Mead & Hunt

HECTOR INTERNATIONAL AIRPORT

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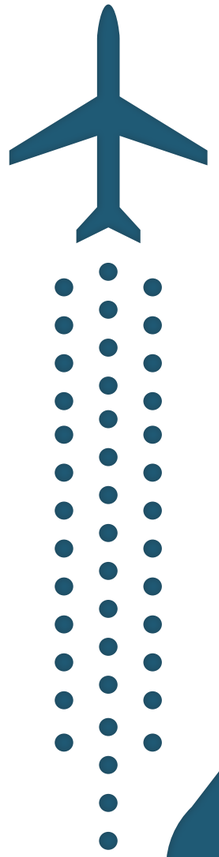
(FAR) TERMINAL EXPANSION AND ADDITION

SCHEMATIC DESIGN REPORT

FEBRUARY 2023



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1. INTRODUCTION

Mead & Hunt, Inc., and our design partners are providing this Schematic Design document to construct the Hector International Airport (FAR) Terminal Renovation and Expansion in Fargo, North Dakota. This document contains an overview of the project scope and narrative descriptions of systems and construction materials to be used in the construction and renovation of the airport facility. This information is based on existing documentation of the airport building, in-person site observations, and discussions with airport staff. Existing building systems and client objectives were assessed to determine this schematic design.

DATA COLLECTION

The 2022 Terminal Area Study provided a solid foundation to begin layouts and discussions. We reached out to the Municipal Airport Authority, Airport occupants, and the community to find out what they like about the existing passenger terminal and what could be improved upon. We received valuable feedback with many overlapping responses. Some of these include:

1. Expand Airline Ticket Offices (ATO) ticketing
2. Improve oversized baggage handling operations
3. Improve outbound baggage operations between scanning and loading
4. Reallocate concession spaces to align with passenger demand on secure side of the terminal
5. Improve heating, ventilation, and air conditioning (HVAC) systems
6. Mitigate glare
7. Relieve passenger congestion at pinch points, such as ticketing and the checkpoint
8. Expand and renovate in alignment with the forecasted enplanements over the next 20 years

Some common responses when asked about the Design Vision:

1. Expansive views looking out to the airfield
2. Design to be iconic, exciting, and resilient
3. Environmentally responsible

2. PROJECT SCOPE

OVERVIEW

The Project is based upon the preferred alternate generated during the Terminal Area Study, which assessed existing conditions, and a preestablished gate analysis and capacity study based on the Federal Aviation Administration approved Terminal Area Forecast (TAF) with corresponding triggering metrics.

Continued growth in air service along with the up gauging of the aircraft fleet has expedited the necessity for FAR to expand their concourse to accommodate additional gates, larger hold rooms, and post-secure facilities. Corresponding expansions of the Outbound Baggage Screening and Ticketing will be required to serve demand from the increased pace of passenger growth.

SCOPE OF WORK

The concourse will be expanded, along with the ticketing and checked baggage support spaces. The existing concourse level will be reconfigured to improve circulation, passenger screening, and access to passenger amenities such as concessions. This project includes work in four major categories: concourse expansion, ticketing, existing terminal remodeling, and employee parking.

Concourse Expansion

The existing concourse will be expanded to the east and will include five gates (four total additional gates). Gate queuing areas, seating, and concourse circulation will be provided as well as concessions and restrooms and other passenger support spaces.

A third level will be provided for administrative offices and a boardroom with dedicated ground level access and vertical circulation.

The first level (below the concourse) will accommodate expanded baggage screening, and baggage makeup, along with the necessary receiving, mechanical, electrical, plumbing, and technology spaces to support the addition.

The existing ticketing hall will also be expanded to the east to accommodate additional ticket counters and ATO.

Concourse Expansion Cont.

Concourse/Ticketing Expansion First Level:	**38,800sf**
Concourse Expansion Second Floor:	**35,525sf**
Concourse Expansion Third Level (Admin):	**4,500sf**

Ticketing Expansion

Ticket counters in the existing terminal will be relocated and renovated to provide additional area in the ticket lobby. The ticket lobby will be expanded to the east and additional ticket counters will be added. The ATOs will be renovated and expanded to the east behind the ticket lobby.

Existing Terminal Remodeling

First Level Remodeling: Ticketing and outbound baggage screening will be reconfigured and expanded into the concourse expansion. Checked baggage inspection system (CBIS) includes conveying systems from the ticket counters to the screening devices and conveying systems to deliver the checked bags to carousels for airline retrieval.

Existing finishes, including painting of the existing walls and exposed structure/ceiling, will be updated throughout public spaces. Existing Terrazzo floors will be refurbished. Restrooms will be expanded to improve access/visibility.

Second Level Remodeling: The existing second level interior space will be completely reconfigured to improve circulation and the passenger experience including the addition of post-secure concessions and expanded passenger waiting areas. The security checkpoint will be relocated to improve queuing and to open concourse circulation east to west. Interior finishes will be updated throughout.

Employee Parking:

Employee parking to the east will be reconstructed to improve access for passenger and delivery vehicles. Landscaping will be updated to provide visual screening a welcoming approach to the terminal.

SCHEDULE

Bids will be received for this project in January 2024. Construction will begin approximately in March 2024.

PHASING

Construction of the new concourse and modifications to the existing building will be phased to achieve the following facility objectives:

- All building services must remain intact and operating during construction. Start-up and new equipment and removal of systems to be demolished must be coordinated to avoid interruptions in service.
- All existing passenger boarding bridges and gates must remain operational until new gates are in place so there is no reduction in passenger and gate capacity.

3. SUSTAINABILITY

The foundation of design is based on the AIA 2030 Framework for Design Excellence and includes a focus on sense of place and enhancing passenger experience. The following strategies will be incorporated into the Hector International Airport Terminal Expansion project.

WELL-BEING

- Daylighting
- Views to the outdoors
- Biophilia, including wood elements
- Acoustics
- Social distancing
- Interior pollution prevention
- CO_2 monitoring
- MERV 13 Filtration
- Bipolar ionization
- Low emitting and healthy materials
- Thermal comfort

Water

- Water bottle filling stations
- Design exploration for incorporating native plantings to mitigate irrigation needs

Change

- Existing generator reuse for energy back up, if capacity is adequate

Energy

- Energy efficiency strategies
- Energy load reduction
- LED lighting
- Daylighting and occupancy/sensory lighting controls
- Commissioning

Resources

- Responsible material selection
- Construction waste diversion
- Build with durable materials
- Local food and beverage from concessionaires

Equitable Communities

- Local artwork
- Gathering space for musical performances
- Universal Design Strategies (UDS)

Discovery

- Owner's Project Requirements (OPR)
- Pre and post occupancy surveys

ENERGY EFFICIENCY

Analysis of the 2019, pre-COVID year, annual energy use (also called Energy Use Intensity, EUI, with units of kBtu/sf-yr) showed that the existing building uses approximately 155 kBtu/sf.

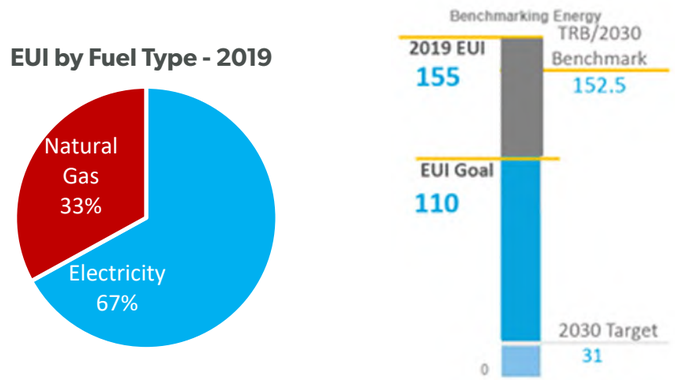

Figure 1. Energy usage (2019) compared to energy goals

The Airport Cooperative Research Program (ACRP) Transportation Research Board (TRB) airport benchmarking for small hub (150 kBtu/sf) and cold climate (155 kBtu/sf) airports shows that FAR is performing similarly to its peers. This benchmarking indicates that the project goal of 110 EUI will make FAR a best in-class, small hub, cold climate airport with about 28 percent savings compared to existing energy usage.

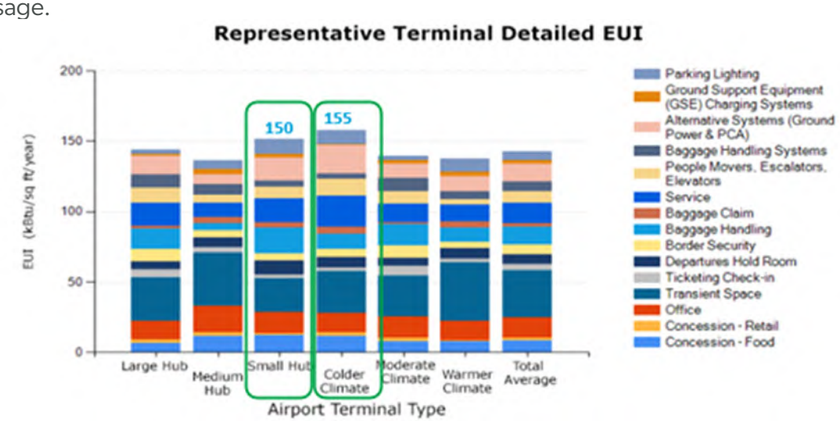

Figure 2. ACRP TRB Energy Benchmarking, with the average EUI for small hub and cold climate airports listed.

The existing EUI is composed of 67 percent electricity and 33 percent natural gas – based on the 2019 (baseline year) utility bill data.

A February 2022 charette identified the goal to improve thermal comfort and efficiency with an energy recovery system including a variable air volume air handling unit system. Due to the frequent opening and closing of building doors, there is a need for a forced air ventilation system that can change temperatures very quickly to ensure a comfortable temperature for passengers and employees.

HIGH PERFORMANCE DESIGN AND OPERATION

Daylighting

The daylighting team will analyze various glazing options for the facility and determine how they perform in terms of glare and visual comfort. Daylight is also a tool that can be used to reduce energy consumption, minimizing electrical lighting power during the daytime hours and lessening operating costs. During the February 2022 charette, concerns were discussed regarding harsh daylight limiting employee visibility in the spring and fall seasons.

Design for Well Being

COVID-19 funding allowed FAR to install a new ventilation system with bipolar ionization. During the terminal renovation and expansion project the team will research the best locations for MERV 13 filter systems. This project will integrate additional bipolar ionization filtration capabilities in the new terminal design.

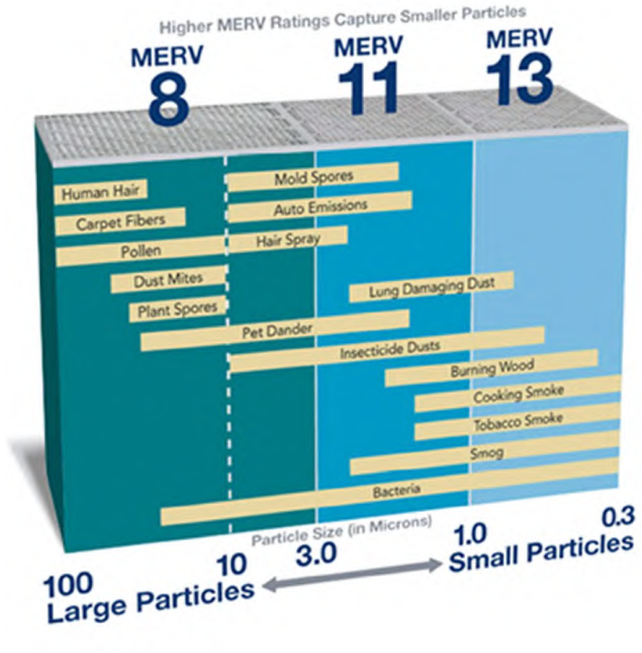

Figure 3. MERV rated Air Filtration Particle capture scale

Water Use

This project will determine potential sites to add more bottle refill stations in an attempt to reduce the volume of single-use water bottles at the airport. FAR already has three to four water bottle filling stations, but is considering incorporating them into all existing water drinking fountains.

Owner's Project Requirements

Mead & Hunt generated a draft of the OPR during Schematic Design for review. This is especially helpful for organizations that do not have design and construction standards. The OPR is used in the commissioning process and is a written document that details the functional requirements of a project to establish design criteria, to identify goals for the project, and to identify the training required for facility staff prior to turnover. It is considered a living document and is reviewed and approved by Hector International Airport staff.

Contributors to the OPR for the ownership team often include occupants and operators. This is to ensure that the systems included in the commissioning process are designed, installed, and operated according to the OPR. Topics can include considerations such as desired light levels and controls, mechanical equipment access for maintenance and indoor air quality. The Basis of Design (BOD), written by the design team, reflects the desires of the owner based on a review of the OPR.

Commissioning

Commissioning is a quality assurance process that improves the delivery of building projects to a client. Commissioning for HVAC, lighting, domestic hot water, controls, and renewable energy systems is a key step in improving overall building efficiency. Additionally, commissioning can be performed for other building systems where third-party quality assurance is desired. Mead & Hunt will provide commissioning for the Terminal Remodel and Expansion Project.

During the Design Development phase, the commissioning steps are to develop the commissioning plan, provide commissioning specifications, and perform a review of the 100% Design Development set for compliance with the OPR and the Basis of Design.

The commissioning process ensures that systems are ready to turn over to the owner. Each system is rigorously tested in all modes of operation. Issues are tracked through to resolution so that the owner receives a complete, functioning building. Documentation is also provided with operations manuals delivered to the building operators so they have all the tools needed to effectively maintain and operate their buildings.

The commissioning process can also be extended through occupancy with continuous or periodic trend analysis for fault detection diagnosis, and energy optimization, also known as monitoring-based commissioning. This will assess the building operation under occupant load and generate energy savings recommendations to keep the building optimized with high levels of occupant comfort. A recent Lawrence Berkley National Laboratory study concluded that period trend analysis results in energy savings of 3-10 percent with a median of 6 percent and an average simple payback of 2.2 years.

Figure 4. View of the terminal addition initial concept, looking southwest

4. CIVIL

Front entry drive will have minimal work. Anticipate repairs to the drive as a result of construction work. Also, blend front drive approach into existing where parking area south of the addition is being reconfigured.

PROJECT UNDERSTANDING

As part of the terminal remodel and concourse expansion project, the front entry drives will be reconstructed to include additional parking, maneuvering, and travel lanes. There will be utility relocates due to the construction around the apron, parking lot, and the west terminal addition.

