOLES

Manhole and handhole spacing shall be as required by code and by wire-pulling requirements, but not more than 500' apart. The minimum inside dimension of manhole that will contain medium voltage cables shall be 12' x 9' x 6'-6". Manhole opening diameter shall be 36". Handholes shall be minimum 24" x 24" x 24".

### 6.9.4 Boxes and Wiring Devices

Boxes for interior electrical systems shall be hot dipped galvanized steel or malleable iron. Cover plates for receptacles, switches, and boxes shall be steel.

**6.9.4.1** RECEPTACLES

Duplex receptacles shall be rated 20 amperes 125 volts with side wired, copper alloy screw terminals. All exterior receptacles shall be GFCI type. GFCI receptacles shall not be wired to protect downstream receptacles. Receptacles shall be identified as follows:

- **A.** Regular Power: Brown or Ivory
- **B.** Emergency Power: red
- **C.** Isolated Ground: Orange

**6.9.4.2** TOGGLE SWITCHES

Toggle switches to control lighting shall be rated for use on 120 and 277 volt circuits and shall be rated for a minimum of 20 amperes.

### 6.9.5 Wire and Cable

**6.9.5.1** GENERAL

All wire and cable shall be copper. All wiring shall be run in raceways.

**6.9.5.2** LOW VOLTAGE SYSTEMS

Conductors to be used on circuits rated 600 volts and less shall be rated for 600 volts and shall be types THHN or THWN. Conductors run below grade for outdoor lighting circuits shall be type XHHW. Wire larger than number 10 AWG shall be stranded. Wire sizes number 10 AWG or smaller may be solid or stranded.

**6.9.5.3** MEDIUM VOLTAGE CABLE

Medium voltage cables installed in manholes and pull boxes shall be wrapped with fire proofing tape, with each conductor separately wrapped. Medium-voltage cable shall be identified in each manhole with laminated plastic tags that indicate voltage, phase, and feeder number.

### 6.9.6 Electrical Identification

**6.9.6.1** LOW VOLTAGE CABLE IDENTIFICATION

Low voltage cables shall be provided in the following colors:

| Phase | 208/120 Volts | 480/277 Volts |
|---|---|---|
| A | Black | Yellow |
| B | Red | Brown |
| C | Blue | Orange |
| Neutral | White | Gray |

| | | |
|---|---|---|
| Ground | Green | Green |

**6.9.6.2** ELECTRICAL EQUIPMENT
Provide engraved plastic laminate identification markers on electrical equipment. Apply markers on the following equipment: Panelboards, switchgear, switchboards, substations, transfer equipment, contactors, transformers, cabinets, enclosures, and disconnect switches.

**6.9.6.3** PANEL SCHEDULES
For every panelboard, provide type circuit schedules with identification of items controlled by each breaker.

**6.9.6.4** RACEWAYS
Label each raceway with pressure sensitive markers with the type of circuit (lighting, power, alarm, signal, PA, etc). Place marker on junction boxes and along raceway on 40' centers.

## 6.10 Lighting Systems

### 6.10.1 Interior Lighting

Voltage for interior lighting shall be 277V. Compact Fluorescent and LED lights are the preferred lamp types. Lighting in general office areas, mechanical, and electrical equipment rooms, corridors, and similar applications shall be fluorescent type. Fluorescent fixtures utilizing linear lamps shall be specified with type T-8 or T-5. Ballasts shall be high-efficiency, minimum 90% power factor. Solid state ballasts shall be used and have a maximum total harmonic distortion of 20%. All fluorescent lighting shall have tube guards or lens covers, except in mechanical areas, where cage guards shall be used.

**6.10.1.1** INTERIOR LIGHTING CONTROL - HAND-OFF-AUTO SWITCHES
Photoelectric controls with hand-off-auto switches shall be provided for interior spaces where natural lighting is available. Occupancy controls shall be utilized in non-public areas which include but are not limited to:

- Offices
- Conference Rooms*

* All Department of Aviation conference rooms shall have dimming capabilities.

**6.10.1.2** INTERIOR LIGHTING CONTROL - MANUALLY CONTROLLED
Where lighting contactors are used, they shall be mechanically held. Service areas shall be manually controlled by wall switches. These include but are not limited to:

- Maintenance Rooms
- Electrical Rooms
- Mechanical Rooms

### 6.10.2 Exterior Lighting

**6.10.2.1** GENERAL
Voltage for exterior lights shall be 277V. Lighting shall be controlled by photoelectric controls, with hand-off-auto switch. For certain applications, where distances are tong for 277V, 480V single phase may be used. Exterior lighting fixtures shall be high pressure sodium, cutoff type. Fluorescent fixtures may be used for small area illumination, such as egress doors, covered walkways, and similar

applications. Exterior, externally illuminated signs shall be illuminated with metal-halide lamps. All light poles shall be locally fused.

### 6.10.3 Emergency Lighting

Emergency lighting and exit signs fixtures shall be fed from emergency circuits. Exit signs shall be LED type.

## 6.11 Vehicle Gates

Vehicle gates shall be supplied from the legally required standby system. Gates shall be provided with weatherproof eyes and operators. All equipment shall be located in NEMA 3 or 4 enclosure, minimum. The Design Consultant shall specify that the contractor is to provide on site training and operation and maintenance manuals. The vehicle gates shall be CMMS track-able.

## 6.12 Fire Alarm Systems

### 6.12.1 General

A complete and integrated fire alarm, detection, control, and monitoring system shall be installed throughout all airport facilities. The system shall be fully addressable, microprocessor and web based. The system shall be capable of being integrated with the Building Management System.

### 6.12.2 Codes and Standards

The system shall comply with all of the most current NFPA requirements.

### 6.12.3 Acceptance and Testing Procedures

Operations Department and the Central Plant Supervisor shall notify of all testing two weeks prior to test date. []

### 6.12.4 General Design Requirement

Design drawings shall include, as a minimum, a comprehensive system riser diagram, annunciator layout, input/output matrix, device schedules, and all equipment device locations.

### 6.12.5 Fire Alarm Control Panel

The main fire alarm control panel shall be sized and configured to accommodate the proposed system plus a 50% expansion capability.

### 6.12.6 System Configuration, Components, and Installation

**6.12.6.1** Manual Pull Stations
Manual pull stations shall be two step and tamper resistant. They shall be located in accordance with all codes.

**6.12.6.2** Audible/Visual Coverage
Audible/visual devices shall be located as required by NFPA 72.

**6.12.6.3** Duct Smoke Detectors

### 6.12.7 Fire Pump System

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### 6.12.8 Special Independently Controlled Fire Suppression Systems

Tenants are not permitted to have Halon systems. All Department of Aviation IT rooms will have a Halon system. No CO2 systems shall be used.

