UNIVERSITY OF NORTH DAKOTA
FLIGHT OPERATIONS BUILDING AND HANGAR

SCHEMATIC DESIGN SUBMITTAL

JULY 23, 2021

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

Mead & Hunt

JLG architects

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PHASE SIGN-OFF

JLG 20117 - UND Flight Operations Building and Hangar
Schematic Design Phase Sign-off
July 23, 2021

Attached are the Schematic Design phase documents for your review and approval.

Please provide signature below stating that you have reviewed the Schematic Design documents provided in this submittal, and JLG Architects and consultants can move into the next phase of design. If necessary, please provide any concerns or questions that need to be addressed prior to moving into the Design Development phase of design or as part of the next phase of design.

PIC Signature _____ Date _____

Owner Signature _____ Date _____

PROJECT OVERVIEW

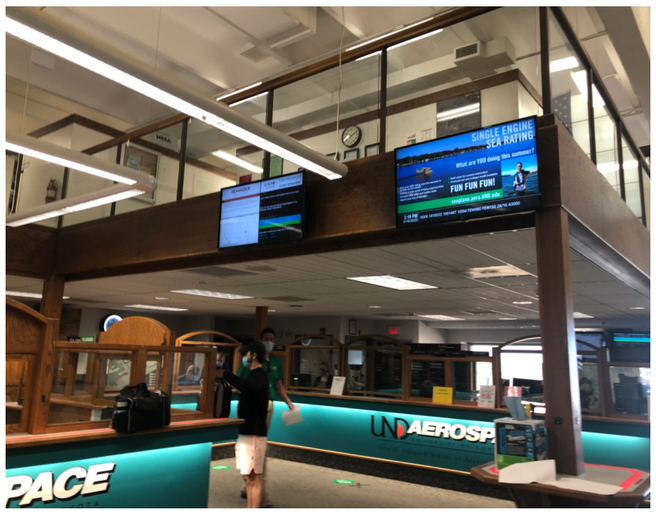
The University of North Dakota Aviation Program, a part of the John D. Odegard School of Aerospace Sciences, is the top collegiate aviation program in the United States. Flight Operations for this premier program currently function out of a compact two-story building which does not meet their needs and does not portray the significance of UND Aviation. As a leader in aviation education, UND is looking to replace the existing old and under-sized Flight Operations Building on its airport campus with a new landmark building that will celebrate UND Aviation history. Along with replacing the Flight Operations Building, UND is also looking to replace an adjacent hangar building to allow it to serve as a multi-purpose space to expand the program's impact with the greater campus and aviation partner community.

The design of the new modern three-story Flight Operations Building prioritizes efficient workflow, technology, and natural light. While the building will have recognizable spaces such as Dispatch, Records, Instructor Work Areas, and a Flight Store; it will also include additional new spaces such as a Grand Lounge with two-story views to the Bravo Apron, Briefing/Debriefing Huddle Rooms, open soft seating areas throughout, and an executive Board Room to further enhance the education of future aviation professionals The site design includes the addition of a parking lot and updating to existing parking to the south of the Flight Operations Building. The new parking lot will be located at an existing retention pond and new drainage utility will be required to properly drain the new site layout.

The overall design embodies the aspirational nature of aviation. The building's architecture gives one the sense of being 'lifted-up.' A perforated screen wall on the south exterior not only serves to filter the strong south daylight and control heat-build up at the large window openings, but also gives the representation of being airborne as it thrusts off the building façade. Exterior materials are a composition of strong, durable finishes at the base of the building with warm tone materials above. Interior materials are a composition of wood, along with durable floor and wall materials that contrast, but compliment the warmth of the wood. An abundance of natural light characterizes the quality of the indoor space. The new building will inspire students, engage industry partners, and bring pride to UND Aerospace and it continues to expand its legacy.

OWNER PROJECT GOALS

1. The UND Flight Operations Building will be a landmark that "lifts up" and inspires current and future students, while celebrating the rich history and ongoing legacy as the top collegiate aviation program in the United States.
2. Effective use of technology and modernization of how things operate, truly be on the leading edge of our aviation peers with a priority on safety/technology (data, analytics, metrics)
3. Provide a place for industry partners to set up and promote themselves. The building should also be a great venue to attract the community and inspire the next generation of pilots and aviation experts
4. Improve parking and access to be easy and intuitive
5. vide and improved workflow and collaboration between dispatch, flight instructors, and management. This includes maintaining the physical interior connection between the project and the administration building
6. Future proofing, think beyond when the building opens (infrastructure and flexibility are key) – what has COVID taught us?
7. Dream dispatch process – allow for more public space on the first floor, less space for offices/desks with the help of technology
8. Provide healthy and naturally lit workplace environments, with access to outdoor space



PROJECT SCHEDULE

SCHEMATIC DESIGN	May 3, 2021 to July 23, 2021
DESIGN DEVELOPMENT	August 9, 2021 to October 8, 2021
CONSTRUCTION DOCUMENTS	Pending
BIDDING	Pending
CONSTRUCTION	Anticipated Summer of 2023

2021

MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
SCHEMATIC DESIGN			DESIGN DEVELOPMENT		

MAY
- May 6th – Owner Kick-Off Meeting
- May 19th – Owner Meeting
  - PD program & plan review

JUNE
- June 3rd – Owner Meeting
  - PD exterior design review, plan review & hangar review
- Week of June 7th – Meeting with City of GF, Initial Code Analysis
- June 17th – Owner Meeting
  - Code update, site review, program confirmation & hangar overview

JULY
- July 1st – Owner Meeting
  - Site & plan review & sustainability overview
- July 15th – Owner Meeting
  - Exterior design review & interior finish overview
- July 23rd – SD SUBMITTAL
- July 29th – Owner Meeting
  - Review SD set & DD phase meetings summary

AUGUST
- Week of August 2
  - Student & Staff Input & Mtg
  - Preliminary Submittal to FAA
- August 12th – Owner Meeting
  - Overall design review
- Week of August 16th – Security Review Meeting
- Week of August 23rd – Catering Review Meeting
- August 26th – Owner Meeting
  - Finishes review & branding
  - A/V and IT system review

SEPTEMBER
- September 3rd – 50% DD SET
- Week of September 6th
  - DD Code Review with City
  - Mech & Elec systems review with Facilities
- September 9th – Owner Meeting
  - Review furniture options
- September 23rd – Owner Meeting
  - DD page turn/review
- Week of September 27th – Door Hardware Review Meeting

OCTOBER
- October 7th – Owner Meeting
  - Review DD set
- October 8th – 100% DD SET
- October 21st – Owner Meeting
  - Review DD estimate
- October 18th to 23rd – UND Homecoming
- October 29th – Start CD's?

SD REVIEW

DD REVIEW

OWNER MEETING · OWNER MEETING · OWNER MEETING · CODE MTG · OWNER MEETING · OWNER MEETING · OWNER MEETING · SD SUBMITTAL · OWNER MEETING · PRELIM FAA · OWNER MEETING · SECURITY REVIEW · INPUT · OWNER MEETING · 50% DD SET · CODE MTG · OWNER MEETING · OWNER MEETING · DOOR REVIEW · OWNER MEETING · 100% DD SET · OWNER MEETING

PRELIMINARY CODE REVIEW

BUILDING STATISTICS	
The following review was completed by:	***Nic Pietron***
Project Number:	***20117***
Project Name:	***UND Flight Operations Building and Hanger***
Building Hieght	***142'-0"***
Site / Lot Area :	***100.0 SF***
Building Areas:	
FIRST FLOOR	***FOB = 9,532 SF | Hanger = 6,745 SF***
SECOND FLOOR/MEZZANINE	***FOB = 6,801 SF | Hanger = 1,970SF***
THIRD FLOOR	***FOB = 8,170 SF***
Total Building Area:	***FOB = 24,403 SF | Hanger = 8,715 SF***
ZONING / SITE REQUIREMENTS	
Zoning District:	***AD - Airport District***
Building Use:	***Aerospace Education / Directly Related to Airport Operation***
	SEE ALSO REQUIREMENTS BASED ON CONSTRUCTION TYPES
BUILDING CODE ANLYSIS - APPLICABLE GOVERING CODES:	
Building Code:	***2018 International Building Code***
State Amendments:	***North Dakota***
Fire Code:	***2018 International Fire Code***
Plumbing Code:	***2018 North Dakota Plumbing Code***
Electrical Code:	***NFPA 70 2020 edition National Electrical Code***
Energy Code:	***2018 International Energy Conservation Code***
Elevator Code:	***2018 International Building Code; Chapter 30***
Accessibilty Code:	***2009 ANSI A117.4 and 2010 ADA***
Other Requirements:	***FAA - Airspace Standards for Airport Safety and Operational Capability, NFPA 409, NFPA 221***
BUILDING CODE ANLYSIS -...	
CHAPTER 3 OCCUPANCY CLASSIFICATION AND USE	
SECTION 302 **OCCUPANCY CLASSIFICATION AND USE DESIGNATION:**	Occupancy classification is the formal designation of the primary purpose of the building, structure, or portion thereof. Structures shall be classified into one ore more of the occupancy groups listed in this section based on the nature of the hazards and risks to building occupants generally associated with the intended purposed of the building or structure. An area, room or space that is intended to occupied at different times for different purposes shall comply with all applicable requirements associated with such potential multipurpose. Structures containing multiple occupancy groups shall comply with Section 508. Where a structure is proposed for a purpose that is not specifically listed in this section, such structure shall be classified in the occupancy it most nearly resembles based on the fire safety and relative hazard. Occupied roofs shall be classified in the group that the occupancy most nearly resembles, accoriding to the fire safety and relative hazard, and shall comply with Section 503.1.4.
OCCUPANCY CLASSIFICATION(S) BY CODE:	***A-2, A-3, B, and S-1***
CHAPTER 6 TYPES OF CONSTRUCTION	
SECTION 602 **CONSTRUCTION CLASSIFICATION**	
602.1 General	Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 602.2 through 602.5. The building elements shall have a fire-resistance rating not less than that specified in Table 601 and exterior walls shall have a fire-resistance rating not less than that specified in Table 601 and exterior walls shall have a fire-resistance rating not less than that specified in Table 602. Where regruied to have a fire-resistance rating by Table 601, building elements shall comply with the applicable provisions of Section 7032. the protection of openings, ducts and air transfer openings in building elements shall not be required by other provisions of this code.
Construction type for this project shall be	***IIB***
How will the building be sprinklered :	***SM***
How many stories will this building be:	***3***
TABLE 601	
Primary structural frame (f) (see section 202)	***0***
Bearing Walls	
Exterior (e,f)	***0***
Interior	***0***
Nonbearing walls and partitions	
Exterior	***See Table 602***
Nonbearing walls and partitions	
Interior (d)	***0***
Floor construction and associated secondary members (see...	***0***
Roof construction and associated secondary members (see...	***0 c***
	a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
	b. Except in Group F-1, H, M, and S-1 occupancies, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant wood members shall be allowed to be used for such unprotected members.
	c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed where a 1-hour or less fire-resistance rating is required.
	d. Not less than the fire-resistance rating required by other sections of this code.
	e. Not less than the fire-resistance rating based on fire separation distance (see Table 602).
	f. Not less than the fire-resistance rating as referenced in Section 704.10.
TABLE 602 RATING BASED ON FIRE SEPARATION...	
The occupancy group under evalation shall be	***A,B,E,F-2,I,R(i), S-2, U(h)***
Fire separation distance (occupancy group-construction type)	***A,B,E,F-2,I,R(i), S-2, U(h)-IIB***
X<5 b	***1***
5<=X<10	***1***
10<=X<30	***0***
X>=30	***0***
	a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
	b. See Section 706.1.1 for party walls.
	c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
	d. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.