Currently FAR has one ground level loop road, Dakota Drive, in front of the terminal building. Dakota Drive provides one way traffic from the northeast to the southwest around the terminal loop. There is an east road (delivery road) at the intersection of Dakota Drive and 30th Avenue N that connects to the east economy lot, the emergency overflow lot, and the east side of the existing terminal building.

GOALS/OBJECTIVES

The goal of the front entry east drive re-configuration is to provide an entry drive that will accommodate the terminal building expansion, provide proper semi-truck access on the delivery road for deliveries to the proposed terminal east addition loading dock area, and provide a parking layout that maintains the same number of existing stalls. The parking stalls will be incorporated to the east of the delivery road and in a straight north to south row as a buffer in between Dakota Drive and the delivery road.

The project will be appropriately phased to always provide vehicle access to the terminal building, except when the terminal east addition is being constructed.

UTILITIES

The reconfiguring of the northeast parking lot/terminal addition and the west addition on the terminal includes modifying the layout and connections to accomodate the added service for the water, sanitary sewer, storm sewer, and the electrical layout for the lighting.

The west addition of the building will include re-routing the water and storm sewer. Water supply lines will be moved in order to maintain the connection to the building and exterior HVAC system during

construction. The storm sewer will be moved to accommodate the terminal addition to the west and the addition of the storm sewer lateral connection to the building.

The northeast parking lot/terminal addition will include the addition of new storm sewer catchbasins and manholes that connect to an ADS subsurface treatment system. The ADS system will be the ideal choice to meet City of Fargo stormwater requirements as the clay soils in the area limit options for above ground infiltration basins or rain gardens. A new sanitary sewer lateral will connect from the mechanical/electrical/plumbing room in the east addition to the existing sanitary sewer. The electrical design will incorporate proper spacing of light poles in the parking lot and rerouting of the electrical lines.

All work on the storm sewer on the apron/north side of the east terminal addition will be done under the terminal apron expansion project.

LANDSCAPE DESIGN

The Municipal Airport Authority has gone to great lengths to maintain, replace, and supplement the original tree plantings throughout the airport grounds. The extensive tree plantings, well maintained lawns, and accent planting beds provide a strong first impression of Hector International Airport. The proposed landscaping is intended to continue that strong landscape aesthetic.

All lawn areas are maintained by the Airport Grounds. The Municipal Airport Authority contracts out the maintenance of the trees. The recently renovated shrub beds located at the entry plaza are maintained by the Fargo Park District. There are two (2) annual planting beds also located at the entry plaza that are also planted and maintained by the Fargo Park District. The district proposes these two (2) annual beds be converted to native perennial wildflower beds to help reduce the required maintenance.

The original airport landscape theme is characterized by a regular pattern of trees, tree groupings and lawn. This 'tree-pattern-and-lawn' theme is to be continued with the terminal expansion. Trees are to be spaced regularly along roadways, parking lot drives and parking islands. Tree groupings are to be utilized where large areas are available, where screening is desired, or where accent is desired and can be accomplished with groupings of accent trees. Selection of trees will be sensitive to height restrictions and to minimize the attraction of wildlife as much as possible.

An accent planting buffer is proposed for the buffering view of the employee parking lot. The accent planting buffer will be a mix of low maintenance shrubs, ornamental grasses, hardy perennials, trees, an accent retaining wall, and low topsoil berm(s) to complement the airport plaza entry accent shrub beds. The proposed landscaping is to be irrigated utilizing and expanding the existing irrigation system. The existing Irrigation Controller located on the West end of the existing terminal is to be upgraded to accommodate the new irrigation associated with the expansion. The lawn is to be sprinkled with pop-up spray heads. Shrub beds are to be irrigated utilizing low flow irrigation.

5. STRUCTURAL

OVERVIEW

The airport terminal building was originally constructed in 1984. Major additions on the west and north sides of the original building occurred in 2006. Foundations for both the original structure and additions consisted of shallow spread footings. The second floor structure of the original building consists of composite concrete slab and steel beam construction. The 2006 addition utilized precast concrete plank supported by steel beams at the second floor level. The roof structures of both the original building and the addition consist of a mix of steel beams, open web steel joists, and fabricated trusses consisting of steel tube sections. Both the original building and the additions are supported by a mix of steel w-flange and HSS tube columns.

This project will consist of one large addition to the east end of the existing terminal building along with some modifications to the original facility. The east addition will consist of a mostly two-level structure with a portion of three-level construction, all supported by a shallow spread footing foundation system. The east addition will consist of composite steel construction up to the second floor level. Above the second floor level construction will consist of mass timber at the main roof/third floor level as well as the upper roof of the three-level portion.

INFORMATION RECEIVED

The following documents were reviewed as part of Heyer Engineering's evaluation:

Existing Building Information

1. "Westside Terminal" Foss Associates, April 26, 1984
2. "Westside Terminal" Foss Associates, October & November, 1984
   (Addn'l bay for United Airlines)
3. "Terminal Additions & Remodeling" TL Stroh Architects, July 27, 2006

Geotechnical Information

1. "Proposed FAR Terminal Expansion Geotechnical Engineering Report" Prepared by Terracon, January 26, 2023

DESIGN CODES

IBC2021	2021 International Building Code
ACI 318-19	Building Code Requirements for Structural Concrete
AISC 360-16	Specification for Structural Steel Buildings
AISI S100-16	North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition
ANSI/APA A190.1-2017	Structural Glued Laminated Timber
ANSI/AWC NDS-2018	National Design Specification (NDS) for Wood Construction w/ 2018 NDS Supplement
ANSI/AWC SDPWS-2021	Special Design Provisions for Wind and Seismic
ASCE 7-16	Minimum Design Loads and Associated Criteria for Buildings and Other Structures

DESIGN CRITERIA

Design Loads

Gravity Floor Live Loads

Typical 2nd Floor Area	**100 psf**
Typical 3rd Floor Area	**80 psf**
Stairs	**100 psf**
Mechanical Rooms	**150 psf**
Storage Areas	**125 psf**

Gravity Roof Live Loads

Ground Snow Load	**50 psf**
Building Risk Category	**III**
Snow Importance Factor	**1.10**
Exposure Factor	**1.0**
Thermal Factor	**1.0**
Flat Roof Snow Load	**38.5 psf (plus required increase for drifted or sliding snow)**

Gravity Dead Loads

Roof	**45 psf (plus weight of any mechanical equipment)**
2nd Floor	**90 psf**
3rd Floor	**70 psf**

Wind Loads

Ultimate Wind Speed	**119 mph**
Wind Exposure Category	**C**
Building Risk Category	**III**
Internal Pressure Coefficient	**+/- 0.18**

Seismic Loads

Building Risk Category	**III**
Seismic Importance Factor	**1.25**
Site Classification	**E (Per Geotechnical Report)**
Ss	**0.059 g**
S1	**0.019 g**
Sds	**0.094 g**
Sd1	**0.054 g**
Seismic Design Category	**SDC = A**

Geotechnical Design Criteria

Allowable Soil Bearing Pressure

Column Footings	**1800 psf**
Strip Footings	**1500 psf**

Ultimate Passive Resistance

Cohesive Backfill	**255 pcf**
Granular Backfill	**375 pcf**

Sliding Resistance

Allowable Cohesion at Native Clay	**130 psf**
Coeff. of Friction at Granular material	**0.25**

Minimum Embedment Below Finished Grade

Exterior Footings (Unheated Areas)	**72 inches**
Exterior Footings (Heated Areas)	**60 inches**
Interior Footings (Heated Areas)	**12 inches**

DELEGATED DESIGN ITEMS

Precast Concrete Components
Structural Steel Connections
Steel Stairs, Handrails, and Guard Rails
CLT Design and Connections
Mass Timber Connections
Exterior Light-gauge Framing

MATERIAL PROPERTIES

Concrete (All strengths noted are at 28 days)

Footings	**4000 psi**
Foundation Walls, Piers	**4000 psi**
Slabs On Grade	**4000 psi**
Slabs On Metal Deck	**4000 psi**

All concrete exposed to weather or deicing salts shall have 6% (+/- 1%) entrained air at the point of placement.

Reinforcing Steel

Typical (Non-Weldable)	**ASTM A615, Grade 60**
Weldable	**ASTM A708, Grade 60** (To be used where noted)

Structural Steel

Wide Flange shapes	**ASTM A992** (Fy = 50 ksi)
HSS Rectangular Tube Shapes	**ASTM A500 Grade C** (Fy = 50 ksi)
HSS Circular Pipe Shapes	**ASTM A500 Grade C** (Fy = 46 ksi)
Pipe Sections	**ASTM A53, Grade B** (Fy = 35 ksi)
Channels, Angles, Plates, Round Bar	**ASTM A36** (Fy = 36 ksi)
Anchor Rods	**ASTM F1554 Grade 36 and Grade 55** (Weldable)
Connection Bolts	**ASTM F3125 Grade A325**
Headed Stud Anchors	**ASTM A108** (Fy = 65 ksi)
Welding Electrodes	**E70XX** (Fy = 70 ksi)

At exposed structural steel locations, it is anticipated that Architecturally Exposed Structural Steel specifications will be required.

Metal Deck

2nd Floor Deck	**2" x 18" ga. Vulcraft VLI Deck - G60 Galvanized**

Cold Formed Metal Framing

- Typical Exterior Studs 6" x 18" ga. (minimum) C-shaped metal studs with ½" return flanges, spaced at 1' 4" o.c. Final design by others as part of a delegated design.
- All light gauge metal studs, connections, etc. to be G60 galvanized.

Glue Laminated Timber

Beams
Species: Douglas Fir
Fb = 2400 psi
Fv = 265 psi
Fc = 650 psi (Perpendicular to Grain)
E = 1,800,000 psi

Columns

Species: Douglas Fir

Fb = 1700 psi

Fv = 265 psi

Ft = 1250 psi

Fc = 1950 psi (Parallel to Grain)

E = 1,700,000 psi

Timber Roof Deck

Main Roof/3rd Floor	**5-Ply CLT**
Upper Roof	**3-Ply CLT**

DEFLECTIONS AND LATERAL DRIFTS

Vertical Deflection Limits (Floor and Roof)	
Roof Total Load	**L/240**
Roof Live Load	**L/360**
Roof Exterior Spandrel Live Load	**L/360** (3/4" Max.)
Floor Total Load	**L/360**
Floor Live Load	**L/480**
Floor Exterior Spandrel Live Load	**L/480** (3/8" Max.)
Floor or Roof Members Carrying Masonry Veneer	**L/600** (Total Load)
Wall Stud Deflection Limits	
Brick/Precast/Stone Finish	**L/600**
EIFS/Metal Panel Finish	**L/240**
Lateral Drift Limit	
Lateral Drift Due to Wind Loading	**H/400**

EAST ADDITION

Substructure

The design of the foundation system will be based on the recommendations of the geotechnical engineer. A geotechnical investigation and report dated January 26, 2023, have been completed and provided by Terracon (Appendix B). The report determined that a shallow spread footing system is feasible and provides allowable soil bearing pressures as noted previously above. The geotechnical report states that undocumented fill was noted at most boring locations. The depths of the fill ranged from 2 to 5 feet below existing grades. It was also noted that during previous geotechnical explorations, depths of up to 7' had been encountered. Per the geotechnical report, it is recommended that all the undocumented fill be removed within the footprint of the building and replaced with a properly compacted granular fill.

Shallow Spread Footings

The foundation system of the east addition will use standard concrete spread footings at the column locations. Per the geotechnical report, spread footings are recommended to bear on granular structural fill or undisturbed inorganic fat clays. A net allowable bearing capacity of 1800 psf for column footings has been provided given the recommendations for site preparation, and placement and compaction of the specified structural fill material are followed.

See drawing S101 for typical preliminary shallow spread footing sizes at interior column locations as well as columns along the exterior walls for both the two and three story areas within the addition. The footing embedment depths along the exterior walls will extend below the recommended embedment depths noted above. Any interior columns will be placed just below the slab-on-grade unless required otherwise due to plumbing, construction schedule, uplift and/or sliding resistance, etc. Where new columns are adjacent to the existing building, a concrete grade beam and pad footing system will be used to span over any existing footings. See drawing S101 for more information.

Frost Walls and Continuous Footings

Frost walls on continuous strip footings will be provided below exterior walls along the exterior building perimeter. A net allowable bearing capacity of 1500 psf for continuous footings has been provided given the recommendations for site preparation and placement and compaction of the specified structural fill material are followed. The average continuous footings will be 5′-0″ x 1′-0″ deep. Frost wall thickness will approximately match the thickness of the exterior wall assembly. Assume an average thickness of 1′-2″ for the exterior frost walls. The footing embedment depths along the exterior walls will extend below the recommended embedment depths. Where new frost walls and continuous footings are adjacent to existing foundations, the intent is to step the footing elevation as necessary to match the elevation of the existing foundation and provide dowels to the existing building foundation to provide compatibility between new and existing. Where columns are present along the exterior wall concrete piers will be provided that will be cast monolithically with the frost wall. The average concrete pier size can be assumed to be 2′ x 2′. Piers will extend from the top of the footing to approximately 8″ below the slab on grade.

Pits, Grade Beams and Mat Foundations

A concrete mat foundation will be provided for support at the base of the precast concrete stair tower/elevator core that extends full height from the first level up to the third floor level. Assume an average thickness of 2′-0″ for the mat footing. Assume a pit depth of 5′-0″ at the elevator pits. The top of footing elevation at the mat footing will be consistent and at the same depth required for the elevator pits. Assume 1′-0″ thick concrete foundation walls at the perimeter of the stair tower and elevator shafts/pits. Area within the stair tower will be backfilled with compacted granular fill and a slab on grade at the first level floor elevation will be provided.

Concrete grade beams/foundation walls will be provided where needed between shallow column footings in line with interior braced frame locations. The grade beams will act as tie beams between individual shallow footings to engage additional weight for sliding and overturning resistance due to lateral loading. Assume grade beams to be 2′-0″ wide x 4′-0″ deep.

Slab-On-Grade

The typical slab on grade will be 6″ thick concrete over 6″ of free draining crushed aggregate or sand per the geotechnical report. Verify with architectural narrative for recommended vapor barrier below the slab on grade. The slab is to be reinforced with #4 bars @ 1′-6″ o.c. each way and shall have saw-cut joints at a maximum spacing of 12′ to 15′ o.c.