### 6.12.9 Smoke and Heat Detector Requirements

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### 6.12.10 Public Address System Requirements

**6.12.10.1** Pre-Recorded Broadcast Message Requirements

### 6.12.11 Annunciator Panel Requirements

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### 6.12.12 Fire Control Room Requirements

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### 6.12.13 Elevator Fire Alarm Systems Requirements

Fire alarm systems for elevator recall shall comply with the latest edition of the most current American Society of Mechanical Engineers (ASME) Standard A17.1 “Safety Code for Elevators and Escalators.”

**6.12.13.1** ELEVATOR HOIST-WAY
Provide a smoke detector and a heat detector at the top of the elevator hoist-way and in the hoist-way pit if a sprinkler head is installed. Heat detectors shall be mounted within 24” of the sprinkler heads in the hoist-way and machine rooms.

**6.12.13.2** ELEVATOR MACHINE ROOM
Provide a smoke detector and a heat detector in the elevator machine room.

**6.12.13.3** ELEVATOR LANDING
Provide a smoke detector at each elevator landing.

**6.12.13.4** LEVEL OF EXIT DISCHARGE
The smoke detector at each landing, the hoist-way, and in the machine room will recall the elevator car to the designated level of exit discharge.

**6.12.13.5** SHUNT TRIP BREAKER
The heat detector in the hoist-way and the machine room shall activate the shunt trip breaker prior to the activation of the shaft sprinklers.

### 6.12.14 Holding Cell Fire Detection Requirements

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### 6.12.15 System Operation Requirements

The manual or automatic operation of an alarm initiating or supervisory operating device shall cause the FACP to transmit an appropriate signal including but not limited to the outline below:

**6.12.15.1** GENERAL ALARM
A general fire alarm caused by an initiating device shall activate the audible and visual alarms through out the building.

**6.12.15.2** ANCILLARY CONTROL FUNCTIONS
An alarm caused by a fire alarm device associated with elevator recall, fire/smoke door release, baggage conveyer shutdown, HVAC shutdown, etc shall activate a general building alarm and operate the equipment that in controls.

### 6.12.16 System Trouble

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### 6.12.17 System Wiring and Raceway Requirements

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### 6.12.18 System Testing Requirements

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# CHAPTER 7: COMMUNICATIONS / SPECIAL SYSTEMS

# CHAPTER 8: INTERIOR SIGNAGE AND GRAPHICS

## 8.1 Introduction

To provide a set of planning standards, requirements and design criteria to be used for all interior and exterior signing applications at the three City of Dallas Department of Aviation's aviation facilities. These guidelines will set forth standards that describe, but the aesthetic, functional and technical design standards for the following sign types:

- Directional Signs
- Informational Signs
- Regulatory and Identification Messages

## 8.2 Reference Standards

The standards and requirements included, but are not limited to the following:

- Federal Department of Transportation (DOT)
- Texas Department of Transportation (TxDOT)
- American Association of State Highway and Transportation Officials (AASHTO)
- ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)
- International Air Transport Association (IATA)
- American Association of Airport Executives (AAAE)
- Airports Council International (ACI)
- Air Transport Association of America (ATA)
- American Institute of Graphic Arts (AIGA)

## 8.3 ADA Guidelines

All Airport signage conform, as a minimum, to the Americans with Disabilities Act (ADA) enacted July 6, 1990 as well as all additional federal guidelines that followed there from.

## 8.4 Unified Environment

All Airport signage must be understood as a coherent, unified environment. These common elements are the foundation of the graphic system for airport signing, providing a set of consistent elements shared by all signs.

### 8.4.1 Signage Description, Type and Color Requirements

The following are DOA requirements for the various Airport signs;

| Signage Description | Display Type | Color Group |
|---|---|---|
| Airport Information | Static & Dynamic | 2 |
| Departures Signage | Static & Dynamic | 1 |
| Arrivals Signage | Static & Dynamic | 1 |

| | | |
|---|---|---|
| Transfer Signage | Static & Dynamic | 1 |
| Baggage Signage | Static & Dynamic | 1 |

## 8.5 Common Graphic Elements

### 8.5.1 Common Elements

Typefaces, arrows, symbols and colors are common to all Airport signage, as described in the relevant parts of this Section.

### 8.5.2 Sign Layouts

All sign layouts should group graphic elements and provide consistent locations for all graphic elements. As an example, arrows should always be located in “arrow bands” reserved for those terminal/parking symbols are located in a consistent area common to every sign etc.

### 8.5.3 Exceptions

Exceptions to “common element” formats must be avoided whenever possible. When unusual circumstances cannot be accommodated within the standard guidelines, every effort must be made to develop a suitable solution that relates as closely as possible to the graphic system described herein. Any such deviations from these standards, and from those this section, must be clearly identified and submitted for review and approval by the DOA.

## 8.6 Selected Typeface

Helvetica has been selected, as the typeface for all exterior signage at DOA Aviation Facilities.

## 8.7 Standard Typefaces

[Content to be added]

## 8.8 Letter and word Spacing

[Content to be added]

## 8.9 Typographic Restrictions

### 8.9.1 Modification of Letter Shapes is Prohibited

Modification of letter shapes is prohibited. Condensed, extended, slanted, outlined or otherwise distorted type will not be acceptable under any circumstances. Language to this effect shall be included in the specifications for all airport sign projects.

### 8.9.2 Typefaces or Type Weights

Typefaces or type weights not described above may not be used at DOA Aviation Facilities.

## 8.10 Arrows

[Content to be added]

## 8.11 Terminal and Parking Symbols

[Content to be added]

## 8.12 Symbols

[Content to be added]

## 8.13 Color

### 8.13.1 Signage Color

The following are the recommended color groups:

- Group 1: Black Text – Yellow Background
- Group 2: Dark Blue Text – White Background
- Group 3: Red Text – White Background

### 8.14.2 Color Definition

Color Definitions are as follows:

| Color | Hue | Saturation | Brilliance |
|---|---|---|---|
| Yellow | 41 | 255 | 122 |
| Dark Blue | 170 | 255 | 84 |
| Red | 8 | 255 | 122 |

# SECTION 5: AIRSIDE DESIGN STANDARDS

These Design Standards are provided to inform the Design Consultant of general requirements for the design of Airside projects at City owned aviation facilities and to identify special requirements which may be unique to particular project types. The Design Standards are organized so that general issues of project design are dealt with first followed by more specialized applications related to specific project types.