	e. For special requirements for Group H occupancies, see Section 415.6.
	f. For special requirements for Group S aircraft hangars, see Section 412.3.1.
	g. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.
	h. For a building containin gonly a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet or greater.
	i. For a Group R-3 building of Type II-b or Type V-B construction, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet or greater.
CHAPTER 5 GENERAL BUILDING HEIGHTS AND AREAS	
SEPARATED OR NON-SEPARATED	***Non-Separated***
MOST RESTRICTIVE OCCUPANCY	***A-3***
	A-3-SM
SECTION 508 **MIXED USE AND OCCUPANCY**	
508.1 General	Each portion of a building shall be individually classified in accordance with Section 302.1. Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisiosn of Section 508.2, 508.3, 508.4,B13or a B13combination of these sections.
	Exceptions: 1. Occupancies separated in accordance with Section 510 2. Where required by Table 415.6.2, areas of Group H-1, H-2, and H-3 occupancies shall be located in a detached building or structure. 3. Uses within live/work units, complying with Section 419, are not considered separate occupancies.
	Noted Exceptions
508.2 Accessory occupancies	
	Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof. Accessory occupancies shall comply with the provisions of Sections 508.2.1 through 508.2.4.
	List Project Accessory Occupancies
508.2.1 Occupancy classification	Accessory occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space.
508.2.2 Allowable building height	The allowable height and number of stories of the biulding containing accessory occupancies shall be in accordance with Section 504 for the main occupancy of the building.
508.2.3 Allowable building area	The allowable building area of the building shall be based on the applicable provisions of Section 506 for the main occupancy of the building. Aggregate accessory occupancies shall not occupy more than 10 perfect of the floor area of the story in which they are located and shall not exceed the tabular values for nonsprinklered buildings in Table 506.2 for each such accessorry occupancy.
	Accessory Occupancy SF/Total Story Area < 10%
508.2.4 Separation of occupancies	No separation is required between accessory occupancies and the main occupancy.
508.3 Nonseparated Occupancies	
	Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.
508.3.1 Occupancy Classification	Nonseparated occupancies shall be individually classfied in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classificiation of that space. In addition, the most restrictive provisions of Chapter 9 that apply to the nonseparated occupancies shall apply to the total nonseparated occupancy area.
508.4.1 Occupancy Classification	Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code based on the occupancy classification of that portion of the building. The most restrictive provisions of Chapter 9 that apply to the separate occupancies shall apply to the total nonfire-barrier-separated occupancy areas. Occupancy separations that serve to define fire area limits established in Chapter 9 for requiring a fire protection systme shall also comply with Section 901.7.
508.4.2 Allowable Building Area	In each story, the building area shall be such that the sum of the ratios of the actual building area of each separated occupancy divided by the allowable building area of each separated occupancy shall not exceed 1.
	(Actual Occupancy Footprint/Alloable Occupancy Area)+ (Actual Occupancy Footprint/Allowable Occupancy Area)....<1
508.4.3 Allowable building height and number of stories	Each separated occupancy shall comply with the building height limitations and story limitations based on the type of construction of the building in accordance with Section 503.1.
	Exceptions: 1. Special provisions of Section 510 shall permit occupancies at building height and number of stories other than provided in Section 503.1.
	Noted Exceptions and Project Application.
508.4.4 Separation	Individual occupancies shall be separated from adjacent occupancies in accordance with Table 508.4.
Table 508.4 Required Separation of Occupancy (Hours)	***Use TABLE 508.4 and list required separations of occupancies (i.e. A:B = 1 HR)***
508.4.4.1 Construction	Required separations shall be fire barriers construted in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both, so as to completely separate adjacent occupancies.
509 Incidental Uses	
509.1 General	Incidental uses located within single occupancy or mixed occupancy buildings shall comply with the provisions of this section. Incidental uses are ancillary funcations associated with a given occupancy that generally pose a greater level of risk to that occupancy and are limited to those uses in Table 509.
	Exceptions: 1. Incidental uses within and serving a dwelling unit are not required to comply with this section.
509.2 Occupancy Classification	Incidental uses shall not be individually classified in accordance with Section 302.1. Incidental uses shall be included in the building occupancies within which they are located.
509.4 Separation and protection	The incidental uses listed Table 509 shall be separated from the remainder of the building or equipped with an automatic sprinkler system, or both, in accordance with the provisions of that table.
Table 509 Incidental Uses	***Use TABLE 509 to list incidental use and separation and/or protection requirements.***
509.4.1 Separation	Where Table 509 specifies a fire-resistance-rated separation, the incidental uses shall be separated from the remainder of the building by a fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 711, or both. Construction supporting 1-hour fire barriers or horizontal assemblies used for incidental use separations in buildings of Type IIB, IIIB, and VB is not required to be fire-resistance rated unless required by other sections of this code.
509.4.2 Protection	Where Table 509 permits an automatic sprinkler system without a fire barrier, the incidental uses shall be separated from the remainder of the building by construction capable of resisting the passage of smoke. The walls shall extend from the top of the foundation or floor assembly below the underside of the ceiling that is a component of a fire-resistance-rated floor assembly above or to the underside of the floor or roof sheathing, deck or slab above. Doors shall be self-or automatic-closing upon detections of smoke in accordance with Section 716.2.6.6. Doors shall not have air transfer openings and shall not be undercut in excess of the clearance permitted in accordance with NFPA 80. Walls surrounding the incidental use shall not have air transfer openings unless provided with smoke dampers in accordance with Section 710.8.
509.4.2.1 Protection Limitation	Where an automatic sprinkler system is provided in accordance with Table 509, only the space occupied by the incidental use need to be equipped with such a system.
	For this project sprinklered protection shall be utilized in lieu of rated walls as applicable with Section 509.4. Doors shall have smoke seals and walls constructed to be smoke tight
506 Building Area	
506.1 General	The floor area of a building shall be determined based on the type of construction, occupancy classification, whether there is an automatic sprinkler system installed throughout the building and the amount of building frontage on public way or open space.
506.2 Allowable area determination	The allowable area of a building shall be determined in accordance with the applicable provisions of Sections 506.2.1 through 506.2.4 and 506.3.
Equation 5-1:	***Aa = At + (NSxIf)***
506.2.2.1 Group H-2 or H-3 mixed occupancies	For a building containing Group H-2 or H-3 occupancies, the allowable area shall be determined in accordance with Section 508.4.2, with sprinkler system increase applieable only to the portion of the building not classified as Group H-2 or H-3.
	Aa = [At + (NSxIf)] x Sa; No individual story shall exceed the allowable area (Aa) as determined by Equation 5-2 using the value of S=1.

PRELIMINARY CODE REVIEW

At	***28500***
NS	***9500***
If	***0.39***
Sa	***3***
Total Allowable Building Area:	***96615***
Total Allowable Story Area:	***32205***
506.2.4 Mixed-occupancy, multistory buildings	
506.2.4 Mixed-occupancy, multistory buildings	Each story of a mixed-occupancy building with more than one story above grade plane shall individually comply with the applicable reuqirements of Section 508.1. For buildings with more than three stories above grade plane, the total building area shall be such that the aggregate sum of the ratios of the acutal area of each story divided by the allowable area of such stories, determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed three.
	Exceptions: 1. For buildings designed as separated occupancies under Section 508.4 and equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed four.
Equation 5-3:	***Aa = [At + (Ns x If)]***
At (SF)	***28500***
NS (SF)	***9500***
If	***0.39***
Total Allowable Story Area (SF):	***32205***
Buildings > Three Stories	***A1/Aa + A2/Aa + A3/Aa.....< 3***
506.3 Frontage	
506.3 Frontage Increase	Every building shall adjoin or have access to a public way to receive an area factor increase based on frontage. Area factor increase shall be determined in accordance with Sections 506.3.1 through 506.3.3.
506.3.1 Frontage Increase	To qualify for an area factor increase based on frontage, a building shall have not less than 25 percent of its perimeter on a public way or open space. Such open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or approved fire line.
	This project has greater than 25% of its perimeter facing a public way or open space. Refer to life safety plans/site plan.
506.3.2 Minimum frontage distance	To qualify for an area factor increase based on frontage, the public way or open space adjacent to the building perimeter shall have a minimum distance of 20 feet measured at right angles from the building face to any of the following: 1. The closest interior lot line. 2. The entire width of the street, alley or public way. 3. The exterior face of an adjacent building on the same property. Where the value of W is greater than 30 feet, a value of 30 feet shall be used in calculating the building area increase based on frontage, regardless of the actual width of the public way or open space. Where the value of W varies along the perimter of the building, the calculation performed in accordance with Equation 5-5 shall be based on the weighted average calculated in accordance with Equation 5-4.
	Exceptions: 1. Where a building meets the requirements of Section 507, as applicable, except for compliance with the minimum 60-foot public way or yard requirement, and the value of W is greater than 30 feet, the value of W shall not exceed 60 feet.
Equation 5-4:	***W = (L1xw1 + L2xw2 + L3xw3..../F)***
	30
506.3.3 Amount of increasee	The area factor increase based on frontage shall be determined in accordance with Equation 5-5.
Equation 5-5:	***If = [F/P-0.25]W/30***
	0.39
504 Building Height and Number of Stories	
504.3 Height in feet	The maximum height, in feet, of a building shall not exceed the limits specified in Table 504.3.
Allowble number of stories:	***3***
510.2 Horizontal building separateion allowance	A building shall be considered as separate and distinct buildings for the purpose of determning area limitations, continuity of fire walls,limitation of number of stories and type of construction where all of the following conditions are met: 1. The buildings are separated with a horiztonal assembly having a fire-resistance rating of not less than 3 hours. Where vertical offsets are provided as part of a horiztonal assembly, the vertical offset and the structure supporting the vertical offset shall have a fire-resistance rating of not less than 3 hours. 2. The building below, including the horiztonal assembly, is of Type IA construction. 3. Shaft, stairway, ramp and escalatory enclosures through the horiztonal assembly shall have not less than a 2-hour fire-resistance rating with opening protectives in accordance with Section 716. Exception: Where the enclosure walls below the horizontal assembly have not less than 3-hour fire-resistance rating with opening protectives in accordance with Section 716, the enclosure walls extending above the horizontal assembly shall be permitted to have a 1-hour fire-resistance rating provided: 1. the building above the horizontal assembly is not required to be of Type I construction; 2. The enclosure connects fewer than four stories; and 3. The enclosure opening protectives above the horizontal assembly have a fire protection rating of not less than 1 hour. 4. The building or buildings above the horiztonal assembly shall be permitted to have multiple Group A occupancy uses, each with an occupant load of less 300, or Group B, M, R, or S occupancies. 5. The building below the horizontal assembly shall be protected throughout by an approved automatic sprinkler system in accordance with Section 903.3.1.1, and shall be permitted to be any occupancy by this code except Group H. 6. The maximum building height in feet shall not exceed the limits set forth in Section 504.3 for the building having the smaller allowable height as measrued from the grade plane.
510 Special Provisions (PARKING BENEATH GROU...	
	List type of parking garage, construction type and Mixed Use Occupancy separation for your project here.
510 Special Provisions (GROUP R-1 AND R-2...	
510 Special Provisions (OPEN PARKING GARAGE...	
510 Special Provisions (MULTIPLE BUILDINGS...	