Superstructure

Superstructure design and component selection will be based on structural requirements, durability, required fire resistance, economy of structure, aesthetics, and architectural requirements.

The superstructure of the addition will be structurally independent from the existing terminal building for both gravity and lateral resistance.

Gravity System Framing – 2nd Floor Level

The second floor level of the superstructure at the addition will consist of a composite concrete slab on metal deck with composite steel wide-flange floor beams and girders supported by w-flange steel columns that extend to the top of the slab at the second floor level. For durability at the first floor level, the perimeter exterior walls between the first and second level will be non-load-bearing, precast concrete walls. The second floor level structure will cantilever past the concrete walls below at the north and south walls of the east addition.

The floor slab will consist of composite steel deck with a normal weight concrete topping, reinforced with steel rebar reinforcing. Additional reinforcement at slab edges and girder locations is required.

This area will contain a pair of elevators and two full height stair towers that extend to the 3rd floor level. The walls of these will be load bearing. Assume miscellaneous steel tonnage for any elevator guiderails and hoist beams. Assume 8″ solid precast concrete wall panels for the elevator shaft and full height stair tower walls. The exterior stair structures at the gate locations will consist of precast concrete load bearing wall panels. See drawings for locations of 8″ solid panels vs 12″ insulated panels at these areas.

Deck: 4" normal weight concrete over 2"x 18" ga. composite metal deck (6" total slab thickness)

Beams/Girders: See sheet S201 for preliminary framing layout including beams sizes, # of 3/4" dia. headed studs to slab and any camber requirements.

Columns: W12 steel w-flange columns (columns extend to 2nd floor slab level)

Exterior walls: Precast concrete, load-bearing walls (perimeter walls extend to 2nd floor level and full height at stair tower and elevator shaft locations)

Gravity System Framing – Main Roof/3rd Floor Level

The main roof/3rd floor level of the east addition superstructure will consist of 5-ply Cross Laminated Timber (CLT) Decking. The area that constitutes the 3rd floor will receive a 2" concrete topping over the CLT deck at that area. The topping will not be provided at areas considered to be roof areas. The CLT deck will be supported by glulam purlins and girders. Glulam columns will support the girders and be aligned with the steel w-flange columns below. Several skylights are planned in this area that will require additional framing.

Deck: 5-Ply Cross Laminated Timber (CLT)

Purlins & Girders: See sheet S202 for preliminary framing layout including glulam beam sizes

Columns: 14 ¼" x 14 ¾" glulam columns

The roof structure above the new ticketing area will consist of CLT decking supported by glulam purlins and girders. The purlins and girders will be supported by several sloping glulam or HSS tube steel columns. This area will have a substantial amount of tall curtainwall that will require additional lateral support. The lateral support will be provided by either glulam columns and glulam horizontal girts or HSS tube steel columns and girts. This area will be developed further in a future phase.

Gravity System Framing – Upper Roof Level

The upper roof level of the east addition superstructure will consist of 3-ply Cross Laminated Timber (CLT) Decking supported by glulam purlins and girders. Glulam columns will support the girders and be aligned with the glulam columns below.
Deck: 3-Ply CLT

Purlins & Girders: See sheet S203 for preliminary framing layout including glulam beam sizes.

Columns: 10 1/4" x 10 1/4"

Primary Lateral Load Resisting System

The lateral load resisting system of the addition will consist of diaphragm action provided by the CLT panels at the upper roof and lower roof/third floor levels and the composite concrete slab at the second floor level. Those diaphragms will transfer the lateral load to a combination of precast concrete shear walls and vertical braced frames. Precast concrete shear walls will consist of 8" solid panels and/or 12" insulated panels. Braced frames between first and second floor at this area will consist of tube steel braces. If braces are to be left exposed to the public, architecturally exposed structural steel specifications will be required. Braced frames between second floor and the roof and between third floor and the upper roof will consist of glulam braces.

RENOVATIONS/MODIFICATIONS TO EXISTING TERMINAL BUILDING

Required Demolition

East Elevator Shaft and Pit Demolition

Demolish the east elevator shaft and pit in its entirety including foundation walls and mat footing. Sawcut and remove existing foundation walls back to face of east building foundation wall and mat footing back to with-in 1'-0" of the outside face of the east building foundation wall.

Demolition of Existing Stoops

Demolish two existing stoops at the east end of the existing terminal building. Demolish the stoop slab and sawcut and remove existing foundation walls back to the exterior face of existing building foundation walls. Remove stoop footings back flush with the face of the continuous and /or pad footing at the existing building.

Demolition of Existing Foundation Walls

At locations where new openings are passing thru the existing exterior wall, demolish existing concrete foundation wall down to 8" below top of concrete slab elevation to allow new concrete slab-on-grade to pour thru and abut the existing slab-on-grade. Dowels will be provided between the new and existing slabs.

Demolition of East Overhead Door Covered Entry

Demolish the east overhead door covered entry in its entirety including roof structure, masonry walls, concrete foundation walls and continuous footings. Sawcut and remove existing foundation walls back to face of east building foundation wall and continuous footings back flush with the face of the pad footings at the existing building.

Demolition of Existing Exterior Walls

Demolition of portions of existing exterior steel stud walls will be required to create openings of various sizes between the new and existing.

Existing X-Brace Removal & Structural Modification

At the 2nd floor level along grid 42 between grids J and G, an existing x-brace is to be removed. A new steel moment frame consisting of 2 new columns, and a new steel beam will be provided between the existing w-flange columns. The new steel columns will be welded to the existing columns, and the new beam will have full penetration field welds to the new columns. Assume W14x109 columns and a W24 x 131 beam.

Existing Building East End-wall Structural Modifications

The existing structure along gridline 43 will most likely require some modifications. The extent of the modifications is not known at this time and will be developed further in a future phase.

Mechanical Openings and Roof Top Units

The renovation of the existing terminal building will most likely require the infill of some existing openings at the floor and roof as well as the creation of some new openings at the existing floor and roof. Additional framing or reinforcing of existing framing may be required for the support of any new mechanical roof top units.

6. ARCHITECTURAL

GENERAL DESIGN REQUIREMENTS AND CONSIDERATIONS

Building Enclosure and Exterior Finishes

Minimum performance criteria for the building envelope will be in accordance with current code requirements. Increased envelope performance to meet sustainability goals will be considered during the design development phase. Any alterations to the existing concourse will be consistent with the existing exterior finishes.

The insulation is to be a variety of thicknesses to achieve R-values and continuous insulation required by code. Vapor/air barrier to be fully adhered or spray applied.

Windows and Curtain Wall

Window and curtainwall systems will be anodized, high performance, 4-sided, toggle glazed system of various depths, based on Kawneer Clear wall System or similar. The design will be based on high performance insulated units, low-e, argon filled, 1" in thickness. Pricing alternates for electrochromic glazing on the ticket hall addition and triple-paned glazing should be provided.

Interior Finishes and Space Qualities

Interior finishes will be updated throughout the existing building. The selections will meet necessary Americans' with Disabilities Act (ADA) and Life Safety codes, durability requirements, and sustainability guidelines, and will adhere to environmentally responsible criteria.

Interior and Exterior Doors

For the interior concourse level and public areas in the existing building, provide 1.75-inch solid core flush wood veneer doors with stainless kickplates. Interior storage/utility areas and exterior exit stairs doors and frames will be hollow metal. Doors integrated with curtainwall systems and at boarding gates will be aluminum entrance doors with glazing. New exterior doors will have thermally broken anodized aluminum frames and insulated glazing.

Toilet Rooms

Walls and floors will consist of hard surfaces such as porcelain tile. Sinks will meet or exceed acceptable high-traffic contract grade requirements for low maintenance, performance, and wear.

Wall-mounted sinks with integrated, sensor-activated, deck-mounted soap dispenser, faucets (with adjustable flow rates), and hand dryers will be utilized.

Stall partitions will be constructed with gypsum board side walls w/ tile finish, and durable materials that meet or exceed acceptable high-traffic contract grade requirements for low maintenance, performance, and wear.

Material surfaces will be selected for performance, cleanability, and appearance.
Restroom accessories such as hand towel dispensers, waste containers, toilet paper dispensers, changing tables, etc. will be constructed of durable materials that meet or exceed acceptable high-traffic contract grade requirements for low maintenance, performance, and wear. Ceilings will be painted gypsum wallboard.

Signage and Wayfinding

Interior and exterior signage will be included to direct visitors and identify rooms. Signage will include identity, directional, and entrance signs designed to coordinate with interior elements and finishes. ADA-compliant, code-related signage will be provided at doorways to individual spaces.

Accessibility and Universal Design

This project provides the opportunity to improve the travel experience for all users, including travelers with disabilities. While features of accessibility are provided throughout the existing FAR terminal building, this project will address deficiencies identified during the study as well as incorporate additional features of accessibility and principals of universal design.

This renovation and expansion includes:

- Additional single-user toilet rooms to allow for independent or assisted use
- Adult changing table
- Sensory space
- Service animal relief area (SARA)
- Updated signage and wayfinding
- Reconfigured and new service counters at accessible heights
- Additional employee-use elevator on the secure side to improve time efficiency for transporting mobility devices between the jet bridge and the cargo area

ADDITIONAL DESIGN REQUIREMENTS AND CONSIDERATION

Concourse Expansion

Building Enclosure and Exterior Finishes

The concourse (second) level and admin (third) level will be non-load-bearing steel stud with a continuous insulation and metal panel cladding system assembly. At the base (first) level, the wall is to be precast concrete walls with modular brick veneer, and modular brick veneer with polycarbonate assemblies for daylighting.

Roof Assembly

The roof assembly at the concourse expansion will be fully adhered membrane with tapered insulation system.

Vertical Circulation

Two machine-room-less (MRL) elevators will be provided. One is a three-stop passenger elevator connecting ground, concourse, and admin levels. The second elevator will be two-stop for light utility use and will connect ground and concourse levels. Elevator shafts and stair towers core structure will be CMU or precast concrete.

Hold Room Expansion

The concourse will be expanded to accommodate four additional gates and associated hold rooms, restrooms, and concessions areas.

Hold room seating will be a mix of beam seating and lounge furniture pieces and will be placed with maximized seating allowances and passenger comfort in mind.

Podiums

Passenger gate podiums will consist of custom millwork counters with solid surface material transaction counters. Signage and electronic equipment will be configured for Common Use Passenger Processing systems (CUPPS). Replacement of existing passenger gate podiums in the existing concourse is included in this project.

Children's Play Area
A children's play area will be incorporated into the new concourse. The area will include an interactive touch screen and child-scaled furniture to inspire imaginative play.

Concessions
At the second level, multiple concessions areas will be provided. Food and beverage options will include table service and quick service options.

First Level Buildout
Below the concourse expansion, the first level will be built out to accommodate utility spaces to support the concourse expansion project. A bid alternate may be considered to buildout a smaller portion of the first floor and leave the remaining open with support structures exposed.

Interior Finishes and Space Qualities
Flooring at the concourse expansion will include epoxy terrazzo flooring and base at circulation and concession seating areas. Hold rooms will have durable, commercial grade carpet tile and 6" high cove rubber base. Walls will be a combination of paint and specialty finishes.

Ceilings in hold rooms and main circulation will be partially exposed mass timber structure with a class A specialty wood ceiling system to conceal Mechanical, Electrical, and Plumbing (MEP) services. Specialty ceilings will be leveraged in concession areas, vertical circulation, and gate podiums.

Newly developed passenger accommodation spaces to include:

Nurturing Room – A room to provide a private space for infant care. Finishes for the space are to include Luxury Vinyl tile flooring, 6" high cove rubber base. High rated Noise Reduction Coefficient (NRC) ceiling with painted gypsum walls. The room will be equipped with millwork solid-surface counter, a sink, and a microwave.

Service Animal Relief Area (SARA) – Finishes will consist of a combination of sealed concrete and a turf flooring system designed for animal relief. Walls will be a hard surface such as porcelain tile for cleanability and a painted gypsum ceiling.

Finishes for the remaining special accommodation spaces will be durable carpet tiles with 6" high cove base. The tiles can be removed and/or replaced for cleaning or when showing signs of excessive wear. High rated NRC ceilings throughout and painted gypsum walls will be specified. Additionally, each room will contain equipment particular to the function of the space.

A Furniture, Fixtures and Equipment (FF&E) package will be included in the design. The goal of the FF&E package is to provide a functional, durable, visually appealing composition. Finishes in the terminal and FF&E package will be coordinated to create a unified, cohesive design.

Included in the project's FF&E package is casework for breakroom and storage, departure lounge furniture, trash and recycle bins, equipment for the special accommodation areas and play area, murals and feature wall, artwork placement and existing office equipment inventory.

Ticketing Expansion

Building Enclosure and Exterior Finishes
Exterior walls will be non-load-bearing steel stud assembly with metal panel wall and soffit cladding. The primary structure will be mass timber and will be exposed to view.

Roof Assembly
The roof assembly will be a membrane, tapered insulation system.

Ticket Counters
The existing ticket counter location will be modified, and new millwork counters will be provided in both the existing and expanded ticketing area.

Interior Finishes and Space Qualities
Finishes for the expanded ticketing area are intended to match and complement those in the existing ticketing area. This includes the expansion of existing Terrazzo flooring as well as specialty ceilings and wall finishes.

Airline Ticketing Offices and Baggage Screening
Finishes for the Airline Ticketing Offices (ATO) and baggage sealed concrete floors, high-rated NRC ceilings throughout and painted gypsum walls rubber base.

Existing Building Renovation

First floor finish updates include painting existing walls, exposed structure (trusses), and the roof deck in the existing ticketing and baggage claim areas.

The existing Terrazzo floors on the first floor and second floors will be reconditioned.

First floor restrooms will be renovated and reconfigured to push the entrances out more into the public space as shown on the drawings.

The existing second floor will be completely reconfigured. Existing ceilings will be removed and replaced, leaving structure semi-exposed throughout the waiting and circulation areas and checkpoint. Exposed structure and MEP services will be painted. Specialty wood and metal ceilings will be used for acoustic control.

Finishes for the newly configured passenger checkpoint will be composed of heavy-duty carpet tile flooring and 6" cove rubber base. Walls will consist of painted gypsum, and ceilings will offer acoustical treatment within the system to allow an acoustic insulation to absorb sound. Glass walls will separate the checkpoint area from the ticket hall and concourse.

Façade rehabilitation as an alternate, existing metal panels on building and canopy will be scarified and repainted to compliment the addition color palette.