| | | | | | File Links/References |
|---|---|---|---|---|---|
| Section 5: Airside Design Standards | Chapter 1 | Environmental | 1.1 Abbreviations<br>1.2 Permitting Requirements | | • Dallas City Code Sec.19-118<br>• Small construction sites<br>• TXR150000 Construction General Permit<br>• Large construction sites |
| | Chapter 2 | Air Operations Area (AOA) | 2.1 (Content to be Added) | | |
| | Chapter 3 | Site and Civil | 3.1 Abbreviations<br>3.2 General Requirements<br>3.3 Critical Design Aircraft<br>3.4 Survey Control<br>3.5 Site Preparation<br>3.6 Geotechnical Investigation and Reporting Requirements<br>3.7 Project Reporting<br>3.8 Construction Means and Methods<br>3.9 Site Demolition<br>3.10 Erosion and Sediment Control<br>3.11 Geometrics<br>3.12 Line of Sight<br>3.13 Gradients and Slopes<br>3.14 Storm Drainage<br>3.15 Hydrology<br>3.16 Computation, Collection, and Disposition of Runoff | 3.17 Utility Trenches, Markings, & Manhole/Handhole Covers<br>3.18 Water Mains<br>3.19 Sanitary Sewers<br>3.20 Electrical/Phone/ Telecommunications<br>3.21 Electrical Structure Drains<br>3.22 Bollards<br>3.23 Runway Exits<br>3.24 Aprons<br>3.25 Aircraft Parking<br>3.26 Pavement Design<br>3.27 Pavement Marking<br>3.28 Landscaping<br>3.29 Topsoil<br>3.30 Seeding and Sodding<br>3.31 Artificial Turf<br>3.32 Access Roads<br>3.33 Airport Fence and Gates | |
| | Chapter 4 | Utilities | 4.1 (Content to be Added) | | |
| | Chapter 5 | Fueling Systems | 5.1 (Content to be Added) | | |
| | Chapter 6 | Airfield Lighting | 6.1 Abbreviations<br>6.2 Underground Conduit<br>6.3 Field Lighting Circuit Color Codes<br>6.4 Wiring Requirements<br>6.5 Counterpoise Wire<br>6.6 Airfield Lighting Control and Monitoring System (ALCMS)<br>6.7 Isolation Transformers<br>6.8 Airfield Visual Aids | | |

# CHAPTER 1: ENVIRONMENTAL

The requirements and standards listed below include, but are not necessarily limited to, subjects to be evaluated by the Design Consultant. The application of these requirements will depend on the type of project. It is the Design Consultant's responsibility to determine which requirements apply to the design of the project and to ensure that all environmental reviews, approvals and permits are secured so as to avoid resultant delays if a permitting requirement is not satisfied at the time construction is ready to begin.

## 1.1 Abbreviations

| | |
|---|---|
| TPDES | Texas Pollutant Discharge elimination System |
| NPDES | National Pollutant Discharge Elimination System |
| SWPPP | Storm Water Pollution Prevention Plan |
| PM | Project Manager |

## 1.2 Permitting Requirements

### 1.2.1 Asbestos and Lead

Federal and State mandated regulations for the must be meet in full. The Design Consultant shall be responsible for determining if existing facilities should be inspected for asbestos and lead based products and the development of an Abatement Plan by a qualified profession detailing the removal and disposal or encapsulation of these hazardous contaminants and materials.

### 1.2.2 Storm Water

Dallas City Code Sec.19-118

### 1.2.3 Construction activities greater than one acre and less than five acres

These must comply with the Texas Pollutant Discharge Elimination System (TPDES) Permit rules and regulations for small construction sites listed in the TXR150000 Construction General Permit, in addition to Dallas City Code requirements.

### 1.2.4 Construction activities greater than five acres

These must comply with the TPDES Permit rules and regulations for large construction sites listed in the TXR150000 Construction General Permit, in addition to Dallas City Code requirements.

### 1.2.5 Federal Clean Water Act

This Act is the primary federal law in the United States governing water pollution. The system for granting and regulating discharge permits is called the National Pollutant Discharge Elimination System (NPDES), which regulates both point and non-point sources that discharge pollutants into waters of the United States. Section 404 of the Federal Clean Water Act may have a bearing on a construction project.

### 1.2.6 Storm Water (SWPPP)

A Storm Water Pollution Prevention Plan is used to describe a process though which a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff.

**1.2.6.1** SOURCES
Sources of pollution potentially affecting the quality of storm water discharges associated with industrial activities that are covered under the MSGP-2000 need to be identified.

**1.2.6.2** IMPLEMENTATION
Implementation of practices to minimize and control pollutants in storm water discharges from these industrial activities is to be described.

**1.2.6.3** COMPLIANCE
Compliance with the terms and conditions of the MSGP-2000 must be ensured.

### 1.2.7 Contaminated Sites

In the case of property already owned by the City, redevelopment plans should consider past land use that may have resulted in site contamination. The Design Consultant, in coordination with the PM, shall schedule a meeting with the City to determine how to identify and manage remediation of existing site contamination.

### 1.2.8 Remediation Sites

### 1.2.9 Air Quality Program

### 1.2.10 Dust Control and Prevention

# CHAPTER 2: AIR OPERATIONS AREA (AOA)

# CHAPTER 3: SITE & CIVIL

## 3.1 Abbreviations

| | |
|---|---|
| AC | Advisory Circulars |
| ADG | Airplane Design Group |
| ALP | Airport Layout Plan |
| AOA | Air Operations Area |
| ATC | Air Traffic Control |
| CBR | California Bearing Ratio |
| CDA | Critical Design Aircraft |
| E/C | Electrical & Communication |
| ESD | Electrical Structure Drain |
| FAA | Federal Aviation Administration |
| FAR | Federal Aviation Regulations |
| HH | Handhole |
| MH | Manhole |
| PCC | Portland Cement Concrete |
| PM | Project Manager |

## 3.2 General Requirements

### 3.2.1 General

This section covers all applicable facilities within the Air Operations Area (AOA) that shall be planned, designed and constructed in accordance with current Federal Aviation Administration (FAA) standards and criteria. These consist of Federal Aviation Regulations (FAR's) and Advisory Circulars (AC's) current editions. Copies may be obtained from the FAA Southwest Regional Office and U.S. Department of Transportation.

### 3.2.2 Minimum Standards

In some cases, the Advisory Circulars (AC's) offer the Design Consultant a range of criteria, in which case this Design and Standards Manual will establish minimum standards to be used at aviation facilities. If there are design criteria decisions to be made which are not covered in the respective AC or this Manual, the Design Consultant will make recommendations to the Airport Contact on a case-by-case basis.

## 3.3 Critical Design Aircraft

The Critical Design Aircraft (CDA) shall be identified for each project; however the standard is Airplane Design Group VI (ADG) per AC 150/5300-13. Changes from this standard may be made pertaining to any of the following elements:

### 3.3.1 Runway Length

The CDA will be furnished by the Airport Contact.