510.9 Multiple buildngs above a horizontal assembly	Where two or more buildings are provided above the horiztonal assembly separating a Group S-2 parking garage or building below from the buildings above in accordance with the special provisions in Section 510.2, 510.3 or 510.8. the buildings above the horiztonal assembly shall be regarded as separate and distinct buildings from each other and shall comply with all other provisions of this code as applicable to each separate and distinct building.
CHAPTER 7 GENERAL BUILDING HEIGHTS AND AREAS	
704 Fire-resistance Rating of Structural Members	
	The fire-resistance ratings of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The fire-resistance rating shall be not less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.
	Exceptions: 1. Fire barriers, fire partitions, smoke barriers and horiztonal assemblies as provided in Sections 707.5, 708.4, 709.4 and 711.2, respectively.
	Noted Exceptions and Project Application.
704.2 Column protection	Where columns are required to have protection to achieve a fire-resistance rating, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column height, including connections to other structural members, with materials having the required fire-resistnace rating.
	Exceptions: 1. Columns that meet the limitations of Section 704.4.1.
	Noted Exceptions and Project Application.
705 Exterior Walls	***Verify requirements with your project specifics. Add rows as necessary.***
706 Fire Walls	
706.1 General	Fire walls shall be constructed in accordance with Sections 706.2 through 706.11. The extent and location of such fire walls shall provide a complete separation. Where a fire wall separates occupancies that are required to be separated by a fire barrier wall, the most restrictive requirements of each separation shall apply.
706.2 Structural stability	Fire walls shall be designed and constructed to allow collapse of the structure either side without collapse of the wall under fire conditions. Fire walls designed and constructed in accordance with NFPA 221 shall be deemed to comply with this section.
706.4 Fire-resistance rating	Fire walls shall have a fire-resistance rating of not less than that required by Table 706.4.
	A,B,E,H-4,I,R-1,R-2,U - 3a Hours
	a. In Type II or IV construction, walls shall be permitted to have a 2-hour fire-resistance rating. b. For Group H-1, H-2, or H-3 buildings, also see Sections 415.7 and 415.8.
706.5 Horiztonal continuity	Fire walls shall be continuous from exterior wall and shall extend not less than 18" beyond the exterior surface of exterior walls.
Exceptions:	***3. Fire walls shall be permitted to terminate at the interior surface of noncombustible exterior sheathing where the building on each side of the fire wall is protected by an automatic sprinkler system installed in accordance with Setion 903.3.1.1 or 903.3.1.2.***
706.5.1 Exterior walls	Where the fire wall intersects exterior walls, the fire-resistance rating and opening protection of the exterior walls shall comply with one of the following:
Exceptions:	***1. The exterior walls on both sides of the fire wall shall have a 1-hour fire-resistance rating with 3/4-hour protection where opening protection is required by Section 705.8. The fire-resistance rating of the exterior wall shall extend not less than 4 feet on each side of the intersection of the fire wall to exterior wall. Exterior wall intersections at fire walls that form an angle equal to or greater than 180 degrees do not need exterior wall protection.***
706.5.2 Horiztonal projecting elements	Fire walls shall extend to the outer edge of horiztonal projecting elements such as balconies, roof overhangs, canopies, marquees and similar projections that are within 4 feet of the fire wall.
Exceptions:	
706.6 Vertical continuity	Fire walls shall extend from the foundation to a termination point not less than 30 inches above both adjacent roofs.
Exceptions:	***3. Walls shall be permitted to terminate at the underside of noncuombustible roof sheathing, deck or slabs where both buildings are provided with not less than a Class B roof covering. Openings in the roof shall not be located within 4 feet of the fire wall.***
707 Fire Barriers	
707.1 General	Fire barriers isntalled as required elsewhere in this code or the International Fire Code shall comply with this section.
707.2 Materials	Fire barriers shall be of materials permitted by the building type of construction.
	1. Separation walls as required by Section 420.2 for Group I-1 and Group R occupancies.
	2. Walls separating tenant spaces in covered and open mall buildings as required by Section 402.4.2.1.
	3. Corridor walls as required by Section 1020.1.
	4. Enclosed elevator lobby separation as required by Section 3006.2.
	5. Egress balconies as required by Section 1021.2
708.3 Fire-resistance rating	Fire partitions shall have a fire-resistance rating of not less than 1 hour.
Exceptions:	***Not Applicable***
708.4 Continuity	Fire partitions shall extend from the top of th efoundation or floor/ceiling assembly below and be securely attached to one of the following: 1. The underside of the floor or roof sehathing, deck or slab above 2. The underside of a floor/ceiling assembly having a fire-resistance rating is not less than the fire-resistance rating of the fire partition.
Exceptions:	***Not Applicable***
708.4.1 Supporting construction	The supporing construction for a fire partition shall have a fire-resistance rating that is equal to or greater than the require fire-resistance rating of the supported fire partition.
	Not Applicable
708.4.2 Fireblocks and draftstops in combustible construction	In combustible construction where fire partitions do not extend to the underside of the floor or roof sheathing, deck or slab above, the space above and along the line of the fire partition shall be provided with one of the following:
	2. Draftstopping up to the underside of the floor or roof sheathing, deck or slab above using materials complying with Section 718.3.1 for floors or Section 718.4.1 for attics.
Exceptions:	***Not Applicable***
708.5 Exterior walls	Where exterior walls serve as a part of a required fire-resistance rated separation, such walls shall comply with the requirements of Section 705 for exterior walls, ans the fire-resistance-rated separation requirments shall not apply.
Exceptions:	***Not Applicable***
708.6 Openings	Openings in a fire partition shal lbe protected in accordance with Section 716.
708.7 Penetrations	Penetrations in a fire partition shall comply with Section 714.
708.8 Joints	Joints made in between fire partitions shall comply with Section 715.
708.9 Ducts and air transfer openings	Penetrations in a fire partition by ducts and air transfer openings shall comply with Section 717.
712 Vertical Openings	
712.1 General	Each vertical opening shall comply in accordance with one of the protection methods in Sections 712.1.1 through 712.1.16.
712.1.1 Shaft Enclosures	Vertical openings contained entirely within a shaft enclosure complying with Section 713 shall be permitted.
713.7 Openings	Openings in a shaft enclosure shall be protected in accordance with Section 716 as required for fire barriers. Doors shall be self- or automatic-closing by smoke detection in accordance with Section 716.2.6.6.
713.7.1 Prohibited Openings	Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.
713.8 Penetrations	Penetrations in a shaft enclosure shall be protected in accordance with Section 714 as required for fire barriers. Structural elemetns, such as beams or joists, where protected in accordance with Section 714 shall be permitted to penetrate a shaft enclosure.
713.8.1 Prohibited Penetrations	Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

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Exceptions:	Membrane penetrations shall be permitted on the outside of shaft enclosures. Such penetrations shall be protected in accordance with Section 714.4.2.
713.9 Joints	Joints in a shaft enclosure shall comply with Section 715.
713.10 Duct and air trasfer openings	Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with Section 717.
714 Penetrations	
714.2 Installation	A listed penetration firestop system shall be installed in accordance with the manufacturer's installation instructions and the listing criteria.
714.4.4 Fire-resistance-rated walls	Penetrations into or through fire walls, fire barriers, smoke barrier walls and fire partitions shall comply with Sections 714.4.1 through 714.4.3. Penetrations in smoke barrier walls shall also comply with Section 714.5.4.
Exceptions:	Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected by eitehr of the following measures: 1. In concrete or masonr ywalls where the penetrating item is a maximum 6-inch nominal diameter and the area of the opening through the wall does not exceed 144 square inches, concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain a fire-resistance rating. 2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.
714.4.1.2 Through-penetration firestop system	Through penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differental of 0.01 inch of water and shall have an F rating of not less than the required fire-resistance rating of the wall penetrated.
714.5 Horiztonal Assemblies	Penetrations of a fire-resistance-rated floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 712.1 shall be protected in accordance with Section 714.5.1 through 714.5.4.
714.5.1 Through penetrations	Through penetrations of horizontal assemblies shall comply with Section 714.5.1.1 or 714.5.1.2.
Exceptions:	1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the annular space is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated. Penetrating items with a maximum 6-inch nominal diameter shall not be limited to the penetration of a single fire-resistance rated floor assembly, provided that the aggregate area of hte opening through the assembly does not exceed 144 square inches in any 100 sqaure feet of floor area. 2. Penetrations in a single concrete floor by steel, ferrous copper conduits, pipes, tubes or vents with a maximum 6-inch nominal diameter, provided that the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the fire-resistance rating. The penetrating items shall not be limited to the penetration of a single concrete floor, provided that the area of hte opening through each floor does not exceed 144 square inches. 3. Penetrations by listed electrical boxes of any material, provided that such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.
714.5.1.1 Fire-resistance-rated assemblies	Through penetrations shall be protected using systems installed in the approved fire-resistance-rated assembly.
714.5.1.2 Through-penetration firestop system	Through penetrations shall be protected by an approved through-penetration firestop system installed and tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 of water. The system shall have an F rating/T rating of not less than 1 hour but not less than the required rating of the floor penetrated.
Exceptions:	1. Floor penetrations contained and located within the cavity of a wall above the floor or below the floor do not require T rating. 2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horiztonal assembly do not require a T rating. 3. Floor penetrations of maximum 4-inch nominal diameter metal conduit or tubing penetrating directly into metal-enclosed electrical power switchgear do not require T rating.
714.5.2 Membrane penetrations	Penetrations of membranes that are part of a horiztonal assembly shall comply with Section 714.5.1.1 or 714.5.1.2. Where floor/ceiling assemblies are required to have a fire-resistance rating, recessed fixtures shall be installed such that the fire resistance rating shall not be reduced.
714.5.4 Penetrations in smoke barriers	Penetrations in smoke barriers shall be protected by an approved through-penetration firestop system installed and tested in accordance with requirements of UL 1479 for air leakage. The L rating of the system measured at 0.30 inch of water in both the ambient temperature tests shall not exceed either of hte following: 1. 5.0 cfm per sqaure foot of penetration opening for each through-penetration firestop system. 2. A total cumulative leakage of 50 cfm for any 100 square feet of wall area, or floor area.
714.6 Nonfire-resistance-rated assemblies	Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Section 713 or shall comply with Section 714.6.1 or 714.6.2.
714.6.1 Noncombustible penetrating items	Noncombustible penetrating items that connect not more than five stories are permitted, provided that the annular space is filled to resist the free passage of flame and the products of combustion with an approved non combustible material or with a fill, void or cavity that is tested and classified for use in through-penetration firestop systems.
714.6.2 Penetrating items	Penetrating items that connect not more than two stories are permitted, provided that the annular space is filled with an approved material to resist the free passage of flame and the products of combustion.
715 Fire-resistant joint systems	
715.1 General	Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which the system is installed. Fire-resistant joint systems shall be tested in accordance with Section 715.3.
Exceptions:	Fire-resistant joint systems shall not be required for joints in all of the following locations: 1. Floors within a single dwelling unit. 2. Floors where the joint is protected by a shaft enclosure in accordance with Section 713. 3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes. 4. Floors within malls. 5. Floors and ramps within parking garages or structures constructed in accordance with Sections 406.5 and 406.6. 6. Mezzanine floors. 7. Walls that are permitted to have unprotected openings. 8. Roofs where openings are permitted. 9. Control joints not exceeding a maximum width of 0.625 inch and tested in accordance with ASTM E119 or UL 263. 10. The intersection of exterior curtain wall assemblies and the roof slab or roof deck.
717.5.1 Fire walls	Ducts and air transfer openings permitted in fire walls in accordance with Section 706.11 shall be protected with listed fire dampers installed in accordance with their listing.
718.2 Fireblocking	In combustible construction, fireblocking shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top story and a roof or attic space. Fireblocking shall be installed in the locations specified in Sections 718.2.2 through 718.2.7.