7. FIRE SUPPRESSION SYSTEMS

SPRINKLER DESIGN STANDARDS

The fire sprinkler system for the airport expansion is to be installed in accordance with NFPA 13 and NFPA 415. The hazard classifications shall be as defined in NFPA 13. Most areas will be sprinkled as light hazard. There will be some spaces that will require Ordinary Hazard Group I and Ordinary Hazard Group II coverage.

SCOPE OF WORK

The existing fire sprinkler riser has two zones served by a 6" fire service. The existing service and riser are adequate to support the building expansion. Either one or two zones will be added to serve the building addition.

The fire sprinkler system in the existing terminal shall remain in place. The piping and sprinkler head locations will be revised as needed in order to accommodate the renovated floor plan.

SYSTEM DESCRIPTIONS

The entire building (existing and expansion) will be provided with a wet fire suppression system. Fire sprinkler system piping shall be a minimum wall thickness of Schedule 40 for pipe up to 8 inches in diameter. Where approved by NFPA, the State Fire Marshall, and local authorities, Schedule 10 pipe may be used for main piping only.

Sprinkler heads shall be quick response, standard spray heads. Concealed sprinkler heads will be installed in rooms with gypsum or acoustical ceilings. Upright pendant sprinkler heads shall be used for areas with exposed ceilings. Sprinkler head guards shall be provided on sprinkler heads in the tug concourse and baggage handling.

8. PLUMBING SYSTEMS

PLUMBING DESIGN STANDARDS

The following standards and codes shall apply to the plumbing systems:

- Uniform Plumbing Code
- ADA

PLUMBING PIPING

There is an existing 4" domestic water service for the airport. The water service and water meter are located in the basement mechanical room. The existing water service and meter will be reused. A new 4" water service will be brought into the main mechanical room of the addition. This water service will be looped back to the existing service to provide redundancy to the domestic water system.

All above ground piping, tubing 1-1/2" size and smaller shall be Type L hard drawn copper. Tubing 2" size and larger shall be Type M hard drawn copper. Soft drawn copper tubing in small sizes may be used adjacent to fixtures and equipment. Water piping shall be insulated with a minimum of 1" fiberglass insulation. PVC jacketing shall be installed on any exposed insulation below eight feet.

SANITARY AND STORM PIPING

The existing terminal has one 4" sanitary service and two 6" sanitary services. The 4" service is for the kitchen on the second floor. One 6" service provides the sanitary drainage for the west portion of the building. The second 6" service provides the sanitary drainage for the east portion of the building. These three services will remain and will be expanded and modified to provide sanitary drainage for the plumbing fixtures that will be located within the existing terminal building.

A new 6" sanitary service will be brought into the building addition. This new service will provide the sanitary drainage for all fixtures that will be located in the terminal expansion.

The roof drainage and overflow drainage will be handled by roof drains spread throughout the building roof. The primary and overflow drainage will then drain through the building. The primary drainage will be connected to an underground storm water connection. It is anticipated that the new storm service will be a 12". The storm piping from the street to the building will be by the civil contractor. All overflow roof drains will be daylighted 18" above grade at areas around the building.

All underground piping will be schedule 40 PVC or no hub cast. All above grade piping will be no hub cast iron pipe. All above grade piping will be allowed to be schedule 40 PVC if the runs are not longer than 35' or in return air plenum spaces.

DOMESTIC WATER HEATER

There are multiple domestic hot water systems in the existing terminal. Water heaters are located near bathroom groups to limit domestic hot water piping. The kitchen also has a dedicated domestic hot water system. All the existing domestic hot water systems will be removed and replaced.

There will be three new domestic hot water systems to serve the lavatories and mop basins in the facility. The water heaters will be electric tanks in mechanical closets located near toilet room groups. Each domestic water heating system will include a hot water recirculation pump. The recirculation loop will be piped to each lavatory and sink.

There will be a new domestic hot water system installed for the kitchen. The water heaters will be gas-fired, high-efficiency tank. It is anticipated that there will be two water heaters, and they will be located near the kitchen. The system will include a recirculation pump and loop to ensure hot water delivery to each fixture.

WATER SOFTENER

A water softener will be used to soften the domestic hot water for the kitchen and the dishwasher. The water softener will be located in the same mechanical room as the kitchen water heaters.

PLUMBING FIXTURES

Plumbing fixtures will be similar to the following:

Lavatories – wall hung vitreous and solid surface integral bowl. All lavatories will have 0.5 gpm sensor (touch-free) faucets.
Urinals – wall hung china with sensor (touch-free) flush valves.
Water Closets – floor set china with sensor (touch-free) flush valves.
Water Coolers – dual height water cooler with a touch free water bottle filler.
Bottle Fillers – touch free.
Sinks – drop-in stainless steel of various sizes with single handle, gooseneck faucets.
Eyewash – wall-hung eyewash with mixing valve.
Wall Hydrants – wall hydrants will be located at various locations around the perimeter of the building to allow for hose connections every 100-150 feet. Hydrants will be similar to Woodford B67.
Roof Hydrant – roof hydrants shall be located on the roof near rooftop equipment. Hydrants will be similar to Woodford RHY2-MS.
Hose Bibbs – all mechanical rooms will have hot and cold water hose bibbs for maintenance.
Mop Basins – 2x2 fiberglass basin with wall mounted mop sink faucets.

All fixtures will be piped to allow for individual and room isolation valves for servicing.

9. MECHANICAL

HVAC DESIGN STANDARDS

The following standards and codes shall apply to the HVAC systems.

- International Building Code (IBC) (edition and amendments currently adopted by the State of North Dakota and City of Fargo)
- International Mechanical Code (IMC) (edition and amendments currently adopted by the State of North Dakota and City of Fargo)
- International Fire Code (IFC) (edition and amendments currently adopted by the State of North Dakota and City of Fargo)

- International Energy Conservation Code (IECC) (edition with amendments currently adopted by the State of North Dakota and City of Fargo)
- NFPA 101 Life Safety Code
- ASHRAE 90.1

The following design conditions will be adhered to in design:

- Summer Design Conditions: 91°F DB, 73°F WB
- Winter Design Conditions: -30°F DB
- Indoor Summer Design Conditions: 75°F with 55% relative humidity
- Indoor Winter Design Conditions: 70°F with 10% relative humidity (assuming no humidification within the building)

DEMOLITION

The existing HVAC system in the terminal building is a California heat pump system. The system consists of small horizontal heat pumps, large vertical heat pumps, a boiler plant, a cooling tower, and HVAC pumps. The entire system will be removed and replaced with a new system. The project will be phased in order to keep the airport operational during construction. Both the old and new systems will be required to operate simultaneously during portions of the project.

NATURAL GAS PIPING

There are two existing natural gas services to the building. One gas service is for the kitchen, and the other gas service is for the existing boilers, water heaters, and rooftop equipment. The gas services will be evaluated by the utility provider to ensure they can handle the additional gas load. Natural gas piping will be replaced where needed to meet the increased demand.

Natural gas piping shall be routed to the following equipment: kitchen cooking equipment, boilers, and water heaters. Gas pressure regulators shall be provided at each piece of equipment.

Above ground natural gas piping shall be black mild steel pipe, ASA Schedule 40 thickness. Fittings shall be banded, black, cast iron 125-pound fittings.

HOT WATER HEATING SYSTEM

The new boiler system will consist of high efficiency fire-tube boilers. It is anticipated that the boiler plant will have three 3,500,000 BTU boilers. The hot water heating system will be piped in a primary/secondary arrangement. Each boiler will have a dedicated, variable speed, inline boiler circulation pump. Redundant, variable flow heating pumps will be provided for the heating loop. The pumps will be end-suction, base-mounted. Future space for heating plant expansion is available on the first level of the east addition.

All piping for the hot water heating system shall be black mild steel pipe, ASA Schedule 40 thickness. Fittings shall be banded black cast iron 125-pound fittings. Grooved piping will be allowed. Type L hard drawn copper tubing may be used at the Contractor's option. Fittings for copper tubing shall be cast bronze or wrought copper solder fittings. All connections shall be made using 95-5 solder. Press fit fittings will be allowed.

The entire hot water heating system shall be filled with 35% ethylene glycol.

TERMINAL HEATING EQUIPMENT

Supplemental heating equipment will be provided in the vestibules, stair towers, and at the jet bridge doors. The heating equipment will be a combination of hot water cabinet unit heaters and hot water air curtains.

Hot water unit heaters will be installed in mechanical rooms, electrical rooms, baggage handling, and tug concourse.

CHILLED WATER SYSTEM

A new chilled water system will be installed to serve the entire facility. It is anticipated that the chilled water plant will have a capacity of approximately 500 tons. The chilled water plant shall consist of one of the following options.

Base Bid: One 500-ton water-cooler centrifugal chiller. The system will also include a two-cell cooling tower that will provide at least a capacity of 60% if one cell is down for maintenance. Redundant chilled water pumps will be utilized for the condenser water system. A remote sump will be installed in the new mechanical room.

Alternate bid: Two, 250-ton air cooled chillers and one heat recovery chiller. The chillers shall include variable speed screw compressors for capacity control.

A heat recovery chiller will provide cooling to the system during the shoulder months. The heat recovery chiller will reject the heat into the hot water heating system. It is anticipated that the heat recovery chiller will have a capacity of approximately 125 tons.

The chilled water will be pumped by redundant, variable-speed, base mounted pumps. The chilled water system will be piped in a variable primary configuration. The heat recovery chiller will have a dedicated pump to ensure minimum flow is maintained through the heat-recovery chiller.

Chilled water piping shall be black mild steel pipe, ASA Schedule 40 thickness. Fittings shall be banded black cast iron 125-pound fittings. Grooved piping will be allowed. Type L hard drawn copper tubing may be used at the Contractor's option. Fittings for copper tubing shall be cast bronze or wrought copper solder fittings. All connections shall be made using 95-5 solder. Press fit fittings will be allowed. All piping exterior to the building shall be schedule 40 steel pipe with welded joints. The entire chilled water piping system will have 35% ethylene glycol.

AIR HANDLING UNITS

The air handling equipment will consist of multi-zone and single-zone units. Large, open areas like the ticketing areas, baggage claim, main front concourse, departure lounges, tug concourse, and baggage handling will be served by single-zone variable air volume (VAV) units. The interior space such as offices, conference rooms, and administration spaces will be served by multi-zone variable air volume units. The single zone VAV units will consist of at least the following: economizer sections, MERV 8 and MERV 13 filter sections, chilled water cooling coils, hot water heating coils, and direct drive supply fan arrays with variable frequency drives (VFDs). The units serving the baggage handling and tug concourse will be heating only units. It is anticipated that there will be eight (8) single zone VAV units.

The single-zone units will serve the following areas:

Entry Concourse, west end	**34,000 cfm**
Entry Concourse, east end	**27,000 cfm**
Tug Concourse	**13,000 cfm**
Baggage handling	**15,000 cfm**
Departure Lounge, west end	**13,000 cfm**
Departure Lounge, center area	**23,000 cfm**
Departure Lounges, east end	**two (2) units @ 23,000 cfm each**

It is anticipated that there will be four (4) multi-zone air handling units.

The multi-zone units will serve the following areas:

Main floor, airline office area	**9,000 cfm**
Second floor, office area	**7,000 cfm**
Second and third floor office and security	**6,000 cfm**
Second floor, east end zones	**3,500 cfm**

ENERGY RECOVERY DEDICATED OUTSIDE AIR UNITS

Energy recovery dedicated outside air units will be utilized to provide the outside air needs for the single zone air handling units. The units will consist of the following sections: direct drive exhaust fans with VFDs, direct drive supply fans with VFDs, MERV 8 filters, chilled water cooling coils, and enthalpy wheel-type energy recovery devices. Toilet room exhaust as well as general exhaust as needed will be routed to these units.

It is anticipated the units will serve the following areas:

Entry Concourse, west end	**5,000 cfm**
Entry Concourse, east end	**4,000 cfm**
Departure Lounge, west end	**2,000 cfm**
Departure Lounge, center area	**3,500 cfm**
Departure Lounge, east end	**7,000 cfm**

There is an existing DX cooling energy recovery rooftop unit that was installed in 2021. This unit will be relocated, and it is anticipated that the unit will be used for the east entry concourse.

HUMIDIFIERS

Building wide humidification will be added as an alternate. The humidifiers will be gas fired, direct steam inject type. The humidifiers shall utilize short absorption dispersion manifolds for humidification injection in each air handling unit. The humidifiers shall be sized to maintain a humidity level of 35% RH in the building.

EXHAUST FANS

Centrifugal, roof-mounted, up-blast UL-761 listed exhaust fans will be used for kitchen hood exhaust. Wall-type propeller exhaust fans controlled by CO_2/NO_2 detectors will provide the exhaust needs for the tug concourse and baggage handling areas.

VARIABLE AIR VOLUME BOXES

VAV boxes will be provided with hot water heating coils in the ductwork to provide separate zoning and zone level controls for the areas served by the multizone air handling units. Final zoning will be verified with the owner during design. VAV boxes may feed more than one room if it is small (less than 500 sf) and has similar cooling requirements as adjacent spaces. In all it is estimated that there will be approximately 45 VAV boxes in the building.

FAN COIL UNITS

Four-pipe fan coil units willed be used to condition the car rental areas on the south end of the building. The fan coil units will get ventilation air from outside air louvers that will be installed on the building exterior. Cooling only fan coil units will be used to cool data rooms.

DUCTWORK & DISTRIBUTION

Ductwork and fittings shall be constructed and supported in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005 Edition.

Ductwork and fittings shall be fabricated from G60 galvanized steel sheets complying with ASTM A527. All ductwork shall be built to 4" pressure class prior to VAV boxes, and 2" pressure class in all other instances.

All supply ductwork in spaces with ceilings will be insulated with 2" fiberglass insulation.

TESTING AND BALANCING

All water and air systems will be tested by a third party Testing and Balancing (TAB) agency. The TAB contractor will be either NEBB or AABC certified for balancing commercial HVAC and plumbing systems.

10. AUTOMATIC TEMPERATURE CONTROLS

OVERVIEW

A direct digital control (DDC) system will be installed on all HVAC equipment throughout the building. The DDC system will control all heating and air conditioning equipment to allow for automatic temperature control and seasonal adjustments and maximize HVAC system efficiencies. In addition to controlling HVAC equipment, monitoring of critical air and water temperatures and system operations (fan/pump status), the system shall also alarm all equipment so maintenance personnel can maintain and troubleshoot all equipment.