### 3.3.2 Width, Clearances & Separations of Runways, Taxiways, and Parking Aprons

The CDA, or its associated Airplane Design Group per AC 150/5300-13, will be recommended by the Design Consultant based on traffic forecasts furnished by the Airport Contact or Tenant Airline.

### 3.3.3 Pavement Design

The CDA will be furnished by the Airport Contact.

### 3.3.4 Review

Review by the Director of Operations of all AOA ADG standards shall be accomplished prior to final design.

## 3.4 Survey Control

The Design Consultant is responsible for quality control checking of all new and existing monumentation prior to using the monuments in accordance with standard survey practices. The Design Consultant shall promptly notify the PM of damaged and destroyed monumentation immediately.

## 3.5 Site Preparation

For major structure and facility excavation, no construction will be permitted without adequate knowledge of subsurface conditions as determined by soil investigations, field sampling, laboratory testing, and a written report provided by a qualified geotechnical consultant familiar with the execution of such work.

## 3.6 Geotechnical Investigation and Reporting Requirements

The Design Consultant shall develop a program to perform subsurface exploration and laboratory testing in the area of any proposed construction. The Design Consultant shall explain the approach as part of the cost proposal required for the project. The explanation shall include technical issues to be resolved, field and laboratory methods to be used, estimated number and depths of borings, and other field's methods, estimated laboratory testing, and reporting methods. Before performing any field work, the Design Consultant shall prepare a detailed work plan. The plan shall include the results of previous investigations relevant to the project. The work plan shall include proposed boring locations, details of investigation methods, coordination issues, and reporting schedule. The work plan shall be submitted to the PM for review and approval before any fieldwork is performed.

## 3.7 Project Reporting

### 3.7.1 Reporting Methods

Project Reporting Shall Utilize 1 of 2 Methods:

**3.7.1.1** SEPARATE REPORTS
Geotechnical Data Report and Geotechnical Baseline Report or Geotechnical Recommendations Report.

**3.7.1.2** OTHER REPORTS
These include Combined Geotechnical Data and Recommendations Report.

### 3.7.2 Report Formatting

**3.7.2.1** GENERAL
The method shall be coordinated with the DOA, along with other issues relating to report formatting. A draft report, for review and comment, shall be submitted for approval by the DOA. The final report

shall include resolution of all comments provided by the DOA. Investigation methods shall be tailored to the needs of the specific project. Borings are anticipated for each project. Seismic refraction surveys are required, for all projects requiring open-cut excavation.

**3.7.2.2** GROUND WATER
Ground water conditions shall be investigated for each project, including significant excavations greater than 15'. This shall include the installation and monitoring of observation wells. When required, monitoring shall continue for at least six months to give an indication of seasonal fluctuation.

**3.7.2.3** COORDINATES
The coordinates (northing, easting, elevation) of each boring or survey line shall be reported, using current airport standards. Boring logs shall include soil descriptions, blow counts, and all other relevant information. Refusal and its relation to top of rock shall be carefully explained and correlated to seismic refraction survey where available.

**3.7.2.4** TECHNICAL ISSUES
Technical issues that may require resolution include, but are not limited to:

**A.** Nature and extent of unsuitable soils and recommendations for remedial methods

**B.** Recommendations for other soil improvement methods, including excavations and replacement, geo-fabrics, and soil stabilization

**C.** Pavement recommendations, including California Bearing Ratio (CBR) values, for flexible pavements and the subgrade modulus (K value) for rigid pavements

**D.** Foundation recommendations, including allowable bearing pressures, anticipated settlement, and issues relating to eccentric loading and uplift loading

**E.** Recommended excavation methods based on seismic refraction results.

**F.** Ground water control recommendations.

**G.** Detailed recommendations for any other special construction

## 3.8 Construction Means and Methods

The Design Consultant shall be sensitive to construction means and methods when developing the design and construction documents. For example, in the area of the terminal, the Design Consultant should evaluate whether pile driving would cause damage to the exterior glazing. Also for example, in areas with existing utilities and sensitive FAA equipment, the Design Consultant should evaluate whether certain demolition equipment would cause equipment failure and recommend any restrictions on construction means and methods.

## 3.9 Site Demolition

Site demolition includes clearing, grubbing, grading, drainage, paving, and special site development structures. All site work shall be designed and conducted to improve the overall aesthetics of the aviation facility and to promote future development. The site shall be prepared preserving the natural character of the terrain by minimum disturbance of existing ground forms, with the objective to develop an attractive, suitable and economical project site. Surface and subsurface flow from storm water shall be diverted away from buildings and pavements to prevent undue saturation of the subgrade that could damage structures and weaken pavements.

### 3.9.1 Pavement and Structure Demolition

The Design Consultant shall be sensitive to the construction means and methods of pavement or structure demolition. Refer to Section "4.1.3 Construction Means and Methods."

### 3.9.2 Excavation and Embankment

Side slopes on excavation (cut) and embankment (fill) areas outside of runway and taxiway safety areas shall have a slope no steeper than four (4) horizontal to one (1) vertical.

## 3.10 Erosion and Sediment Control

## 3.11 Geometrics

All airfield geometry shall conform to the current Airport Layout Plan (ALP). Detailed geometry not included or referenced on the ALP shall conform to the requirements in AC 150/5300-13 and other relevant AC's. All filets for "Cockpit-over Centerline Steering" will be designed in accordance with AC 150/5300-13.

## 3.12 Line of Sight

### 3.12.1 Line-Of-Sight Criteria

All runways and runway safety areas shall conform to the line-of-sight criteria of AC 150/5300-13. Taxiways under the control of the Air Traffic Control (ATC) Towers shall be in full view of the tower cab full length and width. An ATC Tower Line-of-Sight (Shadow) Study shall be prepared to determine the line-of-sight acceptability. Ramp control towers may require line-of-sight studies for aircraft parking areas and taxilane intersections.

### 3.12.2 Additional Considerations

Line-of-sight considerations may also be required when facilities are planned and designed near, or in the vicinity of, FAA NAVAIDS. Prior to commencement of airfield construction, an Airport Board Airspace Review Application" shall be completed with appropriate information and exhibits required by the FAA on which FAA can conduct an Aeronautical Study of the proposal – (reference AC 70/7460-2 and FAR Part 77). Non-AOA projects will require an Airspace Form for staging areas, batch plants, construction cranes and other related items. Construction activities (temporary stationary objects) shall be reviewed through the Airports Local Airspace Review Program administered by the Board.

## 3.13 Gradients and Slopes

All pavement and turf areas on the airfield AOA shall conform to the requirements of AC 150/5300-13, and as supplemented by the following criteria:

### 3.13.1 Side Slopes

Side slopes on excavation (cut) and embankment (fill) areas outside of runway and taxiway safety areas shall have a slope no steeper than four (4) horizontal to one (1) vertical.