718.2.1 Fireblocking	Fireblocking shall consist of the following materials: 1. Two-inch nominal lumber 2. Two thicknesses of 1-inch nominal lumber with broken lap joints. 3. One thickness of 0.719-inch wood structural panels with joints backed by 0.719-inch wood structural panels. 4. One thickness of 0.75-inch particleboard with joints backs by 0.75-inch particleboard. 5. One-half-inch gypsum board. 6. One-fourth-inch cement-based millboard. 7. Batts or blankets of mineral wool, mineral fiber or other approved materials installed in such a manner as to be securely retained in place. 8. Cellulose insulation instlaled as tested for the specific application.
718.2.2 Concealed wall spaces	Fireblocking shall be provided in concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows: 1. Vertically at the ceiling and floor levels. 2. Horiztonally at intervals not exceeding 10 feet.
718.2.3 Connections between horiztonal and vertical spaces	Fireblocking shall be provided at interconnections between concealed vertical stud wall or partition spaces and concealed horizontal spaces created by an assembly of floor joists or trusses, and between concealed vertical and horiztonal spaces such as occur at soffits, drop ceilings, cove ceilings and similar locations.
718.2.4 Stairways	Fireblocking shall be provided in concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairways shall comply with Section 1011.7.3.
718.2.5 Ceiling and floor openings	Where required by Section 712.1.8, Exception 1 of Section 714.5.1.2 or Section 714.6, fireblocking of the annular space around vents, pipes, ducts, chimneys and fireplaces at ceilings and floor levels shall be installed with a material specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and resist the free passage of flame and the products of combustion.
718.2.6 Exterior wall coverings	Fireblocking shall be installed within concealed spaces of exterior wall covering and other exterior architectural elements where permitted to be of combustible construction as specified in Section 1405 or where erected with combustible frames. Fireblocking shall be installed at maximum intervals of 20 feet in either dimension so that there will be no concealed space exceeding 100 square feet betten fireblocking. Where wood furring strips are used, they shall be of approved wood of natural decay or preservative-treated wood. If noncontinuous, such elements shal lhave closed ends, with not less than 4 inches of spearation between sections.
Exceptions:	1. Fireblocking of cornices is not required in single-family dwellins. Fireblocking of cornices of a two-family dwelling is required only at the line of dwelling unit separation. 2. Fireblocking shall not be required where the exterior wall covering is installed on noncombustible framing and the face of the exterior wall covering exposed to the concealed space is covered by one of the following materials: 2.1 Aluminum having a minimum thickness of 0.019 inch. 2.2 Corrosion-resistant steel having a base metal thickness not less than 0.016 at any point. 2.3 Other approved noncombustible materials. 3. Fireblocking shall not be requried where the exterior wall covering has been tested in accordance with, and complies with the acceptance of NFPA 285. The exterior wall covering shall be installed as tested in accordance with NFPA 285.
718.2.7 Concealed sleeper spaces	Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistance-rated floors, the space between the floor slab and the underside of the wood flooring shall be filled with an approved material to resist the free passage of flame and products or fireblocked in such a manner that open spaced under the flooring shall not exceed 100 square feet in area and such space shall be filled solidly under permanent partitions so that communication under the flooring between adjoining rooms shall not occur.
Exceptions:	1. Fireblocking is not required for slab-on-grade floors in gymnasiums. 2. Fireblocking is required only at the juncture of each alternate lane and at the ends of each lane in a bowling facility.
718.3 Draftstopping in floors	Draftstopping shall be installed to subdivide floor/ceiling assemblies where required by Section 708.4.2. In other than Group R occupancies, draftstopping shall be installed to subdivide combustible floor/ceiling assemblies so that horiztonal floor areas do not exceed 1,000 square feet.
Exceptions:	Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
718.4 Draftstopping in attics	Draftstopping shall be installed to subdivide attic spaces where requried by Section 708.4.2. In other than Group R, draftstopping shall be installed to subdivie combustible attic spaces and combustible concealed roof spaces such that any horizontal area does not exceed 3,000 square feet. Ventilation of concealed roof spaces shall be maintained in accordance with Section 1202.2.1.
Exceptions:	Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
CHAPTER 9 FIRE PROTECTION AND LIFE SAFETY SYSTEMS	
902 Fire pump and riser room size	
902.1 Pump and riser room size	Where provided, fire pump rooms and automatic sprinkler system riser rooms shall be designed with adequate space for all equipment necessary for the installation, as defined by the manufacturer, with sufficient working room around the stationary equipment. Clearances around equipment to elements of permanent construction, including other installed equipment and appliances, shall be sufficient to allow inspections, service, repair or replacement without removing such elements of permanent construction or disabling the function of a required fire-resistance-rated assembly. Fire pump and automatic sprinkler system riser rooms shall be provided with doors and unobstructed passageways large enough to allow removal of the largest piece of equipment.
903 Automatic sprinkler systems	Building shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
	Confirm and enter reuqirements per your project type.
905 Standpipe systems	Not Applicable
	Confirm and enter reuqirements per your project type.
907 Fire alarm and detection systems	An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.
	Confirm and enter reuqirements per your project type.
908 Emergency alarm systems	Not Applicable
	Confirm and enter reuqirements per your project type.
909 Smoke control systems	Not Applicable
	Confirm and enter reuqirements per your project type.
910 Smoke and heat removal	Not Applicable
	Confirm and enter reuqirements per your project type.
911 Fire command center	Not Applicable
	Confirm and enter reuqirements per your project type.
912 Fire department connections	Fire department connections shall be installed in accordance with the NFPA standard applicable to the system design and shall comply with Sections 912.2 through 912.6.
	Confirm and enter reuqirements per your project type.
913 Fire pumps	Fire pumps shall be installed in accordance with this section and NFPA 20.
	Confirm and enter reuqirements per your project type.
913 Fire pumps	
	Confirm and enter reuqirements per your project type.
CHAPTER 10 MEANS OF EGRESS	

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1003.2 Ceiling height	The means of egress shall have a ceiling hieght of not less than 7 fee 6 inches above the finished floor.
1005.3.2 Other egress components	The capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inch per occupant.
1005.5 Distribution of minimum width and required capacity	Where more than one exit, or access to more than one exit, is required, the means of egress shall be configured such that the loss of any one exit, shall not reduce the available capacity or width to less than 50 percent of the required capacity or width.
1006 Number of exits and exit access doorways	
Table 1006.2.1 Spaces with one exit or exit access doorway	
1006.2.2 Egress based on use	The numbers of exits shall be provided in the uses described in Section 1006.2.2.1 through 1006.2.2.6.
1006.2.2.1 Boiler, incinerator and furnace rooms	Two exit access doorways are required in boiler, incinerator and furnace rooms where the area is over 500 square feet and any fuel-fired equipment exceeds 400,000 British thermal units input capactiy. Where two exit access doorways are required, one is permitted to be a fixed ladder
Total Occupant Load:	***571***
1006.3.2 Egress based on occupant load	***3 exits required***
1007 Exit and exit access doorway configuration	
1007.1.1 Two exits or exit access doorways	***Exits shal lbe separated by not less than one third the maximum diagonal of the area served.***
1009 Accessible means of egress	
1009.3.2 Stairway Width	Stairways shall have a clear width of 48 inches minimum between handrails.
1009.3.3 Area of refuge	Stairways shall either incorporate an area of refuge within an enlarged floor-level landing or shall be accessed from an area of refuge complying with Section 1009.6.
Exceptions:	***2. Areas of refuge are not required at stairways in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.***
1010 Doors, Gates and Turnstiles	
1010.1.1 Size of doors	The required capacity of each door opening shall be sufficient for the occupant load thereof and shall provide a minimum clear opening of 32 inches.
1011 Stairways	
1011.2 Width and Capacity	The required capacity of stairways shall be determined as specified in Section 1005.1, but the minimum width shall be not less than 44 inches.
1011.3 Headroom	Stairways shall have a headroom clearance of not less than 80 inches measured vertically from a line connecting the edge of the nosing.
1011.5.2 Riser height and tread depth	Stair risers heights shall be 7 inches maximum and 4 inches minimum. Rectangular tread depths shall be 11 inches minimum.
1011.5.4 Dimensional uniformity	Stair treads and risers shall be uniform in size and shape. The tolerance between the largest and smallest riser height or between the largest and smallest tread depth shall not exceed 3/8 inch in any flight of stairs.
1011.6 Stairway landings	The width of the landings shall not be less than the width of the stairways served.
1011.8 Vertical rise	A flight of stairs shall not have a vertical rise greater than 12 feet between floor levels or landings.
1011.12 Stairway to roof	In buildings four or more stories above grade plane, one stairway shall extend to the roof surface unless the roof has a slope steeper than 4/12.
1017 Exit access travel distance	
Table 1017.2 Exit access travel distance	***F-2,S-2,I:Sprinkled - 400 feet***
1020 Corridors	
Table 1020.1 Corridor fire-resistance rating	***A,B,E,F,M,S,U:Sprinkled - 0 Hour***
Table 1020.2 Minimum corridor width	***Any facility not listed in this table - 44 inches***
1029 Assembly	
1029.2 Assembly main exit	A building, room or space use for assembly purposes that has an oocupant load of greater than 300 and is provided with a main exit, that main exit shall be of sufficient capacity to accommodate not less than one-half of the occupant load but such capacity shall be not less than the total required capacity of all means of egress leading to the exit. Where the building is classified as a Group A occupancy, the main exit shall front on not less than one street or an occupied space of not less than 10 feet in widht that adjoins a street or public way. In a building, room or space used for assembly purposes where there is not a well-defined main exit or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total capacity of egress is not less than 100 percent of the required capacity.
CHAPTER 11 ACCESSIBLITY	
1002 Compliance	
1102.1 Design	Buildings and facilities shall be desinged and constructed to be accessible in accordance with this code and ICC A117.1.
1104.1 Accessible route	At least one accessible route within the site shall be provided from public transportation stops, accessible parking, accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance served.
1104.2 Within a site	At least one accessible route shall connect accessible buildings, accessible facilities, accessible elements and accessible spaces that are on the same...
1104.3 Connected space	Where a building or portion of a building is required to be accessible, at least one accessible route shall be provided to each portion of the building, to accessible building entrances connecting accessible pedestrian walkways and to the public way.
1105.1 Public entrances	In addition to accessible entrances required by Sections 1105.1 through 1105.1.7, at least 60 percent of all public entrances shall be accessible.
	4
CHAPTER 13 ENERGY EFFICIENCY	
1301.1.1 Criteria	Buildings shall be designed and constructed in accordance with the International Energy Conservation Code.
CHAPTER 29 PLUMBING SYSTEMS	
2901.2 Minimum number of fixtures	Plumbing fixtures shall be provided in the minimum number as shown in Table 2902.1 based on the actual use of the building or space. Uses not shown in Table 2902.1 shall be considered individually by the code official. The number of occupants shall be deteremined by this code.

MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES

Classification	Description	Occupant Load	Water Closets (Urinals see section 424.2 of the International Plumbing Code)				Lavatories				Bathtubs/ Showers		Drinking Fountains		Other	
			Male	Female	Required Male	Required Female	Male	Female	Required Male	Required...	Count	Required	Count	Required	Count	Required
	Auditoriums without permanent seating, art galleries, exhibition halls, museums, lecture halls, libraries, arcades and gymnasiums	***500***	1 per 125	1 per 65	***2.000***	***3.85***	1 per 200		***1.250***	***1.250***	--	***0***	1 per 500	***1.000***	1 service sink	***1.000***
Business	Buildings for the transaction of business, professional services, other services invloving perchandise, office buildings, banks, light industrial, ambulatory care and similar uses	***71***	1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50		***1.420***	***1.420***	1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80		***0.888***	***0.888***	--	***0***	1 per 100	***0.710***	1 service sink	***1.000***
											Total:	0	***Total:***	2	***Service sink total:***	***2.000***
				Public total:	***4***	***6***		***Public total:***	***3***	***3***						