Equipment to be controlled and monitored includes:

- Air Handling Units
- Energy Recovery Units
- Exhaust Fans
- VAV Boxes
- Fan Coil Units
- All Pumps
- Boiler Plant
- Chiller Plant
- Terminal Heating Equipment
- HVAC Hot Water and Chilled Water Temperatures
- Domestic Hot Water Temperatures
- All thermostats and humidity sensors
- All VFD for pumps and fans.

11. ELECTRICAL

OVERVIEW

The project includes the renovation of the existing 113,000 square-foot, two-story terminal building and the addition of a 74,000 SF, two-story terminal. Four gates will be added. Baggage handling will be completely reconfigured, checkpoint will be relocated, an addition for Federal Inspection Services (FIS) will be included, ticketing will be expanded, concessions areas will be added/reconfigured, and lounges will be reconfigured to be adjacent to gates.

SCOPE

This narrative document summarizes the design concepts for the major electrical systems (Division 26) and fire alarm systems (Division 28) that are to be included in the facility.

Electrical systems (Division 26) included in this document:
Low voltage power distribution system
Generator power distribution system
General electrical equipment and wiring methods

Electronic safety and security systems (Division 28) included in this document:
Fire alarm system

LOW VOLTAGE ELECTRICAL POWER DISTRIBUTION

The utility serving the existing airport terminal building is Xcel Energy. The existing utility transformer is located on the west side of the building. Based on historical electrical billing reports, the peak load on the building is approximately 600kW (720A at 480V, 3-phase).

The existing electrical power service was installed as part of the 2007 addition and remodel project. The service conductors originate from an exterior utility-owned, pad-mounted transformer, and feed a 2500A, 480V switchboard (circuit breaker-style) via a soft loading transfer switch (see also the generator power distribution section). That switchboard was used to back-feed the original 1600A, 480V switchboard (Siemens fuse type) from the original 1986 design. There is also an existing 1200A, 480V tenant switchboard fed from the 1600A main switchboard that was part of the original 1986 building design. The tenant switchboard originally was fed directly from the utility, but has since been refed from the 1600A switchboard. This tenant switchboard has utility-style meters installed at each of several tenant feeders. Each building "tenant" is metered separately through these meters, and the airport reads the meters monthly to collect usage data for billing purposes.

Electrical service capacity requirements shall be closely monitored through the design process, but it is assumed for the purposes of schematic design that an additional 480V electrical service shall be included to add capacity for additional electrical load. The new electrical service will consist of an exterior metering transition cabinet near the existing utility transformer on the west side of the building, service entrance conductors, a new service disconnect, and a power distribution panel. An additional transfer switch (ATS) will be required for this service similar to the existing main transfer switch for the existing 2500A service. Anticipated capacity of the new service is 1200 amps, 480/277 volts, 3-phase, 4-wire. A feed from the new ATS to a breaker at the new generator shall be included.

Surge protection devices will be provided for all new switchboards as well as for main power distribution panels. Surge protection devices will also be provided for all panels of the emergency power system per NEC Article 700.8. The surge protection devices shall be external, self-enclosed, and shall be connected to a branch breaker at the panel with conductors as short as possible.

Electronic power monitors will be provided at strategic locations within the power distribution system for the owner to monitor electrical loads throughout the facility. A meter shall be provided at the main power distribution equipment to monitor overall facility usage. Meters will be provided for each of the individual feeds to the tenants who are to be billed for their power consumption. Meters for the tenants shall be revenue-grade accuracy for billing purposes.

The existing original building power distribution equipment (from 1986) shall be replaced with new. This includes the 1600A switchboard, the 1200A "tenant" switchboard, the MCC in the basement, and all panelboards from that era.

In general, any panels installed as part of the 2007 project or later are able to remain; however, any panels within remodeled areas that require panel relocation will also be replaced with new.

Due to the scope of remodeled spaces, it is expected that all "tenant" panels and transformers will be demolished for the expansion of that area. New 480V and 208V panels and step-down transformers will be provided for each individual tenant.

Power will be distributed throughout the building using 480V distribution. Step-down transformers will be provided at new electrical rooms to transformer down from 480V to 208/120V. 208/120V panelboards will be provided to serve utilization loads throughout the building. Dedicated 480/277V panels will be provide for lighting loads. Panels will be provided to serve the new kitchen and concessions areas.

New distribution panelboards (480V) will be provided in the new addition for new mechanical equipment. Also, the motor control center in the basement level of the existing building will be replaced with a new distribution panel (480V) to feed new, replacement, and existing mechanical equipment in that area.

Panels that serve airport and common area loads will be provided throughout, but loads dedicated to individual tenants such as any dedicated gate computer loads, dedicated jet-way equipment, electric Ground Support Equipment (GSE) equipment chargers, terminal offices, etc. shall be served by panelboards dedicated to those users. It is expected that each "tenant" will have a 480V panel, step-down transformer, and 208/120V panel at a minimum.

In general, panelboards shall have bolt-on circuit breakers. Bussing is to be copper or aluminum. Panels shall be configured with feeder connections of either mechanical lugs only or a main circuit breaker as required. Doors shall be hinged with lock, all keyed alike. Enclosures shall be type 1 for interior dry locations and type 3R for wet or damp locations. Panelboards shall be fully rated to interrupt symmetrical short-circuit current available at terminals. Series rated equipment is not allowed.

Step down transformers shall be energy efficient and dry, enclosed and vented with aluminum or copper windings. Insulation rating shall be 220 degrees C with 150 degrees C rise above 40 degrees C ambient. Transformers serving a majority of non-linear loads will be provided with a K4 rating.

GENERATOR POWER DISTRIBUTION SYSTEM

There is an existing 1200kW/1500kVA, 480V Cummins generator in the interior of the NW corner of the ground level of the building. The generator serves the entire existing airport building and was installed in 2007. Currently, the generator is loaded to approximately 50% of its capacity. The generator is cooled via a remote radiator located on the roof of the building. The facilities staff for the airport reports that the roof mounted radiator has been difficult to maintain and is not accessible enough for effective, regular visual inspections.

The generator provides power to the facility via a 2500A soft loading transfer switch that was installed in 2007. The transfer switch has controllable breakers for both the utility feeds and the generator feeds to allow it to transfer the building load between the two sources. This transfer switch provides optional standby power for the building, as opposed to emergency power as detailed in the following paragraph. In general, the equipment appears to be in good condition; however, the transfer switch has occasionally had issues with not being able to be manually transferred back to utility after being on generator power. This should be investigated, and a full evaluation, maintenance, repairs, and update shall be provided by the factory for the equipment.

In addition to the overall optional standby power transfer switch for the building, there is an existing emergency transfer switch and panel that is dedicated to loads designated as "emergency" type loads by the National Electrical Code. The transfer switch serves a 480V panel, transformer, and 208 panel for emergency egress lighting and other designated loads. The emergency transfer switch and associated power distribution shall remain.

It is expected that a new generator will need to be provided due to the new load associated with mechanical upgrades and the new building expansion. The new generator will be EPA Tier IV rated. Preliminary sizing is 1500kW/1875kVA. The need for a new generator is not certain and will be dependent upon new equipment and connection loads for the building expansion. For the purposes of schematic design, a new, larger generator with an exterior weatherproof, sound attenuated enclosure and integral radiator shall be included as part of the project. The generator shall have a 2500A breaker for the existing service as well as a 1200A breaker for the proposed new electrical service. The generator shall also have a 200A breaker for the emergency power transfer switch/panel.

GENERAL ELECTRICAL EQUIPMENT AND WIRING METHODS

Power connections and devices will be provided for all new inspection equipment, terminal desks, check-in counters, baggage handling, jet way, and other equipment as part of the projects. New receptacles and devices will be coordinated with the architectural team to accommodate signage, lounge seating, and other building features. Receptacles will be located around the perimeter walls at regular intervals for convenience. Receptacles shall be provided at the exterior of the building near exits and where needed.

Per the applicable energy code, IECC 2021 edition, any remodeled offices will need to have 50% of the receptacles controlled via occupancy. A plug-load relay shall be installed to control the required receptacles, and the relay shall be controlled via the room occupancy sensors that are also used for lighting controls.

Devices/connections for electric vehicle charging stations shall be provided in the lower level for charging of GSE equipment and vehicles. Requirements for this equipment are yet to be determined, but the equipment is expected to require a significant load. Any vehicle charging stations dedicated to a specific airline shall be fed by the metered service for that airline.

All wiring devices shall be heavy duty. Snap switches shall be 120/277 volt, 20-Ampere. Receptacles shall be NEMA 5-20R, 125 volt, 20-Ampere. Kitchen spaces shall have stainless steel faceplates. GFCI-type receptacles shall be provided where required. USB receptacles shall be provided at specific locations for staff and customer convenience. Exterior receptacles shall be GFCI, weather-resistant and shall be provided with a weatherproof, cast-metal, in-use cover. In general, a maximum of six (6) general purpose receptacles shall be connected to a single 20A, 120V circuit. Multi-wire branch circuits with shared neutrals shall not be allowed.

Concrete housekeeping pads shall be provided for all floor-mounted electrical equipment.

A grounding bus-bar will be provided external to the main service disconnect. All building grounding electrodes will be bonded to this point. A telecommunications bonding conductor sized per TIA requirements shall be brought to each telecom room and terminated at a telecommunications grounding bus bar at those locations. Each communications rack and enclosure will be bonded to the ground bar for that room.

Feeders shall be sized for a maximum voltage drop of 2%.

Conductors:

- Conductors shall generally be type THHN/THWN and shall be installed in conduit. Type XHHW-2 wiring shall be utilized for the secondary side of VFD's. All conductors for the project shall be copper. Aluminum is not allowed.
- Conductors shall be solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- Use stranded conductors for control circuits.
- Use conductor not smaller than 12 AWG for power and lighting circuits.
- Use conductor not smaller than 16 AWG for control circuits.
- Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 60 feet. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 145 feet.
- All motor branch circuits shall be copper. Make connections to equipment with flexible metal conduit or liquid tight flexible metal conduit. Make connections to luminaires with flexible metal conduit or factory furnished flexible fixture whips.

Conduit:

- All power wiring shall be installed in conduit.
- MC cabling shall not be used.
- EMT type conduit is allowed for most applications indoors above grade.
- EMT with water-tight fittings shall be provided for exterior and wet or damp locations where not subject to physical abuse.
- Utilize rigid galvanized steel conduit or IMC conduit where subject to physical abuse.
- Connections to rotating or vibrating equipment shall be made with flexible metal conduit.
- Utilize liquid tight flexible metal conduit in wet or damp locations.

PVC conduit shall be allowed below grade only. Minimum conduit size shall be ½" with ¾" minimum for home-runs. Conduit shall be color coded with factory pigmentation for different systems. Fire alarm shall be installed in red conduit and low voltage communications systems shall be installed in blue conduit. Other colors may be utilized for other systems/functions.

LIGHTNING PROTECTION SYSTEM

A lightning protection system shall be installed on the airport terminal building. The system shall be installed per NFPA 780 and shall be certified per UL 96 and LPI-176. Installation shall include bonding conductors, air terminals, down-leads, and all connections and accessories for a listed and certified system.

12. ELECTRONIC SAFETY AND SECURITY SYSTEMS

FIRE ALARM SYSTEM

The existing building fire alarm system is an addressable Simplex 4100U system. The system utilizes voice-type audible notifications and strobes for visible notifications. The main panel is located on the ground level of the existing building. The existing system panel can remain in place, but the panel will need to be upgraded with a new control board for the added system capacity. A slave panel will be provided in the addition for connection of the new devices, but the panel will report back to and be controlled by the existing upgraded main panel. All reporting and emergency notification dialing will be accomplished at the existing main panel. The system will maintain the voice notification capability throughout the building, and new audible and visible devices will be provided throughout the remodeled and new spaces.

The fire alarm system shall be initiated by manual and automatic means. Duct smoke detectors will be provided at air handling units for unit shut down. Smoke detectors will be provided at all protected openings. Other smoke detection devices will be provided as required by code. Manual fire alarm pull stations shall be provided at each exit from the building. Addressable monitor modules will be provided for monitoring of all sprinkler tamper and flow switches for the fire suppression system.
All fire alarm wiring will be installed in conduit, and the conduit shall have red pigmentation.
Fire alarm shall be installed and tested per NFPA 72.

CODES AND STANDARDS

The following is a partial list of applicable codes governing the systems described herein:

- International Building Code (IBC) 2021
- International Mechanical Code (IMC) 2021
- International Fire Code (IFC) 2021
- International Energy Conservation Code (IECC) 2021
- NFPA 70 National Electrical Code
- NFPA 72 National Fire Alarm and Signaling Code
- NFPA 101 Life Safety Code
- ADA

The following is a partial list of design and installation standards governing the systems described herein:

- BICSI Telecommunications Distribution Methods Manual
- IES Lighting Handbook, Tenth Edition
- International Electrical Testing Association (NETA) Standards
- National Electrical Contractors Association (NECA) Standards

13. TECHNOLOGY SYSTEMS

SCOPE OF WORK

The technology scope for this project includes the build-out of new and expanded technology spaces, pathways, and a Structured Cabling System (SCS). Most of the technology systems will require backend expansion to accommodate the endpoints in the expansion areas, and all those systems will be assessed throughout the design process.