### 3.13.2 Far Requirements

All topography and above ground objects, except those required by function for navigation, shall be clear of the imaginary surfaces of FAR Part 77 and shaped or designed to avoid line-of-sight problems

and interferences with Airport navigational instruments and facilities. Objects that are within safety areas shall comply with FAR Part 139.

### 3.13.3 Crowns

The standard crowns (transverse slope) on runways and taxiways shall be one percent, except where flatter grades are necessary due to intersection transitions, in which case they shall be a minimum of 0.5 percent.

### 3.13.4 Shoulders

All paved runway shoulders and taxiway shall be paved with a minimum of one percent to a maximum of five (5) percent surface gradient. The desirable slope is two (2) percent. The maximum slope shall not be used without approval of the Airport Contact. The edge of pavement to edge of shoulder conform joint shall be at the same elevation (no pavement lip).

### 3.13.5 Parking Aprons

Pavement gradients on aircraft parking aprons shall be 0.5 percent min., except where conforming or transitioning to existing facilities, and except for fifty (50) feet from Terminal buildings at the gate and parking positions which shall be one (1) percent to conform to NFPA Standard 415 on "Aircraft Fueling Ramp Drainage."

### 3.13.6 Obstacle Free Zones

Gradients, slopes, and object clearing criteria for "Obstacle Free Zones", "Runway and Taxiway Safety Areas," and "Runway Protection Zones" shall conform to the standards of AC 150/5300-13 for the respective critical aircraft or mix of aircraft.

## 3.14 Storm Drainage

Storm drainage design of the Airport in those areas referred to as the AOA shall be governed by AC 150/5320-5. Additional City storm drainage design criteria and requirements must be accommodated in the design. In those instances where a conflict shall arise between the landside design and the AOA design, the more conservative criteria shall govern.

## 3.15 Hydrology

For drainage areas less than two hundred (200) acres the Rational Method is acceptable for determining the amounts of rainfall and runoff in the AOA to be used as a basis for drainage system designs. The Rainfall Intensity Curves presented in the Weather Bureau Technical Paper No. 40 shall be used. The storm interval as presented in AC 150/5320-5 shall be used.

## 3.16 Computation, Collection, and Disposition of Runoff

In addition to any special requirements of the City, the coefficients to be utilized in the rational formula, as well as charts for surface flow time calculations, are presented in AC 150/5320-5. A topographical map shall be prepared of existing conditions, preferable with a two (2) foot contour intervals as well as a detailed plan showing proposed and ultimate layout of the runways, taxiways, aprons, and building areas with the finished contours drawn to an one (1) foot interval or less. With the addition of various basins, storm pipelines and drainage sketched upon the detailed plane, it will become a working drawing for drainage considerations at the site. Open channel calculations will be in accordance with the FAA Manual procedures utilizing various nomographic solutions presented in

AC 150/5320-5. The conveyance analysis and design of culverts in the AOA shall be in accordance with the Texas Department of Transportation Hydraulic Manual. Minor losses shall be calculated by methods presented in Section 2.3.3.9 – Design of Closed Storm Drainage System.

### 3.16.1 Drainage of Unpaved Areas Adjacent To Buildings

Unpaved areas adjacent to buildings shall be sloped to direct surface water and roof drainage away from buildings at a minimum slope of five (5%) percent in the first ten (10) feet of horizontal distance. Unpaved areas shall be permanently stabilized with vegetative cover to prevent erosion and soil loss. Surfaces paved with concrete or bituminous pavement shall have a slope of not less than 0.5 percent in the direction of drainage, to prevent ponding.

### 3.16.2 Drainage of Unpaved Areas Not Occupied By Buildings

Portions of the site not occupied by buildings or pavement shall have adequate continuous slopes to drain toward watercourses, drainage swales, roadways, and storm drainage inlets. Drainage swales or channels shall be sized and sloped to accommodate the design runoff. Sheet flow across sidewalks is allowable. The concentrated runoff shall be carried under walkways in pipes or by suitable sidewalk drains. Swales shall be used to intercept water at the top and bottom of banks where large areas are drained. To provide positive drainage, a slope of not less than two (2%) percent for turf areas is desirable. Slopes shall be designed to ensure non-erosive runoff velocities. Turf banks, where required, shall be graded to permit the use of gang mowers, providing a maximum slope of four (4) horizontal to one (1) vertical. The tops and bottoms of all slopes shall be gently rounded in a transition curve for optimum appearance and ease of maintenance.

### 3.16.3 Storm Drain Inlets

Various charts are available in the Drainage Manual that shall be used to determine the capacity and efficiency of the particular type of inlet chosen. When designing inlets, freedom from clogging or from interference with traffic shall take precedence over hydraulic considerations. Precast units may be used for load bearing applications only with the approval of the DOA and City.

### 3.16.4 Placement of Manholes and Inlets

Manholes or combination manholes and inlets shall be placed wherever necessary for clean-out and inspection purposes. Place manholes at changes in direction, junctions of pipe runs, and at intervals of three hundred (300) to five hundred (500) feet in long pipe runs where the size or direction is not changed. The invert of the manhole section shall be rounded to match the inverts of the pipes entering the manhole in order to reduce eddying and resultant head losses. For manholes that are larger than the incoming or outgoing pipes, expansion losses can sometimes be significant. The use of heavy duty manholes may be required in some cases depending on location and shall be coordinated with the DOA and City.

### 3.16.5 Flow in Storm Drains And Their Appurtenances

Storm drains shall be designed to have a minimum mean velocity of 2.5 feet per second flowing full; velocities greater than thirteen (13) feet per second shall be avoided.

### 3.16.6 Design of Closed Storm Drainage System

In the preparation of hydraulic designs, a thorough investigation shall be made of all existing structures and their performance on the waterway in question. The design frequency for all new closed drainage systems shall be 10 years with a combined 100-year emergency overflow as required

herein. The total capacity of the drainage facility, including surface flow within limits of available right-of-way or easements, shall be equal to or greater than the runoff of a storm of 100-year design frequency. Should the 100-year storm runoff exceed the capacity of the above design, then the closed storm system shall be designed based on a minimum 25-year frequency, or larger, to develop a 100-year emergency overflow system. The hydraulic gradient shall be calculated for all storm drain lines and culverts and shall not be designed above the entrance flowline of any inlet. The permissible difference between the hydraulic gradient and top-of-curb is normally two (2) feet.

### 3.16.7 Design and Analysis of Open Channels

Backwater analysis is to be developed for major channels to establish water surface elevation and to avoid adverse impacts on adjacent properties. All new channels shall be designed using the one hundred (100) Year Design Frequency, HEC-2 Water Surface Profiles Method as presented in the U.S. Army Corps of Engineers, Water Resources Support Center or alternate methodology as approved by the DOA. Channels shall be concrete lined for velocities over 7.5 feet per second. A 2'-0" freeboard will be incorporated into the design calculations.