SITE PLAN DIAGRAM

SPACE PROGRAM

Proposed Flight Operations Building

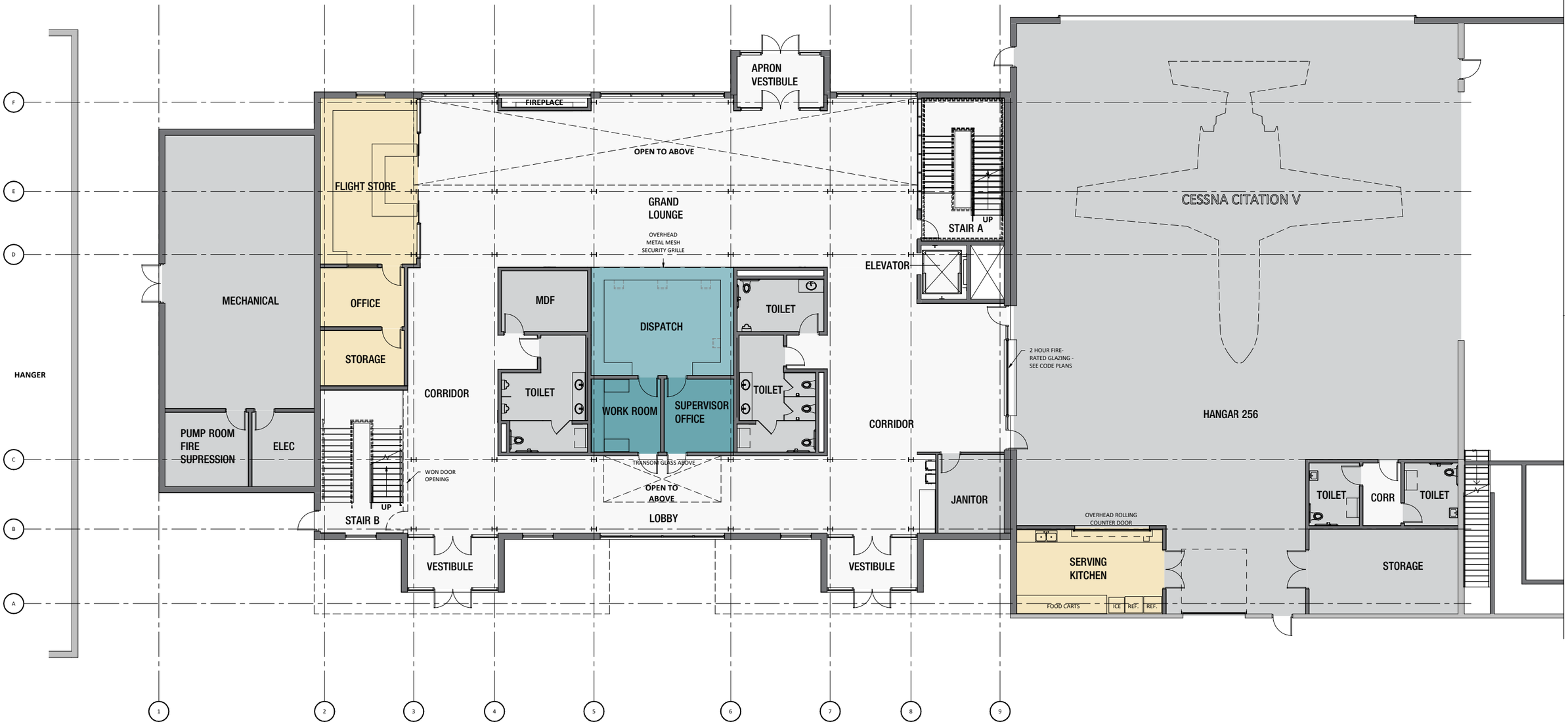
Number	Space Type	Capacity	ASF/Occ.	ASF	Qty	Total ASF	Existing
	Total Area SF					*15,815*	
	Building Grossing Factor (Corridors, Wall Thickness, Shafts, etc)		*0.54*			*8,585*	
	TOTAL SQUARE FOOTAGE					*24,400*	*11,520*

	Number	Space Type	Capacity	ASF/Occ.	ASF	Qty	Total ASF	Existing
Public Spaces								
	100	Lobby	6	60.00	330	1	330	1,156
	101	Security Checkpoint to Apron	1	130.00	130	1	130	
	102	Board Room	16	35.00	570	1	570	
	103	Grand Lounge	21	40.00	830	1	830	
							1,860	
Dispatch								
	110	Dispatch	4	100.00	400	1	400	325
	111	Dispatch Manager Office	1	120.00	130	1	130	99
	112	Dispatch Supervisor Office	1	120.00	130	1	130	142
							660	566
Flight Store								
	120	Flight Store	8	50.00	400	1	400	396
	121	Offices	1	140.00	140	2	280	120
	122	Storage	1	120.00	120	1	120	30

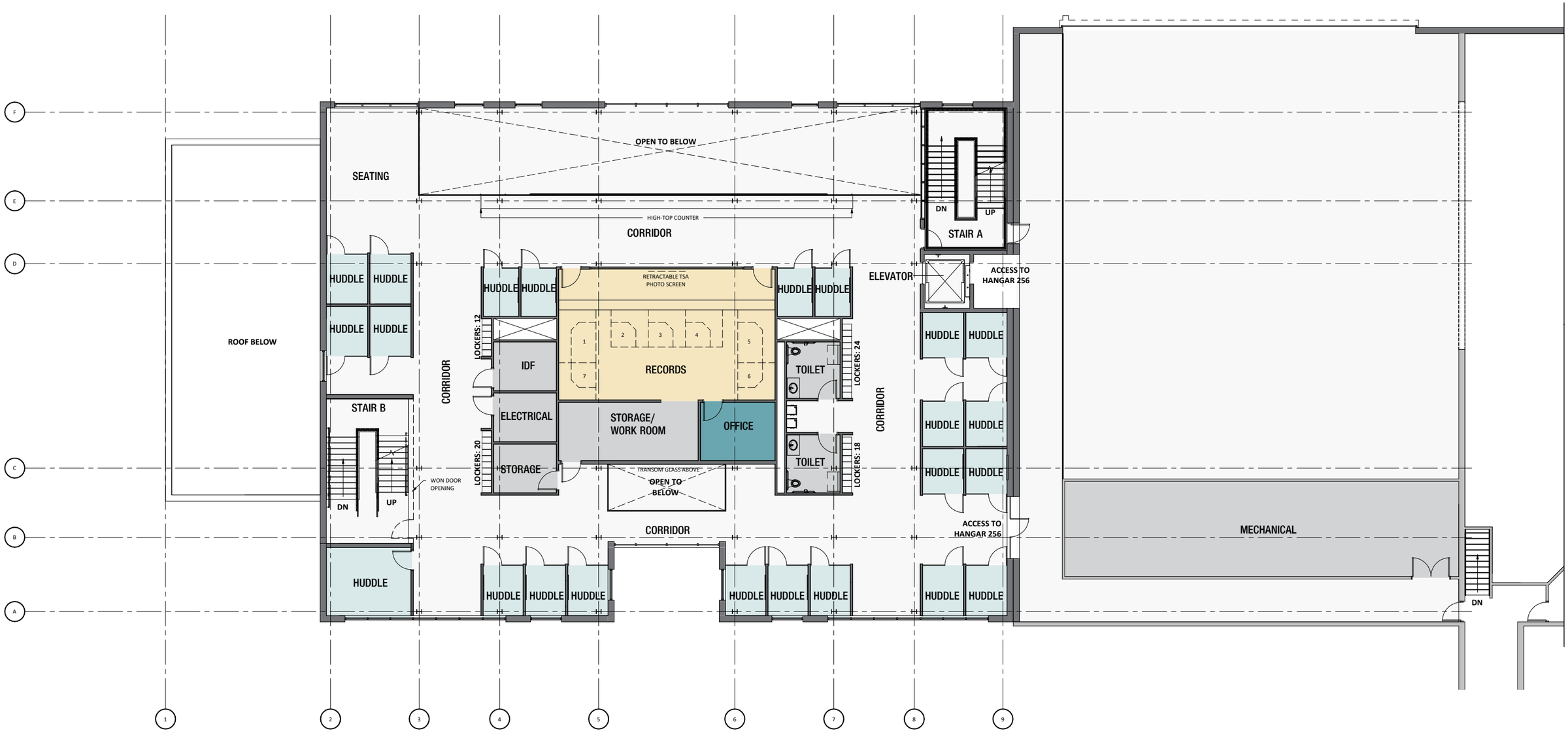
Records								
	130	Records Work Area	6	95.83	575	1	575	490
	131	Waiting	9	20.00	180	1	180	240
	132	Storage	1	210.00	210	1	210	208
	133	Managers Office	1	115.00	115	1	115	120
							1,080	
Flight Instructor Spaces								
	140	Chief Instructor Office	1	120.00	120	1	120	Varies
	141	Assistant Chief Offices	1	120.00	120	6	720	100
	142	Lead Instructor Workstations	2	40.00	80	18	1,440	60-100
	143	Instructor Lounge	6	45.83	275	1	275	
	144	Lead Instructor Huddles	3	25.00	75	8	600	
	145	Instructor Soft Seating	10	60.00	600	1	600	
	146	CFI Workstations	8	38.13	305	1	305	
							4,060	
Instructor/Student Interaction Spaces								
	150	Briefing/Debriefing Huddle Rooms	2	25.00	50	22	1,100	
	151	Soft Seating	20	38.00	735	1	735	
	152	Locker Room/Storage	–	–	80	1	80	
							1,915	
Miscellaneous								
	160	Toilet Rooms	–	–	130	6	780	
	161	Single User Toilet Room	–	–	110	1	110	
	162	MDF/IDF	–	–	80	3	240	
	163	Main Electical Room	–	–	120	1	120	
	164	Electrical Rooms	–	–	80	2	160	
	165	General Storage	–	–	240	1	240	
	166	Main Janitorial Room	–	–	140	1	140	
	167	Floor Janitorial Room	–	–	80	2	160	
	168	Vertical Circulation	–	–	680	3	2,040	
	169	Mechanical	–	–	1,450	1	1,450	
							5,440	
		Total					15,815	

FIRST FLOOR PLAN

TOTAL PROJECT SQUARE FEET		
Name	Area	Comments
FIRST FLOOR	9850 SF	INCLUDING 1460 SF MECHANICAL ENCLOSURE
SECOND FLOOR	7718 SF	9202 SF (w/ OPEN TO BELOW INCLUDED)
SECOND FLOOR SKYWAY EXTENTION	115 SF	
THIRD FLOOR	9333 SF	
	27016 SF	28500 SF