CODES AND STANDARDS

Applicable portions of the following codes, standards, regulations, and recommendations shall be observed in the design of the information technology infrastructure system, technologies, and supporting facilities:

- International Telecommunications Union – Telecommunications (IT-UTI)
- International Organization for Standardization (ISO)
- National Electrical Code (NEC 2020)
- National Fire Protection Association (NFPA 72, 2016 Edition)
- American National Standards Institute / Telecommunications Industry Association (ANSI/TIA)

ANSI/TIA-568.0.E	Generic Telecommunications Cabling for Customer Premises	2020
ANSI/TIA-568.1.E	Commercial Building Telecommunications Cabling Standard	2020
ANSI/TIA-568.2.D	Balanced Twisted-Pair Telecommunications Cabling and Component Standard	2018
ANSI/TIA-568.3.D	Optical Fiber Cabling Components Standard	2016
TIA-569	Commercial Building Standard for Telecommunications Pathways and Spaces	2019
ANSI/TIA–606.C	Administration Standard for Commercial Telecommunications Infrastructure	2017
ANSI/TIA-607.D	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunication	2019
TIA-758.B	"Customer Owned Outside Plant Telecommunications Infrastructure Standard"	2012

Institute of Electrical and Electronic Engineers (IEEE)

ANSI/IEEE 802.3	IEEE Standard for Ethernet	2018
ANSI/IEEE 802.11	Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification	2016

Building Industry Consulting Services International (BICSI) Manuals:

TDMM	Telecommunications Distribution Methods Manual	14th Edition
ITSIMM	Information Technology Systems Installation Methods Manual	7th Edition
OSPRDM	OSP Design Reference Manual	6th Edition

Transportation Security Administration (TSA)

Planning Guidelines and Design Standards for Checked Baggage Inspection Systems (PGDS) Version 7	July 2020

DESIGN CRITERIA

The following sections reflect and define the criteria and assumptions that will be used for the design, specifications, and documentation of the FAR Airport information technology infrastructure. This infrastructure addresses the spaces, pathways, cabling, and technology systems that support both the building and user services. Three distinct areas will make up the complete information technology infrastructure solution for this Facility:

- Technology Spaces (Building Entrance Facility (BEF), Main Technology Room (MTR), Technology Room(s) (TRs), Technology Enclosure(s) (TEs) etc.).
- The SCS including the pathways that support the distribution of the SCS (cable tray, conduit, etc.).
- Technology Systems, the systems that support the needs of the facility (networking, physical security systems, overhead paging (PA), Wi-Fi, etc.).

Technology Spaces

Building Entrance Facility (BEF)

The BEF resides in the west end of the building on the first floor near the baggage claim area. The BEF provides the point of demarcation for incoming telecommunications services from service providers and as the transition point between outside plant (OSP) cabling and the SCS. The purposes of the MTR and TR are described in more detail in the following sections.

Copper and fiber optic cables are provided by the Local Exchange Carrier (LEC) and the Internet Service Provider (ISP) for analog telecommunications and internet connectivity to this facility.

Main Technology Room (MTR)

The MTR currently resides in the room immediately adjacent to the BEF. The wall between the two areas will be removed as part of construction to combine the two areas into one technology space.

The MTR houses the base infrastructure for the facility including internet routers, firewalls, network distribution switches, and servers supporting the building services and applications.

The MTR will provide the head end location for the majority of the buildings technology systems, including access control, video surveillance, paging, and portable radios.

Technology Rooms (TR)

The TRs will primarily be located on the second floor to serve the remodeled terminal space as well as the new addition.

The TRs are defined as the interface between the backbone cabling system and the horizontal cabling system. The TRs accommodate necessary space and environmental considerations for all components necessary to provide final connectivity to end user devices through the horizontal cabling system.

Criteria established under TIA 568 set forth distance limitations on high performance cabling systems, which will be discussed in the SCS section below, but have a direct effect on the placement of these distribution rooms. The TRs must be located so that installed and terminated horizontal cable lengths do not exceed 295 feet (90 meters).

Any entrance door should open outwards to increase the available usable space within the TRs.

The TRs will be arranged to accommodate the following systems and equipment:

- Termination and patching facilities for horizontal cabling.
- Termination and patching facilities for backbone cabling.
- Hardware and racking for network switches and any other electronic components necessary to support the facility and users.

Power outlets for any electronic equipment located within the TR should be fed from an electrical panel dedicated to these loads, ideally located within each TR. Panels serving the TR should be on the building emergency power distribution system. Power accommodations should include both 120V and 208V to rack power distribution and UPS systems.

Dedicated cooling, electrical, and fire suppression provisions are recommended for the TRs to allow the network and associated electronics to operate efficiently and reliably over the life cycle of the building. The installation shall be in accordance with TIA 569.

The following are recommended guidelines for TRs:

SIZE	Minimum size 120 sq. ft arranged in a rectangular shape of 10’ X 12’.
FLOOR	Floor covering shall be sealed concrete, VCT tiles of a type that does not promote static, or static dissipative tile.
CEILING	Ceiling shall be treated with a spray on sealant to prevent flaking of spray on fire proofing of the structure above. Finished ceiling is not required.
WALLS	Walls shall be from slab to structure and shall have a minimum 2-hour fire rating unless higher rating is dictated by code. All penetrations of fire rated walls will be fire-stopped in an approved manner to prevent the passage of flames, smoke, and fumes. Wall should be painted a light color to enhance room lighting. All walls will be covered with A-C grade fire-rated plywood. 4’X8’X3/4” Plywood sheets shall be installed vertically starting at 24” AFF. Plywood shall be painted with white fire-retardant paint; two coats both sides and all edges.
DOOR	A 36” x 84” door is required. Door shall open out of the room.
WATER INFILTRATION	Precautions shall be taken to minimize the risk of water infiltration. A curb around the perimeter of the room is required where adjacent rooms have water outlets or are otherwise prone to flooding. There shall be no roof drain, stand-pipe or water riser penetrations in the structure above the room.
HVAC	Dedicated HVAC is required to serve the room. The HVAC system shall be available 24/7/365 on emergency power. Environmental variables for the room shall be monitored by the BMS. Temperature must be maintained between 20C (68F) and 25C (77F). Changes in temperature shall be kept to a minimum. Humidity must be maintained between 40% and 55%. Changes in humidity shall be kept to a minimum.

ELECTRICAL	Cable Runway is required above equipment racks. Power for each room should be via a panel dedicated to telecommunications loads only. Backup emergency power shall be provided. Lighting fixtures, motors, air conditioning, etc. should not be powered from the same electrical distribution panel as the telecommunications equipment in the room. Power distributed to equipment will primarily be 120V & 208V, 20A-30A dedicated circuits to equipment racks terminated in locking type receptacles for connection to plug strips within the racks or directly to equipment. Additional receptacles will be provided on the walls to support wall mounted equipment. The overall load for equipment in the room is estimated to be approximately 75-90W/sq. ft. Lighting mounted height and position shall be coordinated to minimize shadows from cable support structures, e.g. ladder rack, and provide equal lighting on both sides of the equipment rack(s).Lighting level shall be 500 Lux at 36" AFF, minimum. A dedicated ground bar is required within each room.
FIRE PROTECTION	Sensors connected to the fire alarm systems shall be provided in each room for detection. Sprinkler heads shall have protective baskets. Fire suppression via sprinkler system. Dry pipe, pre-action system may be considered to reduce the risk of water infiltration.
SECURITY	Access to the space shall be controlled via credential reader.

Technology Enclosures (TE)

Each airline tenant space shall have a single equipment cabinet within their space to facilitate the mounting of telecommunications equipment such as a telephone system, network switch or a wireless access point.

This cabinet shall be wall-mounted in a minimal-use area of the tenant space and shall include an equipment shelf for tenant-furnished, tenant-installed equipment.

The Structured Cabling System (SCS)

The SCS infrastructure is the cabling system that interconnects all technology spaces and devices in the FAR Airport Terminal from the BEF to the MTR, to the TR, and ultimately out to the technology outlets and subsequently to network-connected devices.

End devices will connect through the horizontal cabling terminated in the TR serving that area. Having a TR serving specific areas not only simplifies resource planning, but also is designed to ensure that the proper distance limitations are maintained for the horizontal cabling.

To ensure the SCS is a reliable and flexible solution that can accommodate future growth and maintenance requires proper planning and design for the building pathway systems (cable trays, conduits, etc.) and the actual technology space buildout (racks, wire management, etc.).

The SCS, building pathway systems, and technology space buildout are outlined in detail in the subsections below.

SCS Design Considerations

The following are the considerations regarding the design of the SCS for this facility.

In conformance with the ANSI/TIA-568.0.E standard, the information technology cabling system should be designed in a hierarchical star topology, in the following manner:

- Horizontal cabling will be home run from each technology outlet to its respective TR.
- No intermediate termination or patching facilities will be allowed.
- Backbone optical fiber cabling shall be installed in a star topology from the fiber distribution panel in the MTR to each TR/TE.
- Backbone copper cabling shall be installed in a star topology from the copper terminations field located in the MTR to each TR/TE.
- All cable is to be of PVC, LSZH or Plenum construction depending on local codes, standards, and configuration of the HVAC system installed.

Cable length limitations

- Horizontal Cabling – 295’ feet (90 meters) from the technology outlet to the termination point located within the TRs.

Wherever possible, distribution of non-standard compliant cabling will be designed to conform to the above topological requirements.

The cabling system is designed to support any digital and analog voice grade services.

Fiber/Copper Backbone Cabling

Any primary backbone infrastructure will be single-mode optical fiber cable installed from the MTR to the TRs and TEs in this building. This will provide the capability to extend the network services and allow capacity for other systems or network topology changes. This will also support the implementation of 10Gbps Ethernet backbone and future 100Gbps technologies throughout the facility.

A limited traditional voice copper backbone will be assessed and expanded as required to accommodate any copper reliant analog or digital voice grade services that are required in the facility. Internal voice backbone cables shall consist of a minimum of 25 pairs.

The voice backbone cables should be terminated on rack-mounted, “resource” patch panels in the TR. Termination in the MTR should be on 110 and 66-type blocks coordinated with existing terminations.

TV Cabling

TV service will be distributed throughout the facility via network cabling. End clients are used at displays where necessary to convert signals for display on flat panels. Where technology permits, direct connection to displays may be an alternative for this project.

Horizontal Cabling

The horizontal cables connecting the end user device to the network at a minimum should consist of Category 6 (Cat6) 4-pair unshielded twisted pair (UTP) cables for technology outlets and Category 6a (Cat6a) for wireless access points (WAPs).

Additional considerations for horizontal cabling:

- All 4-pair UTP cables shall be terminated at the outlet utilizing Cat6 or Cat6a, 8-pin modular connectors with the 568B wiring configuration.
- All 4-pair UTP cables shall be terminated within the MTR/TR/TE on rack mounted 24 or 48-port patch panels utilizing the 568B wiring configuration. The termination method should be identical regardless of the intended application.

Any systems not capable of being supported on this media shall be addressed on a case-by-case basis. Where necessary, vendor-specific cabling should be provided.

Building Pathway Systems

Conduits, cable tray, non-linear cable supports and other fixed containment that support information technology cabling within the facility are a key component in the information technology infrastructure. Proper sizing, placement, routing, and integration with other routed services will ensure connectivity and flexibility, which becomes a benchmark in the determination of a truly successful infrastructure. Design parameters established herein follow standards established in the TIA 569 Installation Practices within Buildings documents. These standards have been established in reference to the dynamic, changing nature of information technology cabling systems and provide guidelines to enable maximum cabling flexibility to accommodate future changes.

Backbone Cabling Pathways

The copper and optical fiber backbone cabling will be accommodated in appropriate conduit pathways as required in this facility.

Horizontal Cabling Pathways

The SCS horizontal cable distribution from the TR to each outlet position will require a flexible pathway of appropriate dimension to accommodate day one and future cabling installations to the SCS outlets. Also, ease of installation and cable maintenance are important in the selection of the appropriate pathway.

The horizontal pathway will be provided within the ceiling area. The provision of a properly sized conduit and cable tray system will provide flexibility in installing, modifying, adding, or deleting any portion of the cable plant.

All pathway routes shall be coordinated with other building services (electrical, mechanical, etc.) to assure proper clearance and access, as well as to avoid impacts from heat, electro-magnetic interference, or leakage from other building services.

The pathway system shall be coordinated with the electrical distribution system in order to maintain a minimum 12" separation between parallel runs of information technology and electrical cabling. Where electrical and information technology cabling cross, it should be at right angles only.

Technology Space Hardware:

Cabinets

- 7' high standard and colocation network cabinets supporting 19" rack mounting with standard EIA hole spacing.
- Rack Units (RU):
- Standard Network Cabinet: 44 RU
- 2-Compartment Colocation Cabinet: 21 RU (36.812") x2
- 3-Compartment Colocation Cabinet: 14RU (24.625") x3
- Cabinets shall be secured to the floor and adjacent cabinets.
- Vertical cable management shall be cabinet manufacturer specified to reside within the cabinet enclosure.
- Horizontal cable management shall be provided for patch cable management.
- Vertical power distribution strip a minimum of 60" mounted at the rear of the standard network cabinets (Zero-U).
- All racks will be bonded to the telecommunications grounding bus bar with a horizontal rack-mounted ground bar.

Racks

- 7' high, 19" mountable with standard EIA hole spacing.
- 42U minimum usable spaces.
- 2-post racks to support cabling.
- 4-post racks to support network electronics.
- Racks shall be bolted to the slab at front and rear flanges and tied to overhead cable track.
- All racks are to be connected together in the TRs.
- Vertical cable management shall be dual sided for patch cable management at the front and horizontal cable distribution management to the patch panels at the rear.
- Vertical power distribution strip a minimum of 60" mounted to stand off brackets at the rear of the racks.
- All racks will be bonded to the telecommunications grounding earth bar with a horizontal rack-mounted ground bar.

Wall Mount Enclosures

- A minimum of 36" tall by 30" deep enclosure supporting 19" rack mounting with standard EIA hole spacing.
- 20U minimum useable spaces.
- Enclosures shall be secured to the plywood backboard mounted to the wall.
- Vertical cable management shall be enclosure manufacturer specified to reside within the enclosure.
- Horizontal cable management shall be provided for patch cable management.
- All enclosures will be bonded to the telecommunications grounding bus bar with a horizontal rack-mounted ground bar.

Telecommunications Grounding (Earthing) System

- The SCS cabling system must be provided with a reference signal grounding system, provided in accordance with the ANSI/TIA-607.D: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunication – 2019, EN 50310 Bonding and Earthing standard, and local codes and standards documents. This system is an important component of the information technology infrastructure, maintaining ground continuity over the entire analog and digital transmission network throughout the building.

The following guidelines are provided for the design of the system:

- A Telecommunications Main Grounding Busbar (TMGB) is located in the MTR.
- A Telecommunications Grounding Busbar (TGB) shall be located in the TR.
- A copper grounding cable shall connect each grounding bus bar (TMGB/TGB) to the electrical distribution board serving the respective TR.
- The grounding bus bars (TMGB/TGB) shall be solid copper or electro-tin plated and insulated from their supports.

Pathways, space, and media identification

Due to the all-encompassing nature of the SCS, an identification system will be developed to uniquely identify each pathway segment, technology space, cabinet, rack, termination panel, grounding component and cable installed.

All horizontal and backbone cables shall be assigned a unique alphanumeric designation for identification purposes and shall follow the ANSI/TIA-606.C Cable Labeling Standard.