### 3.16.8 Design of Culverts

Drainage culverts shall pass storm flow from the upstream side of highway, road or railroad to the downstream side without causing excessive backwater head and without creating excessive downstream velocities. The Design Consultant shall keep the discharge velocities within safe limits (usually 6 feet per second) while selecting the most economical structure that will provide satisfactory service.

## 3.17 Utility Trenches, Markings, & Manhole/Handhole Covers

### 3.17.1 Utility Markings

The design and construction of all City Aviation Facility projects shall include the requirement to mark all underground utilities with magnetic tape. The tape should be 3" wide and positioned at a maximum 8"-12" deep below top of ground, or 4" wide and positioned at a maximum 3"-6" deep below the bottom of pavements.

### 3.17.2 Manhole/Handhole Covers/Lids

All new and replacement manhole/handhole covers/lids shall include customized cover/lid surface lettering as follows:

### 3.17.3 Labeling Criteria

All Airport manhole/handhole covers/lids shall include the name "AIRPORT NAME" and the type of utility: "ELECTRIC", "STORMWATER", "SANITARY SEWER", "WATER", "GAS", "TELEPHONE." Lettering shall be Helvetica, medium, capitalized and 1 1/2 inches in height.

## 3.18 Water Mains

See Section 5-4 Utilities for information and details.

## 3.19 Sanitary Sewers

See Section 5-4 Utilities for information and details.

## 3.20 Electrical/Phone/Telecommunications

See SECTION 5:Chapter 4: Utilities for information and details.

## 3.21 Electrical Structure Drains

An Electrical Structure Drain (ESD) shall be provided as a drainage design alternative for electrical manhole (M H) and handhole (HH) structures where other preferred alternate drainage measures may not be possible to facilitate drainage away from the Electrical and Communications (E/C) Infrastructure Systems.

### 3.21.1 Alternate Drainage Measures

Qualifying Preferred Alternate Drainage Measures are the following:

**A.** Install 6" Polyvinylchloride (PVC) drainage pipe from E/C MH or HH directly into a drainage MH in close proximity provided inverts permit positive drainage.

**B.** Install 6" PVC drainage pipe from E/C MH or HH directly into drainage pipe in close proximity provided inverts permit positive drainage.

### 3.21.2 Locations

ESD(s) shall be installed in locations where space is available and where other preferred drainage measures cannot be provided in grass areas. For proposed E/C ductbank installations the Design Consultant shall provide either adequate space for ESD installations at an E/C structure or design the ductbank plan and profile to allow for the E/C ductbank infrastructure to drain to a low point at a MH or HH where an ESD can be installed.

### 3.21.3 Existing Ductbanks

Many design measures have been taken in the past to prevent water from entering the E/C infrastructure at lighting conduits, manholes, handholes, etc., however water has entered the E/C infrastructure despite those efforts, and design measures need to be taken to remove the water that has both entered in the past and will continue to enter in the future. For existing E/C ductbank runs, ESD(s) need to be installed at ductbank profile low points at E/C MH(s) and HH(s) where space is provided.

## 3.22 Bollards

All bollards shall be a minimum of six (6) inches in diameter steel pipe and concrete filled.

## 3.23 Runway Exits

### 3.23.1 High Speed Exit Taxiway

Locations shall be as shown on the Airport Layout Plan. The geometric layout shall either match existing high speed exit taxiways on the Airport or conform to AC 150/5300-13. Larger-than-standard fillet radii shall be investigated where traffic “backturns” are anticipated.

### 3.23.2 Right Angle Connector Taxiway

Right angle intersections shall meet the requirements of cockpit-over-centerline steering and shall conform to the requirements of AC 150/5300-13.

### 3.23.3 Runway and High Speed Exit Taxiway Grooving

All runway and taxiway grooving shall conform to AC 150/5320-1 2C. Slurry from sawing must be vacuumed as part of the sawing operation and disposed of off the Airport property. Final cleanup shall include flushing by water.

## 3.24 Aprons

Where holding aprons are included in the project scope, the overall location and geometric layout will be reviewed with DOA for approval. Widths, clearances, fillet radii and other details not furnished shall conform to AC 150/5300-13, or as recommended by the Design Consultant and approved by the DOA.

## 3.25 Aircraft Parking

Aircraft parking aprons shall be based on an "Apron Utilization Plan". Apron utilization criteria, including wingtip clearance, shall be approved by the DOA and must be within the maneuvering limits of the Aircraft Characteristics Manual of the Critical Design Aircraft. Aircraft service pits, where applicable, shall be located to minimize impact on Portland Cement Concrete (PCC) pavement joint performance.

## 3.26 Pavement Design

Pavement design for all aircraft worth pavements shall be based on FAA methodology and requirements in AC 150/5320-6. Standard sections exist for the various aircraft pavements encountered at the Airport. Deviation from these standard sections required the submittal of a pavement report prepared by a qualified geotechnical and materials engineering firm and a pavement section design sealed by a professional engineer registered in the State of Texas and the approval of the DOA.

### 3.26.1 Subgrade

### 3.26.2 Subbase

### 3.26.3 Base Course

### 3.26.4 Pavement Type

All airfield pavements shall be Bituminous Concrete or Portland Cement Concrete (PCC) pavement.

**3.26.4.1** BITUMINOUS CONCRETE

**3.26.4.2** PORTLAND CEMENT CONCRETE

## 3.27 Pavement Marking

### 3.27.1 Paint Composition Criteria

Pavement marking of runways, taxiways, taxilanes and other paved areas within aircraft operations areas, with the exception of black markings, shall be waterborne paint containing glass beads and shall conform to AC 150/5340-1 H.

### 3.27.2 Paint Color Criteria

Paint shall be waterborne in accordance with Federal Specification TT-P-1952D, Type I or Type II depending on usage [Type I has a standard drying time (no pick-up when tested in accordance with ASTM D 711), Type II may be used for striping where faster curing is desirable]. Paint shall be furnished in [white (37925), yellow (33538 or 33655), red (31136), black (37038), and pink (1 part red — 31136 to two parts white — 37925)] in accordance with Federal Standard Number 595. Black paint should be used to outline a border at least six inches wide around markings on all light colored pavements. Black paint shall not contain glass beads.

### 3.27.3 Glass Beads Criteria

Glass beads shall meet the requirements for Federal Specification TT-B-1325C, Type III. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

## 3.28 Landscaping

## 3.29 Topsoil

## 3.30 Seeding and Sodding

Composition and application of seed fertilizer and sod shall be coordinated with the Airport Contact. All areas within 10" of the edges of airfield pavements, runways, taxiways, and aprons shall be sodded and sod shall be secured from detrimental effect of jet blast. The placement of all turf adjacent to paved shoulders and blast pavement shall be 1-1/2 inches below the pavement surface.