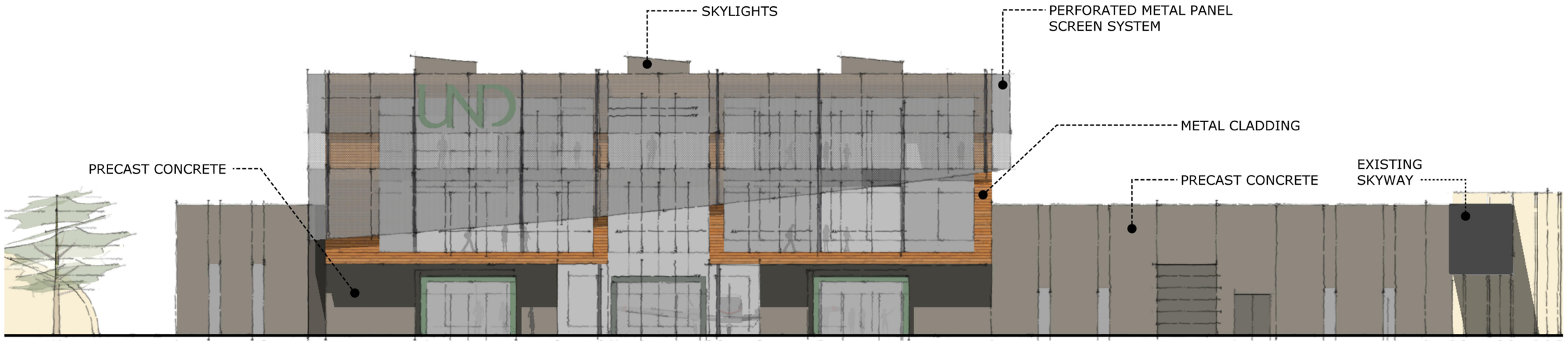


SECOND FLOOR PLAN

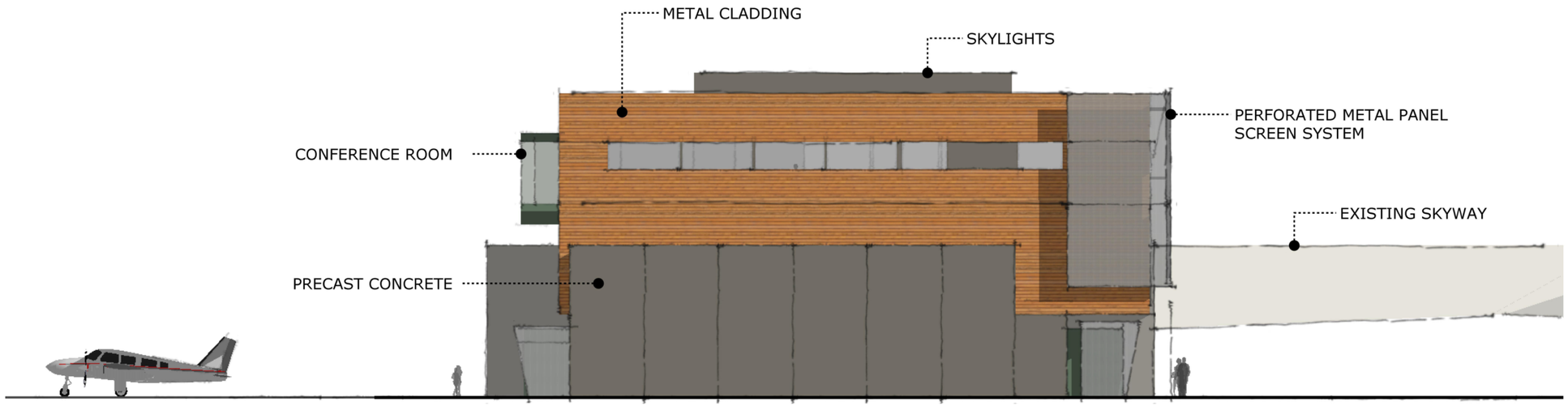


THIRD FLOOR PLAN

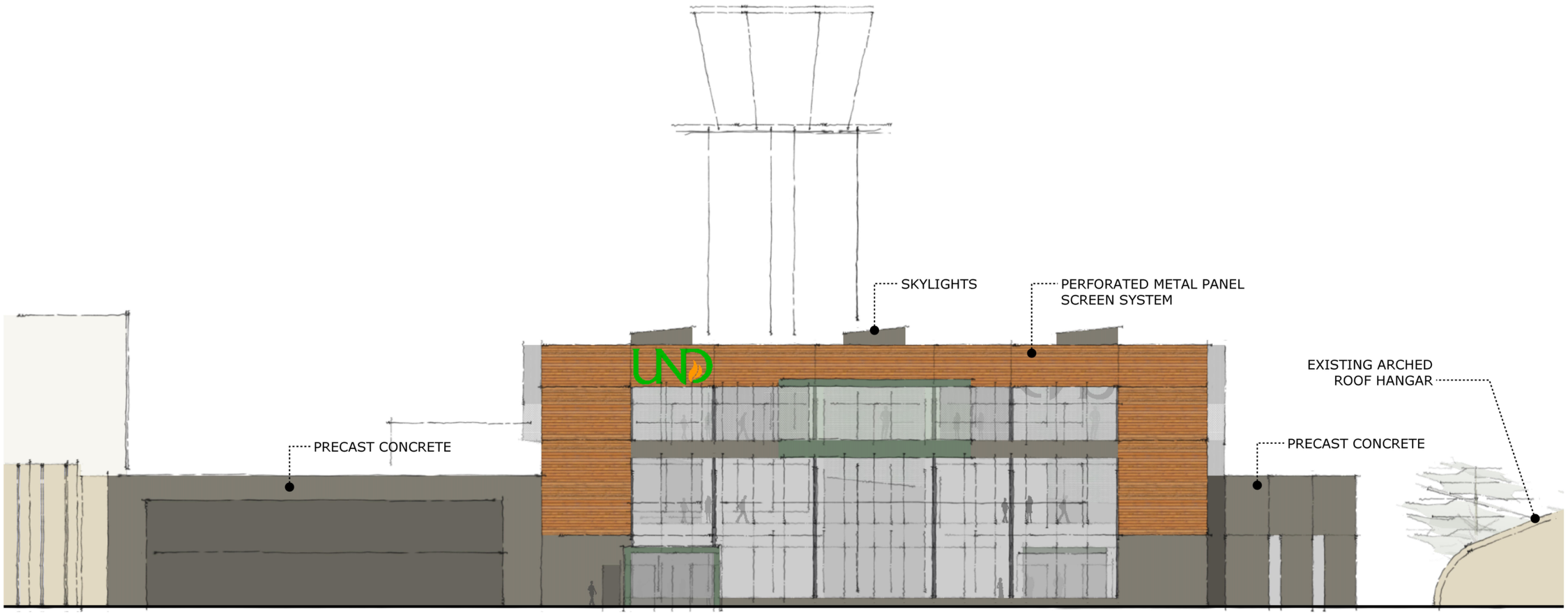
SOUTH ELEVATION



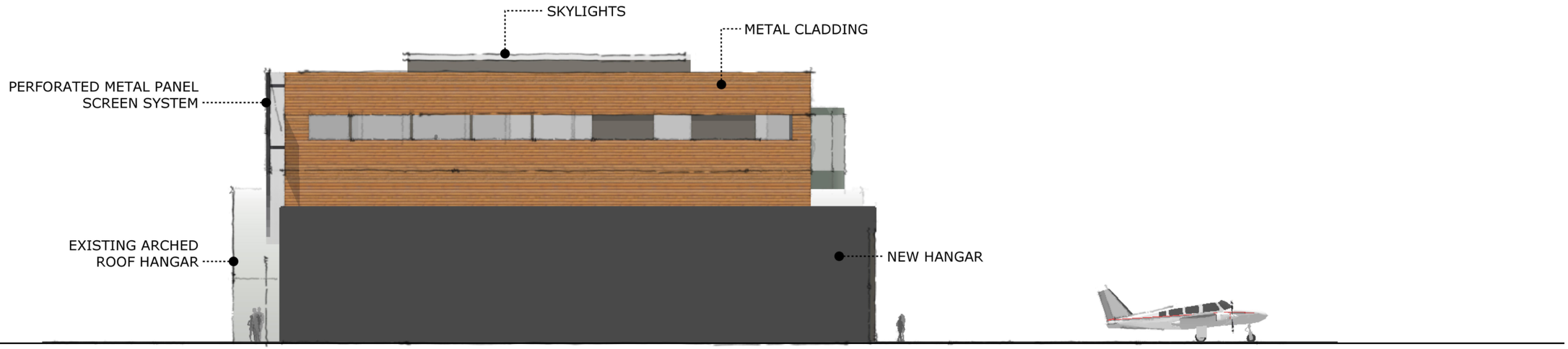
WEST ELEVATIONS



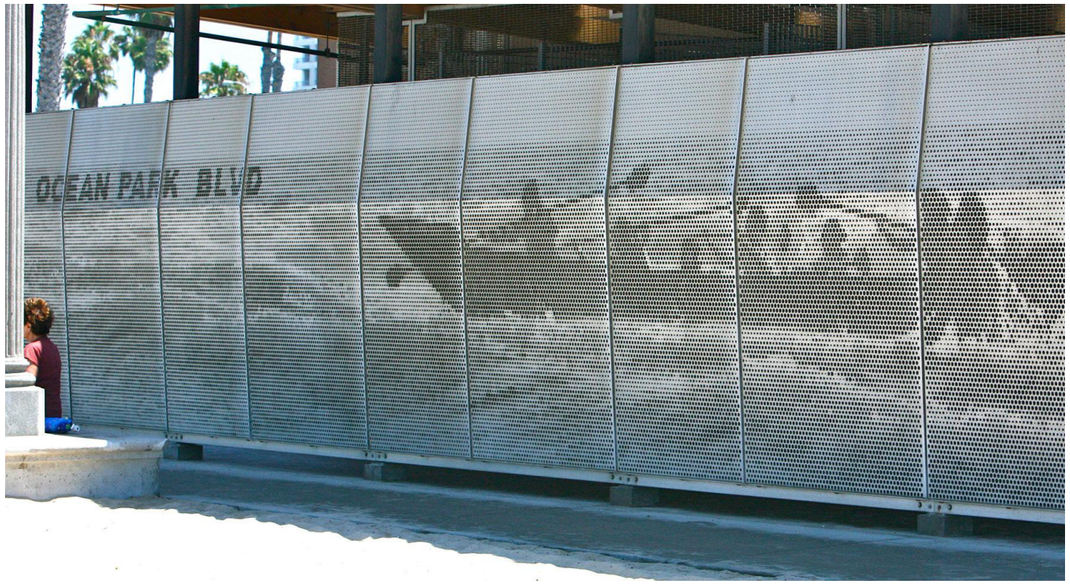
NORTH ELEVATION

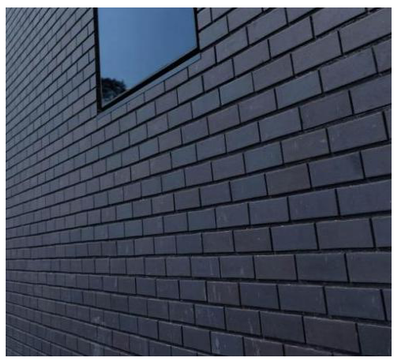


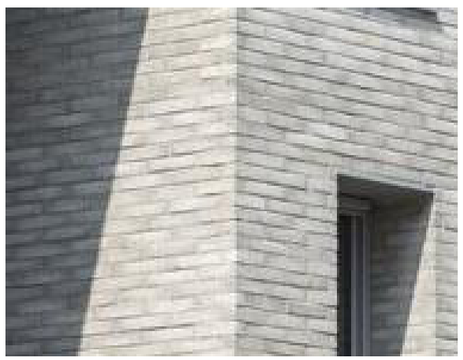
EAST ELEVATION



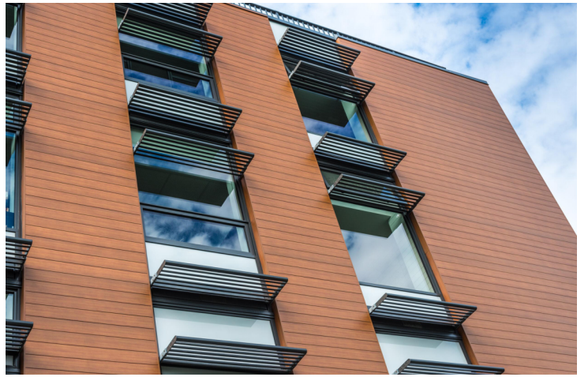
EXTERIOR CONCEPT | BOARDS



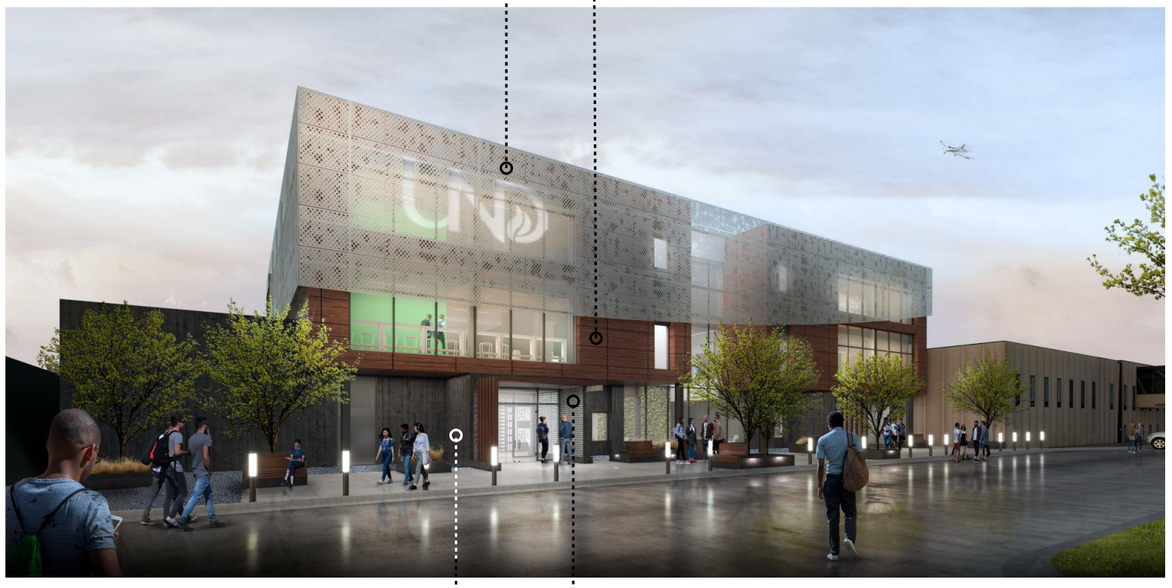




PERFORATED METAL PANEL SCREEN SYSTEM

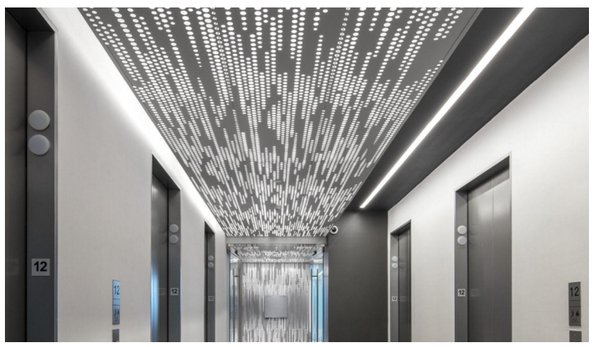


METAL CLADDING

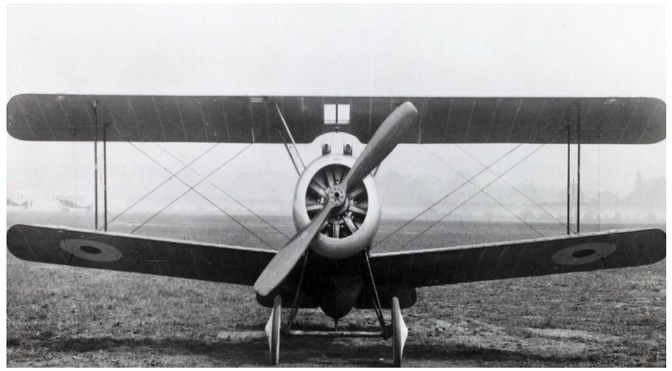


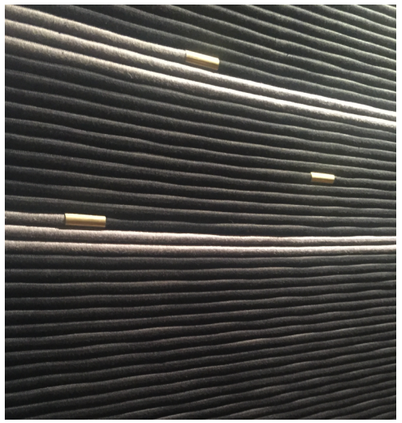
CONCRETE OR MASONRY BASE

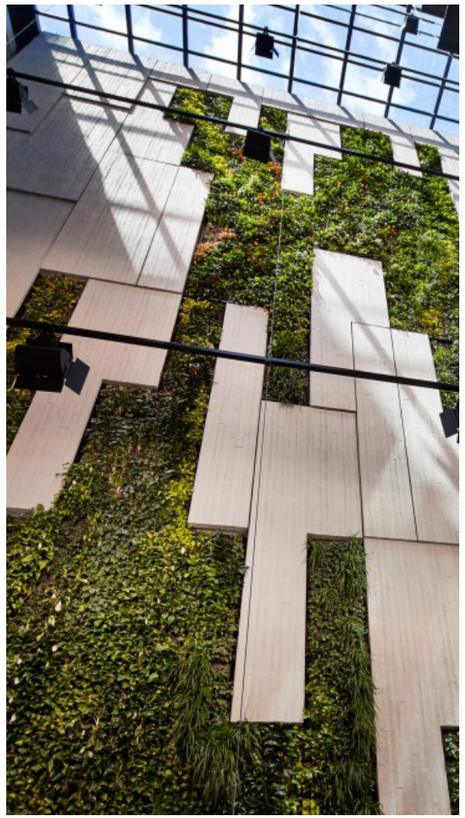
PERFORATED METAL PANELS

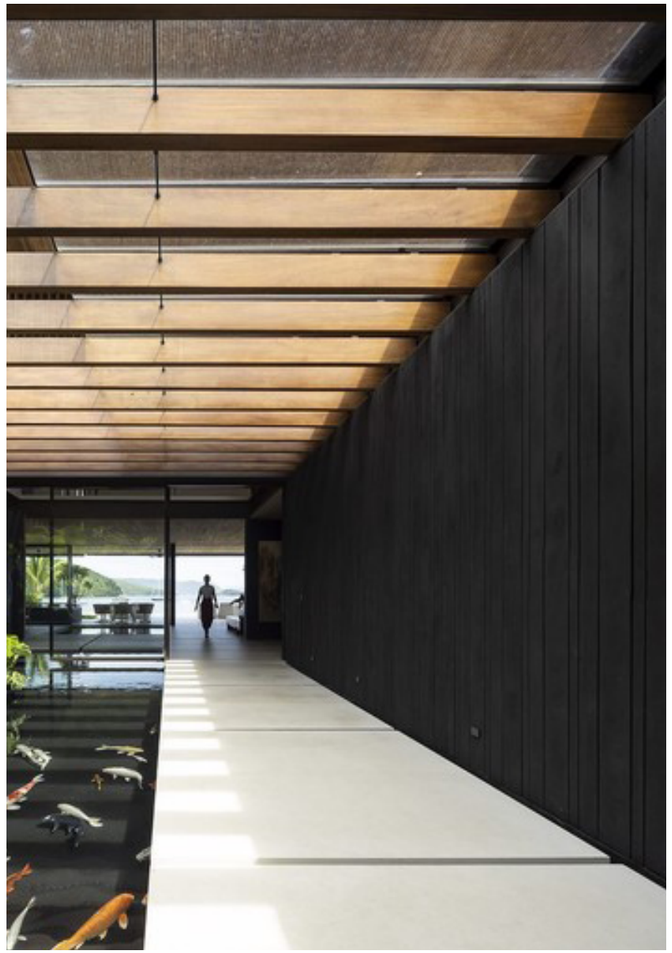


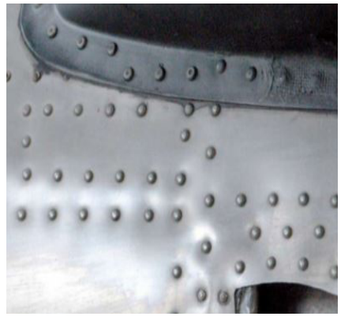
INTERIOR CONCEPT | BOARDS



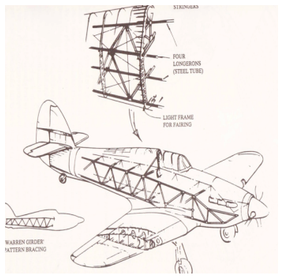


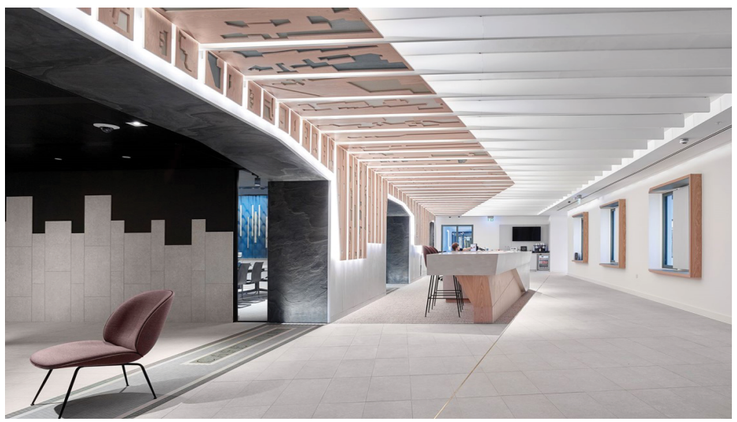




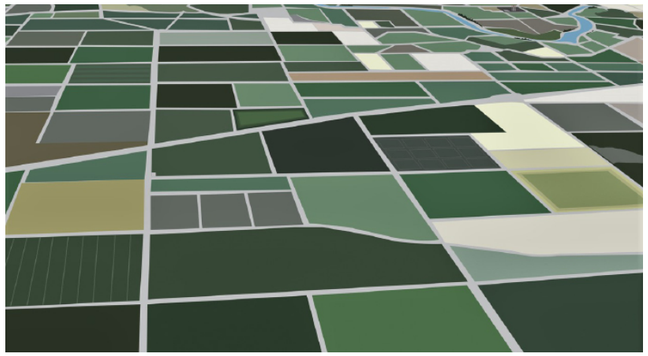