Labels having the appropriate cable designation shall be provided in the following locations for each cable:

- On each end of each cable
- On the outlet face plate in the work area.
- On the termination patch panels in the MTR and TRs.

Cable designations will be designed for easy identification of point-of-origin and point-of-termination location.

Technology Systems

Wi-Fi

Infrastructure for Wireless Access Points (WAPs) will be installed in a distributed design throughout the entire facility providing access in all areas for mobile devices. Cat6a cabling will be used to take advantage of the latest wireless technologies and to provide the required Point-Of-Entry.

Public Address (PA)

The TOA public address system will be expanded with loudspeakers distributed throughout the expansion to provide balanced audio reinforcement.

The loudspeaker type, design, and head-end will be designed to accommodate the zone requirements, live announcements, recorded announcements, and background music (BGM) applications.

Common Use Systems

A Common Use infrastructure will be deployed at select Gate Podiums to allow full airline flexibility at any transaction spaces.

Flight Information Display System (FIDS), Gate Information Display System (GIDS), and Baggage Information Display System (BIDS) will be integrated into the common use system at these same locations.

Physical Security Systems

Video Surveillance System (VSS)

The existing Genetec Security Center Omincast VSS will be expanded as part of this project. Additional storage capacity for a minimum of 30 days retention of full resolution recording 24/7 at 15 frames per second (FPS) will be required as part of this project to accommodate any new cameras being installed in this facility.

Cameras

New IP cameras will be installed to provide visual monitoring of all public and secure areas. A combination of fixed, multi-sensor and pan-tilt-zoom (PTZ) cameras will be used throughout the facility. Enclosures will be required appropriate to the environment where the cameras will be installed to mitigate any potential physical damage and maintain operability in adverse weather conditions. Axis is the primary camera manufacturer at FAR.

Access Control System (ACS)

The existing Genetec Security Center ACS will be expanded as part of this project. Genetec Access Control Panels and power supplies will be installed in new TRs to serve access control doors within the vicinity of the room.

Digital Display Systems

The current Electronic Video Information Display Systems (EVIDS) and digital signage solutions are provided by the Hector International Airport and will be expanded upon as required for new display layout.

Flight Information Display System (FIDS) / Gate Information Display System (GIDS) / Bag Information Display System (BIDS)

The current FIDS/GIDS/BIDS systems are primarily provided by the airport and will be expanded to accommodate the facility's expansion and renovation. The EVIDS vendor will maintain control of the media hardware and content. Connectivity will be provided through the SCS and space will be allocated in the MTR and TRs for any current or additional head-end and connectivity hardware.

Digital Signage

The current digital signage platform will be expanded with new LED displays providing advertising content. The current digital signage vendor will maintain control of the media hardware and content. Connectivity will be provided through the SCS and space will be allocated in the MTR and TRs for any current or additional head-end and connectivity hardware.

Security Screening Checkpoint (SSCP)

Requirements and guidelines outlined in the latest version of the Checkpoint Requirements and Planning Guide (CPRG) will be followed for all the general connectivity and security requirements. Additional cameras will be required to provide specific fields of view of all operational aspects of the checkpoint. These cameras will be part of the Airport's video surveillance system.

Access control will be required to secure the SSCP during non-operational hours; this will be part of the Airport's access control system. All SSCP hardware Cat6 cabling will terminate in the new TSA Technology Room.

14. CONCESSIONS

OVERVIEW

During the Schematic Design phase, ICF located concessions within the footprint provided in project drawings for airside and landside concessions. In doing so, ICF reviewed the previously completed existing conditions and sizing analyses conducted in the conceptual design phase. We analyzed 2022 data to determine if significant changes have occurred. ICF then based the concessions layout on the previously completed situational diagnostics and sizing analyses. ICF also analyzed circulation patterns, sightlines, and visual connectivity to the extent they can be determined in 2-D to identify the relative strength of potential locations with an eye toward creating an inviting shopping environment where visitors have multiple choices and ample room to shop and dine.

In addition, ICF confirmed existing plans, suggested alternative boundaries for concession blocks of space, and proposed layouts that create a seamless and integrated environment by considering opportunities to develop neighborhoods, clusters, and outposts of shops as appropriate. ICF identified the appropriate concept mix (food vs. retail) and took seasonality into consideration. We also examined whether the proposed design will lend itself to "back-of-house" passageways to keep product delivery and garbage and grease removal out of the customer's sight and provided best practices utility requirements for concessions.

STATEMENT OF WORK

During this phase of the work, ICF's remit was to preliminarily locate concessions within the footprint provided in project drawings for airside and landside. More specifically, we were tasked with:

1. Reviewing again the previously completed existing conditions and sizing analyses completed by ICF during the conceptual design phase. Review 2021 data to determine if significant; changes have occurred. Based on the situational diagnostics and sizing analyses previously completed, analyze circulation patterns, sightlines and visual connectivity to the extent they can be determined in 2-D in order to identify the relative strength of potential locations with an eye toward creating an inviting shopping environment where visitors have multiple choices and ample room to shop and dine.
2. Confirming existing plans or suggest alternative boundaries for concession blocks of space and propose layouts that create a seamless and integrated environment by considering opportunities to create neighborhoods, clusters and outposts of shops as appropriate.
3. Identifying appropriate concept mix (food vs. retail) in consideration of seasonality.
4. Considering how the proposed layout offers a logical potential to expand the concessions footprint, given the future commercial demand projections, or whether it limits growth opportunities.
5. Examining whether the proposed layout will lend itself to "back-of-house" passageways to keep product delivery, garbage, and grease removal out of the customer's sight.
6. Providing best practices utilities requirements for concessions.

FORECASTS AND REQUIREMENTS

A number of factors are considered when developing the concession space sizing requirements.

Historical and Forecasted Enplanements

Although the compounded annual growth rate (CAGR) for the pre-pandemic period of 2013 to 2019 was 4.4 percent, passenger traffic at FAR has not yet recovered from pre-pandemic levels. In 2022, FAR served 455,512 enplaned passengers, which was 3.4 percent less than what was served in 2019. In consideration of the slightly slower than projected recovery, concession sizing analysis should be based on the mid-range forecasts.

Year	2019 (FAR)	2026 - Low	2026 - Mid	2026 - High
Enplanements	417,333	495,000	550,000	605,000
F&B SF	5,322	3,900	4,600	5,300
Retail/N&G SF	1,508	700	1,000	1,200
Terminal Concession SF	6,830	4,600	5,600	6,500
Terminal SF/1K Epax	16.4	9.3	10.2	10.7
Year	2019	2031 - Low	2031 - Mid	2031 - High
Enplanements	417,333	554,400	616,000	677,600
F&B SF	5,322	4,600	5,500	6,300
Retail/N&G SF	1,508	1,000	1,300	1,700
Terminal Concession SF	6,830	5,600	6,800	8,000
Terminal SF/1K Epax	16.4	10.1	11.0	11.8
Year	2019	2036 - Low	2036 - Mid	2036 - High
Enplanements	417,333	613,800	682,000	750,200
F&B SF	5,322	5,400	6,300	7,200
Retail/N&G SF	1,508	1,300	1,700	2,300
Terminal Concession SF	6,830	6,700	8,000	9,500
Terminal SF/1K Epax	16.4	10.9	11.7	12.7
Year	2019	2041 - Low	2041 - Mid	2041 - High
Enplanements	417,333	674,100	749,000	823,900
F&B SF	5,322	6,200	7,200	8,600
Retail/N&G SF	1,508	1,600	2,200	2,700
Terminal Concession SF	6,830	7,800	9,400	11,300
Terminal SF/1K Epax	16.4	11.6	12.6	13.7

Figure 5 - Passenger Forecast and Concession Requirements

SEASONALITY

Like most airports, FAR experiences some level of seasonality. The degree of the seasonal fluctuation is considered moderate and would not have a significant impact on the concessions layout, number of units, or supportable square footage. The degree of seasonality would not likely impact concessionaire hours of operations or require additional temporary/pop-up locations.

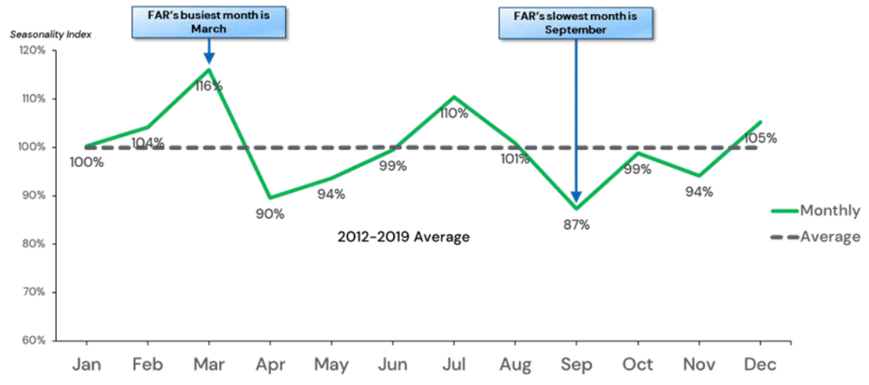

Figure 6 - Passenger Traffic Seasonality

TIME OF DAY ACTIVITY

Airline schedules at FAR comprise three peak departure periods. The largest peak in passenger traffic is early morning (05:00). Passengers departing in the first departure bank tend to arrive at the TSA checkpoint closer to their departure time. To best meet the needs of the passengers in this bank, the concessions program will need to have counter service and walkaway breakfast/ coffee options, as well as travel essentials. The second departure bank occurs later in the morning. Between the initial and secondary peak, passengers arrive at the TSA checkpoint well in advance. To best serve these passengers, the concessions program will need the addition of a full service/sit down location. As the day progresses, menu offerings may change focus to support lunch and dinner. For example, ICF is recommending a coffee and cocktail hybrid concept. While all menu offerings are envisioned to be available all day, internally the operator may change the focus with menu changes (i.e., from breakfast sandwiches to burgers and pizza). The last and final departure peak occurs in the afternoon (17:00).

It is assumed that passengers departing from this bank will continue to arrive well in advance of the departure and are best served by the concepts that are already open.

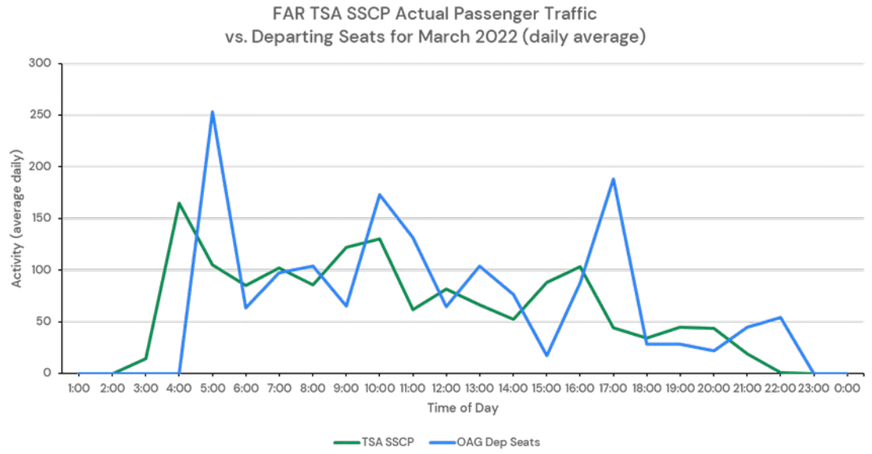

Figure 7 - Time of Day Enplanement Activity Source: OAG and Airline Data, Inc.

LAYOUT PLANS AND BLOCK DIAGRAMMING PRINCIPLES

Diagramming Principles

The clustering and sizing of concessions spaces maximizes the customer experience, by increasing sightlines, providing space for efficiently diverse offerings, and enabling the operators to optimize staffing. This layout provides flexibility for staffed and self-serve locations to account for limited staff availability and reflects FAR's growing tech industry. Additionally, the self-serve outlets enhance the passenger experience by providing services when traditionally staffed units would be closed, because of the prohibitive expense to the concession operators. Below are principles used to further develop the layout during this schematic phase.

Number	Key Planning Principles	Diagramming Principle/Importance
1	**Motivate shopping behavior** with variety and choice.	Provide a diverse set of offerings during all hours of the day by creating both staffed and self-service concepts.
2	**Understand and affect traffic flow**, by locating units that are visible from high traffic areas.	Maximize visibility to facilitate improved capture rates and sales.
3	**Create opportunities for meeters/greeters and well-wishers to congregate** for an optimal experience for passenger visitors.	Locations are created that have visual connectivity to the exit and to the security checkpoint, allowing passenger visitors to be in "revenue generating seats."
4	**Create expandability** by appropriately phasing the program for the future.	Enabling multiple concepts/levels of services to be incorporated in a single space, provides an opportunity to phase development/CAPEX investments as enplanements grow. Phasing ensures the program is not overbuilt at the onset, impacting profitability.
5	**Consider concessionaire profitability** by right-sizing spaces and creating operational efficiencies.	Large or clustered concessions, to stimulate or capitalize on footfall, and centrally located concessions programming to increase easy access to all users. Designs should promote the efficient use of staff, improve levels of service to passengers, and grow sales opportunities.

Figure 8 - Key Planning Principles

INFLUENCERS OF THE KEY PRINCIPLES

Circulation Patterns

- Several factors can influence circulation patterns. The proper placement of signage or concessions can drastically improve circulation patterns. In FAR as passengers leave the TSA security screening checkpoint, they will face a decision point. Do they go left or right? The time it takes to make that decision may cause a bottleneck. Large and clear wayfinding, visible concessions, and amenities signage with limited visual clutter can quickly help passengers make their decision on where to go next. Once a passenger decides where to go, they tend to walk on the right.

- The layout provided capitalizes on strong circulation to all Food & Beverage (F&B) premises. All F&B premises will have outstanding visibility – not only from passengers as they pass by, but as they proceed to the TSA checkpoint, and as they leave the TSA checkpoint. Although in a relatively low-traffic area, Retail 1 (see Figure 9 below) offers good exposure to the circulation of all passengers coming from the east as they move west. With proper signage or perhaps a reveal, all passengers will be exposed to Retail 2 as they leave the TSA checkpoint. Retail 2 also benefits from circulation patterns of passengers using the gates in the east expansion.