## 3.31 Artificial Turf

## 3.32 Access Roads

### 3.32.1 ARFF

**3.32.1.1** TURNING RADIUS

The external turning radius (wall to wall) shall not be less than fifty-seven (57) feet. The internal radius shall be no less than thirty-five (35) feet. The turn at no time will be less than twenty-two (22) feet wide.

**3.32.1.2** GRADE

The maximum grade change of any portion of a fire apparatus access road shall not exceed ten (10) feet of rise per hundred (100) feet of run.

### 3.32.2 Site Preparation NAVAIDs

Design criteria for NAVAID critical areas shall conform to AC 150/5300-13. FAA NAVAIDS access roads shall be a minimum of ten (10) feet wide. Airport facilities will be checked for compliance with FAA electromagnetic standards. See FAA Advisory Circular AC 70/7460-2.

## 3.33 Airport Fence and Gates

### 3.33.1 Fence Design Requirements

Security fencing is any fence used to separate public areas from restricted areas. Any Proposed modifications to the AOA security fence must be submitted to the DOA for review 60 days in advance of installation. Security Fencing shall meet the following requirements;

**A.** Provide fencing and component complying with FAA Advisory Circular AC150-5370-10B, Change 8, Part VIII, Item F-162; a Standard for specifying fence construction at aviation facilities.

**B.** Fence Height: 8 feet minimum. For additional height requirements, verify with DOA.

**C.** 9ga. Galvanized wire

**D.** (6) Strands Barb Razor wire with V-Bob outrigger

**E.** Top Rail

**F.** Bottom Wire Support

**G.** All Poles must be set in Concrete a minimum of 2' below grade.

**H.** Components shall be bolted down

### 3.33.2 Gate Design Requirements

**A.** Gates require Fire Department Lock Box and Fire Department Permit. Gate Operators require either battery backup or manual release which ever is code required.

**B.** The wheels for the gate shall have wearing cycle that meet shift changes and use requirements that exceed estimated use by at least twice the load count for a 5 year period.

**C.** Card readers, intercom station may be required when designing the fence and gate systems.

**D.** The size and weight of the gates should be considered when sizing of the operator and provide a large safety factor as to not under size the operator for the gates.

**E.** Weatherproof eyes and Operators meeting a minimum NEMA 3 or 4 criteria

**F.** Controlled Transponder

**G.** For all Fire and Police sites, the commercial heavy use wheels and operator are required.

**H.** Concrete aprons should be considered for the approaches for the gate.

**I.** Emergency Power

**J.** CMMS Track-able Reference SECTION 2:4.7 Computerized Maintenance Management System (CMMS)

**K.** On-Site Training and O & M Manuals. Reference SECTION 2:4.6 Operation and Maintenance Manuals (O&M)

**L.** Extended warranty is desirable for large gates that are heavy duty use.

### 3.33.3 Additional Design Criteria

**3.33.3.1** CLEAR ZONES

DOA requires a minimum clear zone of 5' to 8' on both sides of any security fencing. No equipment parking or material storage is allowed within this Clear Zone.

**3.33.3.2** SIGNAGE

"NO TRESPASSING" signage must be provided every 200' and at all gates (refer to the City of Dallas Department of Aviation Dallas Love Field Air Operations Area (AOA) Construction Rules )

# CHAPTER 4: UTILITIES

[Content to be developed in the Future]

# CHAPTER 5: FUELING SYSTEMS

[Content to be developed in the Future]

# CHAPTER 6: AIRFIELD LIGHTING

The Design Consultant shall design all projects so that the work required in the Construction Documents incorporates all relevant requirements as set forth below. All work shall follow the guidelines set forth in the applicable FAA Advisory Circulars and shall follow the requirements set forth in the National Electrical Code and all state or local requirements.

## 6.1 Abbreviations

ALCMS Advisory Circulars

CCR Constant Current Regulators

ETL ETL Testing Laboratories

FAA Federal Aviation Administration

LED Light Emitting Diode

PAPI Precision Approach Path Indicators

REIL Runway End Identifier

## 6.2 Underground Conduit

All underground conduits shall be installed in accordance with applicable FAA advisory circulars and the National Electrical Code and shall be set a minimum 18” below top of grade. A 4” to 6” wide magnetically detectable marking tape indicating “Electrical Cable Buried Below” shall be installed above the conduit run a maximum 12 inches from top of grade or as recommended by the manufacturer. Pull boxes for underground wire shall be installed flush with grade at a maximum of every 200' along a conduit run or as required by code and the wire requirements. All airfield lighting junction boxes, manhole and handhole covers shall be permanently marked with “ELECT.AL” (Airfield Lighting) markings.

## 6.3 Field Lighting Circuit Color Codes

All conductors in airfield manholes, handholes, light cans, transformers, and any other location where conductors are accessible, shall be marked with nylon wire tags labeled with the circuit number, in each light can, handhole, manhole, and junction box.

## 6.4 Wiring Requirements

### 6.4.1 General

All taxiway and runway lighting shall be wired as constant current, two-wire systems. All airfield circuit cable shall be FAA L-824 Type B cable. Where new cable is being installed on a circuit with existing wiring, the circuit’s insulation resistance shall be tested in accordance with standard FAA procedures.

### 6.4.2 Splices and Connections

Each cable in a manhole, handhole, or light can shall have an ETL certified FAA L-823 quick disconnect type splices. The primary, Type I, airfield circuit connections shall be FAA Class B, field assembled connections. The secondary, Type II, airfield circuit connections shall be FAA Class A, molded on cable, connections. Heat-shrink tubing shall be installed over all splices.

### 6.4.3 Wiring Accessory Requirements

All light cans and junction cans shall be FAA Type L-867 where located in non-movement areas and Type L-868 where located within any movement areas. All manholes and handholes located within the

runway and taxiway safety areas shall be rated to withstand aircraft loads unless otherwise approved by the Aviation Administration or Airport.

## 6.5 Counterpoise Wire

All airfield lighting circuits shall include a No. 6 AWG size bare copper counterpoise wire. The wire shall be approximately a minimum 4" above the conduit or duct bank and at least 8 inches below the top of sub-grade in paved areas and 10 inches below finished grade in un-paved areas. Counterpoise running parallel to runways or taxiways shall be located midway between the edge of pavement and the duct bank, conduit or cable per FAA requirements. Counterpoise shall be securely attached to copper ground rods installed not more than 500' apart. The ground rods shall be copper clad steel, a minimum of 10' long and ¾" in diameter. All connections shall be by exothermic weld. The Aviation Administration or Airport may provide additional counterpoise requirements based on the needs of the particular project.