Sightlines and visual connectivity

Sightlines and visual connectivity to concessions are critical. Not only does it improve the ease in which passengers navigate the terminal, but it also dramatically improves the ability to generate revenue. Locations with limited visibility will rely more heavily on footfall immediately walking past it. Retail concessionaires especially rely heavily on visibility. This is because potential shoppers often do not intend to shop at the airport. A passenger typically becomes a retail customer only after seeing an inviting storefront, a desirable brand, or compelling merchandise. F&B locations rely less on sightlines than their retail counterparts, as passengers seek out F&B locations when they are hungry, wish to spend time at a bar, or want to grab more substantial food for their flight. If there is signage, advertising a strong brand (i.e., Starbucks or Chick Fil-A) passengers will go out of their way to get to the location.

Concessions Neighborhoods

- Concession neighborhoods provide operational efficiencies, stimulate footfall, and result in higher sales. ICF set out to incorporate neighborhoods so long as these were not located in underserved areas.

- The recommended layout creates these concessions neighborhoods. In the recommended layout plan, Retail 1 and F&B 1 are close in proximity and provide easy access to those utilizing the western gates. Retail 2 and F&B 3 are clustered just outside of the TSA checkpoint. This neighborhood is the most convenient for all passengers to access. Future F&B and Retail space has been identified in the easternmost portion of the east expansion. This location would support eastern gates users.

Back-Of-House (BOH) Logistics

- Incorporating BOH circulation for distribution of product into and trash removal from commercial facilities can greatly improve the experience of a facility user. BOH circulation allows facility operators to keep operational support functions such as deliveries, waste removal, the temporary storage of unsightly utility equipment (i.e., garbage cans) and employee conversations, out of public/customer areas. BOH circulation can provide efficiencies in the operation by reducing the distance between storage rooms, loading docks, concessions administration areas, and concessions spaces.

- During the Schematic Design phase, ICF desires to incorporate BOH circulation where possible. The efficient size of FAR provided limited opportunities to incorporate BOH circulation to support the concessions space. The team has incorporated circulation to the loading dock in the east expansion on the first floor into the design for BOH logistics. This BOH layout connects the loading dock to vertical circulation, and concessions storage and administrative spaces. In the next phase of design ICF will work with Mead & Hunt to refine the logistics to allow easy access to landside facilities.

LAYOUT

Based on the diagramming principles, ICF recommends the layout in figure 9 for the concessions program. The layout consists of three F&B locations and two retail locations, with the opportunity to phase two additional locations when passenger traffic increases.

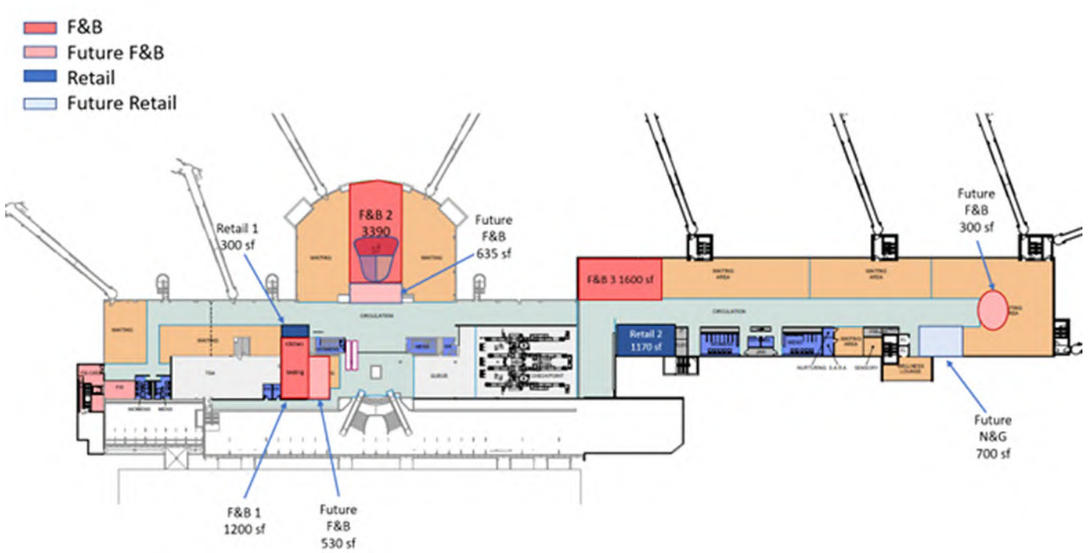

Figure 9 - Recommended Program Layout

			Proposed					
	Actual	Model Requirement	Phase 1	Phase 2				
	2019	2026	2031	2041	2026	2031	2031	2041
Epax	417,333	550,000	616,000	749,000	550,000	616,000	616,000	749,000
F&B	5,322	4,600	5,500	7,200	6,190	6,190	7,655	7,655
Retail	1,508	1,000	1,300	2,200	1,470	1,470	2,170	2,170
Total	6,830	5,600	6,800	9,400	7,660	7,660	9,825	9,825
SF/1K Epax	16.4	10.2	11.0	12.6	13.9	12.4	15.9	13.1

Figure 10 - Layout Summary

F&B 1 is envisioned as a quick-serve with coffee and sandwiches to serve the meeters/greeters and well-wishers as well as airport employees. F&B 2 would incorporate a full-serve sit-down restaurant with a bar as well as one or two quick-serve outlets on the face of the corridor. F&B 3 is a coffee and cocktail hybrid concept. F&B 4 would be held for a later date when increased traffic warrants, but utilities and plumbing should be run to that space as part of the initial construction program to save costs on running those services later.

Retail 1 could be designed to operate as either a staffed outlet during peak hours with a self-checkout component for slower periods, or as all self-checkout location at all times. Retail 2 is to be designed fully staffed supplemented with a self-checkout option and contain the full provision of news, gift and convenience items. Retail 3 is in a second phase, in response to future growth and will support the easternmost gates.

ADVANTAGES

- F&B visibility, proper sizing, balanced exposure
- Each F&B spaces can be expanded to support growth without major impact to adjacent spaces
- Optimal retail sizing, operations, and exposure

DISADVANTAGES

- Ideal placement for Retail 2, which would provide the greatest line of sight, would be north of where it currently resides (where F&B 3 is located). Because of the number of fixtures and equipment required in a retail store, ICF did not believe the retail store would be able to meet the Airport's desire to maintain a line of sight to the scenic plains outside the terminal. The placement of a bar/ lounge or coffee concept would be able to achieve that requirement. Therefore F&B 3 has been placed in that spot.

Phases

The layout provided contemplates a phased expansion. Phase 1 is designed to meet Mead & Hunt projected levels of traffic in the mid-2031 projections. Phase 2 is an expansion of the concessions program to meet the Mead & Hunt mid-2041 projected levels of traffic. ICF believes this phased approach provides the operators the opportunity to keep initial CAPEX manageable. If arrangements are made by FAR to finance the initial concession CAPEX requirements, ICF believes it would be advantageous to exercise building out Phase 2, except for the two future opportunities in the eastern most portion of the expansion. If Phase 2 is not initially built out, the Phase 2 locations, including the two future opportunities, should be developed when traffic levels hit mid-2031 projected levels.

CONCEPT MIX (FOOD VS. RETAIL)

Through Phase 1, the F&B program will account for 81 percent of the concessions program. The Retail program will account for 19 percent of the concessions program. As the program is expanded to meet the needs of growing traffic, in Phase 2 the F&B program will account for 78 percent, while the Retail program will grow and account for 22 percent of the concessions program.

The table below shows preliminary preferred concepts.

Space	Subtype	Preliminary Preferred Concept
F&B 1	Counter Service	Coffee/Sandwich Cafe
F&B 2a	Table Service	American Grille
F&B 2b	Counter Service	Deli Bakery
F&B 2c	Counter Service	Pizza
F&B 3	Sit Down	Coffee & Cocktails Hybrid
Retail 1	News/Convenience	Travel Essentials
Retail 2	News/Convenience	Travel Essential, News, Gifts, and Apparel

Figure 11 - Preliminary Preferred Concept

ORDER OF MAGNITUDE SALES AND REVENUE FORECAST

With a properly placed, right-sized, and diverse concession program, ICF believes that the concession program can achieve a Sales Per Enplanement (SEP) of $9.92 in 2026 (2019 SEP $6.21). These figures are based on a conservative capture rate of 50 percent of the enplaning traffic with an average check amount of $15.25 for F&B and a 17 percent capture rate for retail, with an average check of $13.50. The revenue forecast is based on the minimum annual guarantee (MAG) and percentage rents described in FAR's existing F&B and retail agreements. Currently, the F&B rent is the greater of the MAG, which is $75,000 or 10 percent gross revenue for food and non-alcoholic beverages and 14 percent for alcoholic beverages. The rent for retail is a MAG of $12,000 or 10 percent of gross revenue, whichever is greater. However, there may be opportunities to increase the net revenues to the airport for both F&B and retail by updating the financial terms of the concession agreements.

Sales Per Enplanement Forecast

Years	2026	2027	2028	2029	2030
Projected Enplanements	550,000	565,950	582,363	599,251	616,629
F&B Gross	$4,193,750	$4,315,369	$4,440,514	$4,569,289	$4,701,799
F&B SEP	$7.62	$7.62	$7.62	$7.62	$7.62
Retail Gross	$1,262,250	$1,298,855	$1,336,522	$1,375,281	$1,415,164
Retail SEP	$2.30	$2.30	$2.30	$2.30	$2.30
Total SEP	$9.92	$9.92	$9.92	$9.92	$9.92

Figure 12 – Sales Per Enplanement, Gross Sales, and Net Revenue Forecasts

Food & Beverage Gross Sales Forecast

Sales for Concessions Unit	2026	2027	2028	2029	2030
Food & Non-Alcoholic Beverages	$2,935,625	$3,020,758	$3,108,360	$3,198,503	$3,291,259
Alcoholic Beverages	$1,258,125	$1,294,611	$1,332,154	$1,370,787	$1,410,540
Gross Sales	$4,193,750	$4,315,369	$4,440,514	$4,569,289	$4,701,799

Note: Food and non-alcoholic beverages account for 70% of sales. Alcoholic beverages account for 30%.

Retail Gross Sales Forecast

Sales for Concessions Unit	2026	2027	2028	2029	2030
News, Gift, & Specialty Retail	$1,262,250	$1,298,855	$1,336,522	$1,375,281	$1,415,164
Gross Sales	$1,262,250	$1,298,855	$1,336,522	$1,375,281	$1,415,164

Food & Beverage Net Revenue Forecast

Concession Fee	2026	2027	2028	2029	2030
Minimum Annual Guarantee or	$75,000	$75,000	$75,000	$75,000	$75,000
Food & Non-Alcoholic Beverages (10% gross)	$293,563	$302,076	$310,836	$319,850	$329,126
Alcoholic Beverages (14% gross)	$176,138	$181,245	$186,502	$191,910	$197,476
Net Revenue	$469,700	$483,321	$497,338	$511,760	$526,601

Retail Net Revenue Forecast

Concession Fee	2026	2027	2028	2029	2030
Minimum Annual Guarantee or	12,000	12,000	12,000	12,000	12,000
Monthly Rental (10% gross)	$126,225	$129,886	$133,652	$137,528	$141,516
Net Revenue	$126,225	$129,886	$133,652	$137,528	$141,516

UTILITY REQUIREMENTS

- Separately Attached

STORAGE REQUIREMENTS

To accommodate the needs and support the concessions operations, ICF recommends that approximately 1,700 square feet of concessions storage and administration space be allocated in the vicinity of the loading dock and vertical circulation. Ideally this space will be accessible by the public for mitigating security risk for operational activities such as deliveries and interviews. ICF recommends that approximately 1,300 square feet be allocated to the F&B operator and approximately 400 square feet be provided to the Retail operator. It should be assumed that a small walk-in freezer may be required by the food service operator.

15. AIRCRAFT PARKING AND PASSENGER BOARDING BRIDGES

SCOPE OF WORK

The Passenger Boarding Bridge (PBB or boarding bridges) and aircraft parking design are being done in close coordination with the terminal gate and holdroom layout. The scope of work includes four PBBs to remain in place (three will be refurbished), one PBB to be refurbished and relocated, and four new PBBs to be added. The existing boarding bridges are currently nearing the end of today's standard life expectancy of a PBB, so refurbishments will improve and extend the life of this equipment. The basis of design for the new PBBs will be for 3-tunnel apron-drive models, which is the industry standard and will allow for maximum flexibility in the future. In addition to the new boarding bridges, a 400Hz Ground Power Unit will be provided and mounted on the underside of the PBB cab.

The aircraft parking plan is being designed to support full ADG II and ADG III aircraft at all nine gates. One gate is capable of supporting an ADG IV (B757) aircraft with no operational restrictions required, and other gates may be able to support larger aircraft as an alternate position by temporarily closing an adjacent gate. All parking positions and PBB designs will comply with ADA sloping standards.

16. BAGGAGE HANDLING SYSTEMS

OUTBOUND BAGGAGE SCREENING AND MAKEUP

The existing terminal building at FAR has been slated to undergo terminal expansion and renovation. As such, the existing outbound Baggage Handling System (BHS) will be demolished and replaced with new equipment and controls systems. The existing outbound baggage operations will be updated.

The BHS system has been designed to include the following new additions. Two (2) new take-away conveyor belts located behind the ticket counters will be provided and will feed directly into a newly constructed TSA checked baggage inspection area (BIA). The two (2) current Explosion Detection Systems (EDS) machines will be relocated into a new standalone configuration. A right of way (ROW) will be reserved for a future EDS screening line. This allows for three (3) EDS machines in the screening room in the future to account for future demand. A clear line subsystem will be provided to transport baggage from the screening room to the outbound baggage make-ups. The new conveyor belts will be outfitted with a flared inner radius to allow for oversize baggage to be transported in and out of the screening room. Two (2) fire/security doors will be provided at the ticketing. One (1) fire/security doors will be provided at the clear line. One (1) Automatic Tag Reader (ATR) will be provided on the clear line to allow for sortation. Two (2) new flat plate make-up devices will be provided to allow for more cart staging and ease of use for the existing/future airlines. These make-up devices will be fed from the clear line, and bags will be loaded via a baggage tip chute.

The design team will lay out a TSA Planning Guidelines and Design Standards (PGDS) compliant stand-alone system in the inspection area as proof of concept and to reserve the equipment right-of-way (ROW). Each of these systems are to be separately constructed and phased into operations to provide the least impact to operations and to provide better customer experience.

INBOUND BAGGAGE HANDLING

The existing inbound system will remain and will have no changes at this point.