## 6.6 Airfield Lighting Control and Monitoring System (ALCMS)

For projects that add lighting circuits or significantly alter the physical arrangement of existing circuits, the project shall include the updating of the Airfield Lighting Control and Monitoring System, including the graphic display. Software modifications shall be done by the equipment hardware or software vendor; information may be obtained from the Aviation Administration or the Airport.

## 6.7 Isolation Transformers

On any airfield lighting project or portion thereof where new power wiring is provided to light fixtures, new isolation transformers shall also be provided. Exception: if the existing transformers are less than four years old, they may be reused. All Isolation Transformers shall be ETL Certified FAA L-830, 60 Hz, 6.6 Amp and have molded on FAA Style 2 and 9 primary connectors and FAA Style 8 secondary connectors. Transformers shall be properly sized for the wattage of the light fixture it will be paired with as recommended by the fixture manufacturer.

## 6.8 Airfield Visual Aids

### 6.8.1 General

All lighting for airfield visual aids must be powered from a 6.6 amp current driven circuit. Exceptions shall be as approved by the Administration or Airport. Such systems that may not be current powered shall include but are not limited too, Approach Light Systems, Runway End Identifier Lights (REIL), Precision Approach Path Indicators (PAPI) or any system that may be available with a voltage power supply. Any voltage powered system shall match the existing voltage levels available on the airfield.

### 6.8.2 Lighting Types

All airfield visual aids shall be ETL certified and, where available, of the Light Emitting Diode (LED) type. Where ETL certified LED lighting is not available, the lighting type shall be quartz-halogen or as approved by the Aviation Administration or Airport.

### 6.8.3 Constant Current Regulators

All current driven airfield lighting circuits shall be powered by FAA Type L-828, Class 1 (6.6 amp), Style 1 or 2 as required, dry type, Constant Current Regulators. Input voltage shall be that which is available at the airport and output sized for the individual circuit it is being connected to. Where a new

CCR is being installed on a circuit with existing wiring, the circuit's insulation resistance shall be tested in accordance with standard FAA procedures. All Constant Current Regulators shall be capable of interfacing with the existing lighting control system.

# SECTION 6: APPENDICES

| | | | | File Links/ References |
|---|---|---|---|---|
| Section 6: Appendices | Appendix A | Air Operations Area Construction Rules | Content to be Added | • Air Operations Area (AOA) Construction Rules |
| | Appendix B | CAD Requirements | Content to be Added | |
| | Appendix C | Signage Requirements | Content to be Added | |
| | Appendix D | Security Requirements | Content to be Added | |
| | Appendix E | Links to Resource Information | Content to be Added | |
| | Appendix F | Feedback Form | Content to be Added | |
| | Appendix G | Abbreviations | Content to be Added | |

# APPENDIX A - AIR OPERATIONS AREA CONSTRUCTION RULES

City of Dallas Department of Aviation Dallas Love Field Air Operations Area (AOA) Construction Rules

# APPENDIX B - CAD REQUIREMENTS

[Content to be developed in the future]

# APPENDIX C - SIGNAGE REQUIREMENTS

[Content to be developed in the future]

# APPENDIX D - SECURITY REQUIREMENTS

[Content to be developed in the future]

# APPENDIX E - LINKS TO RESOURCE INFORMATION

SECTION 1: GENERAL OVERVIEW

- An Overview of LEED, Green Building Programs and Recommendations for Next Steps
- City of Dallas Building Construction Codes
- Green Building Ordinance
- Ordinance No.27131 Overview for Small Commercial Buildings
- Summary of Ordinance Requirements

SECTION 2: DESIGN & CONSTRUCTION PROCEDURES

- Air Operations Area (AOA) Construction Rules
- Airport Design
- Airport Safety Self-Inspection
- ASI Checklist
- Conferences for Airport Grant Projects
- Construction Administration Checklist
- Construction Schedule Checklist
- Construction Startup Checklist
- Debris Hazards at Civil Airports
- Equipment Add/ Remove form
- FAA Advisory Circular Checklist
- FAA Airfield Visual Aid Safety Placard
- FAA Closeout Checklist
- FAA Construction Checklist
- FAA Construction Handbook
- FAA Project  Checklist
- FAA Project File System checklist
- FAA Safety Plan Checklist
- Facility Impact Request Form
- Final Completion Checklist
- Ground Vehicle Operations on Airports
- IR-Industrial Research District Link
- Minimum Requirements for Construction Documents Phase Checklist
- Minimum Requirements for Design Development Phase Checklist
- Minimum Requirements for Schematic Phase Checklist
- NOTAM Example
- Operational Safety on Airports during Construction
- Painting, Marking, and Lighting of Vehicles Used On an Airport
- Pre-Construction Meeting Checklist
- Programming Checklist
- Project Deliverables

- Project Meetings Checklist
- RFI Checklist
- Specific Use Permit Application
- Standards for Airport Markings
- Standards for Specifying Construction of Airports
- Submittals Checklist
- Zoning Applications

SECTION 3: LANDSIDE DESIGN STANDARDS

- Dallas City Code Sec.19-118
- small construction sites
- TXR150000 Construction General Permit
- large construction sites

SECTION 4: TERMINAL DESIGN STANDARDS

- Piping Identification Table

SECTION 5: AIRSIDE DESIGN STANDARDS

- Dallas City Code Sec.19-118
- Large construction sites
- Small construction sites
- TXR150000 Construction General Permit

SECTION 6: APPENDICES

Air Operations Area (AOA) Construction Rules

# APPENDIX F - FEEDBACK FORM

Listed below are the forms that have been referenced in the respective chapters of the Design and Standards Manual (DSM).

**FEEDBACK FORM FOR THE DESIGN AND STANDARDS MANUAL (DSM)**

Date: Feedback Log Number:

To: City of Dallas Airport System

Department of Aviation

Dallas, TX

From:

Design and Standards Manual (DSM) Section and Chapter:

Design and Standards Manual (DSM) Paragraph:

Design and Standards Manual (DSM) Page Number:

Background:

[Insert background for suggested change(s) here.]

Current Design and Standards Manual (DSM) Text:

[Copy and paste here the text from the Current Design and Standards Manual (DSM) for which the revision will be suggested.]

Proposed Design and Standards Manual (DSM) Text:

[Use RED text, normal font not bold, to indicate added language. Use “strikeout” to indicate deleted language. Do not use “track changes”.]

# APPENDIX G - ABBREVIATIONS

[Content to be developed]

# SECTION 7: INDEX

## A



## B

## C

## D



## E



## F

## G



## H



## I



## J



## K



## L

## T



## U



## V



## W

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