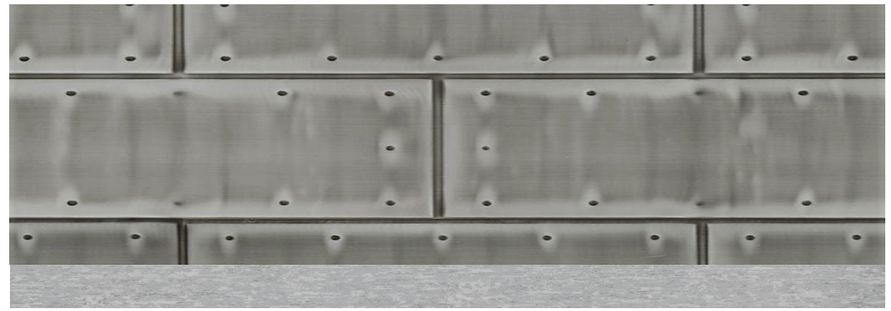
INTERIOR CONCEPT | BOARDS

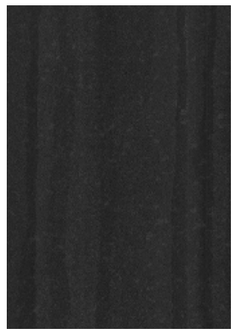


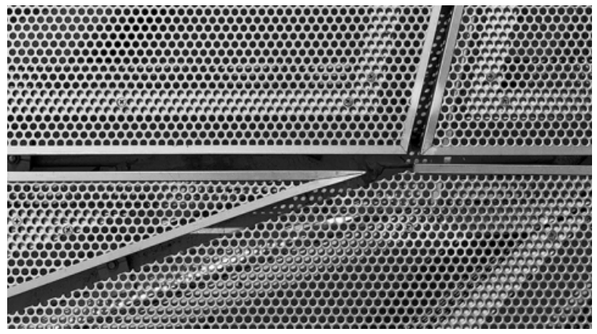


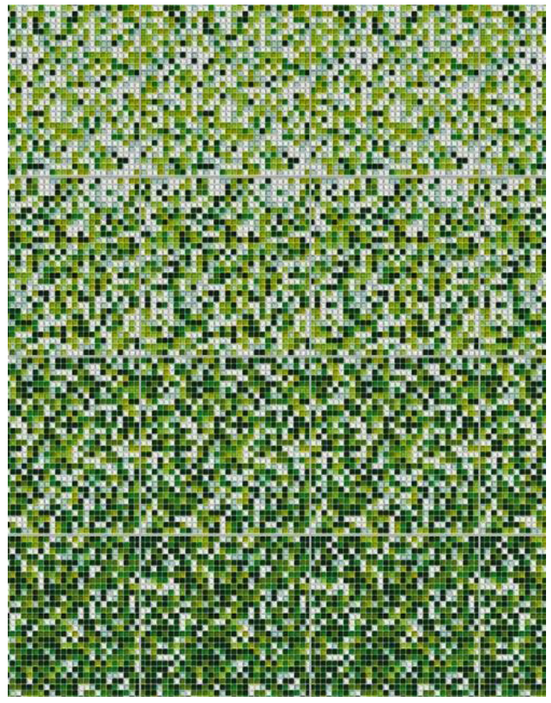
INTERIOR CONCEPT | BOARDS





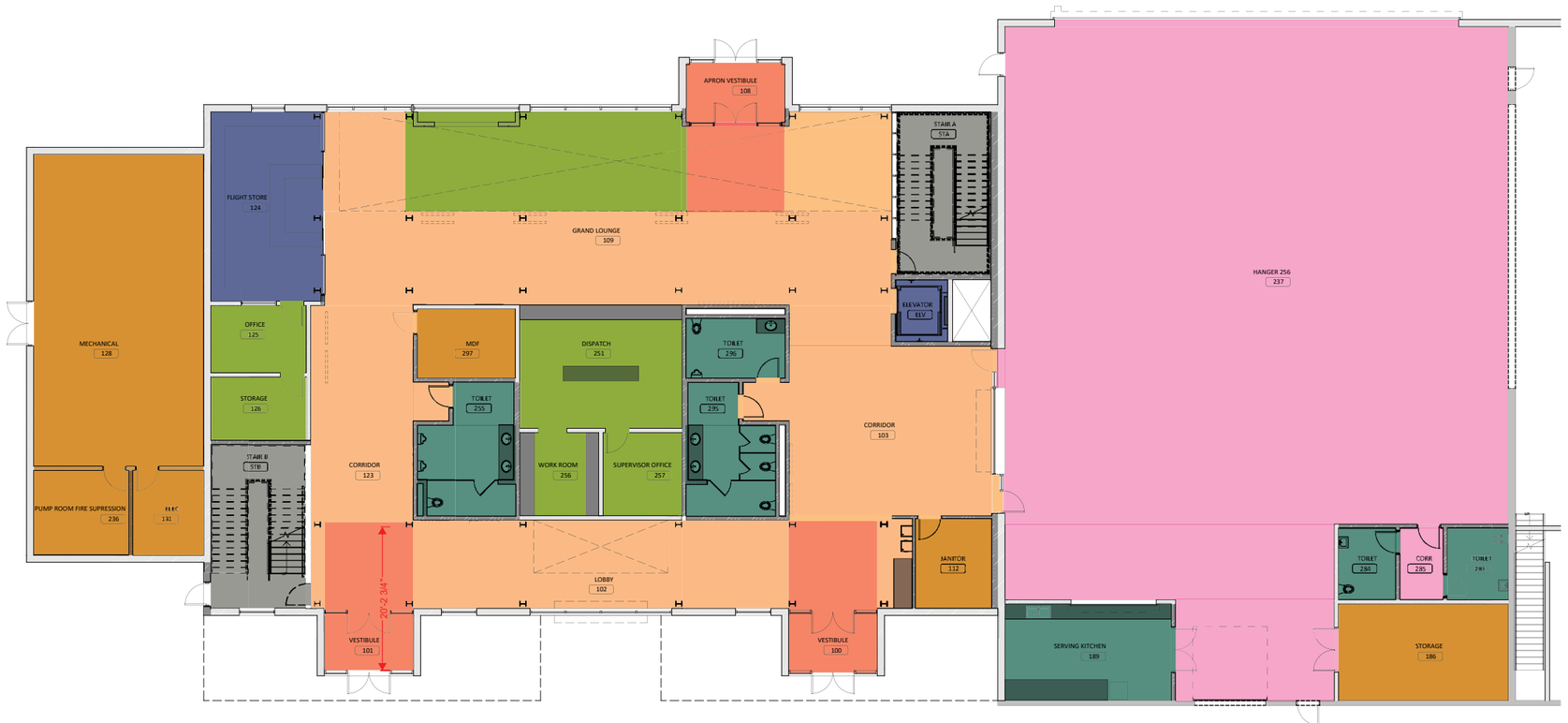






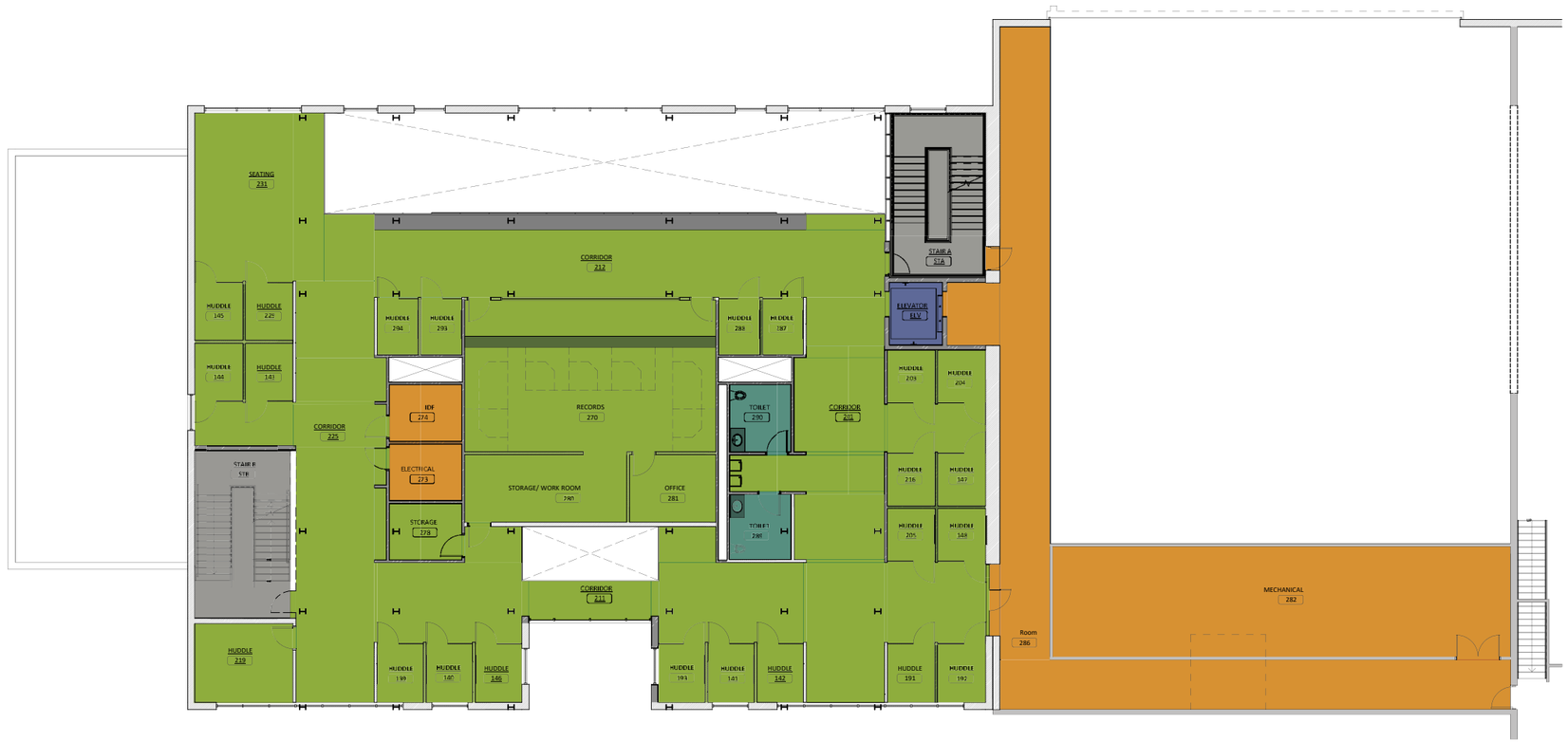
PRELIMINARY INTERIOR FINISHES | FIRST FLOOR

- TILE
- SEALED CONCRETE
- WALK OFF CARPET
- RUBBER FLOORING
- LVT
- CARPET TILE
- EPOXY FLOORING
- LARGE FORMAT TILE OR TERRAZZO



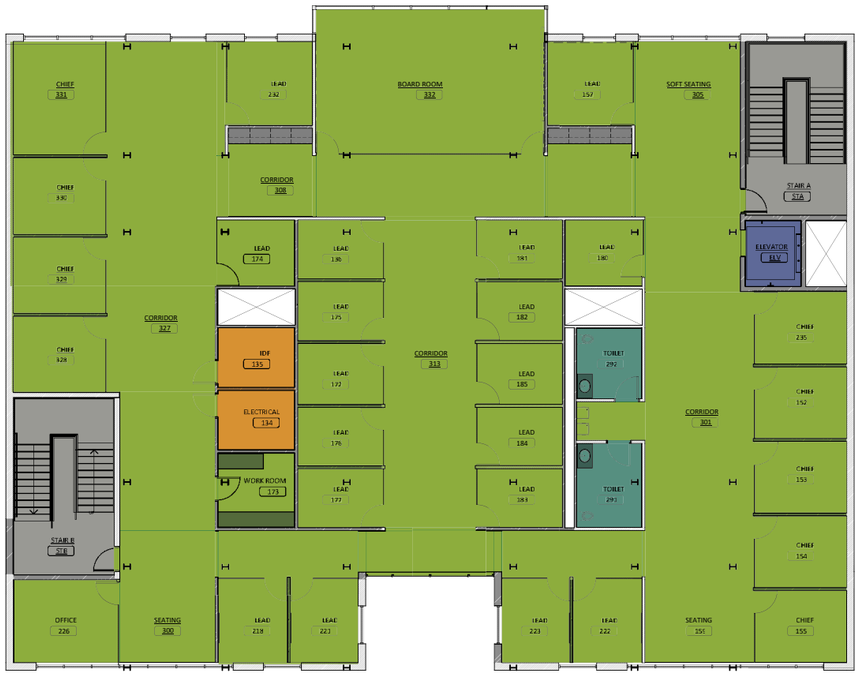
PRELIMINARY INTERIOR FINISHES | SECOND FLOOR

- TILE
- SEALED CONCRETE
- WALK OFF CARPET
- RUBBER FLOORING
- LVT
- CARPET TILE
- EPOXY FLOORING
- LARGE FORMAT TILE OR TERRAZZO



PRELIMINARY INTERIOR FINISHES | THIRD FLOOR

- TILE
- SEALED CONCRETE
- WALK OFF CARPET
- RUBBER FLOORING
- LVT
- CARPET TILE
- EPOXY FLOORING
- LARGE FORMAT TILE OR TERRAZZO



STRUCTURAL NARRATIVE

www.ae2s.com

1.1 STRUCTURAL

The flight operations facility is a multi-story structure with a 1-story low roof attachment that will be sited on the current site of the existing flight operations building.

The adjacent hangar 256 will either be renovated or replaced with a new hangar.

Hangar 256 will have an elevated interior walk way to connect to the 2nd floor of the flight operations building.

1.1.1 Roof Design Loads

- Minimum Roof Live Load including all equipment enclosures = 20 PSF

1.1.1.1 Snow Load

Snow load for the facility is based on ASCE 7-16, which is incorporated by reference in the IBC.

Primary Structure, not including canopies and overhangs:

- Flat Roof Snow Load, pf = 42 psf
  - Occupancy Category II
  - Ground Snow Load, pg = 60 psf
  - Snow Importance Factor, I_S = 1.0
  - Thermal Factor, Ct = 1.0 for heated, enclosed structures
  - Exposure Factor, Ce = 1.0
- Rain-on-snow Surcharge (Slope < ½ inch/foot) =5 psf
- Snow Drifts at low-high roof transitions per ASCE 7-16, Chapter 7

For canopies and overhangs:

- Flat Roof Snow Load, pf = 50 psf
  - Occupancy Category II
  - Ground Snow Load, pg = 60 psf
  - Snow Importance Factor, I_S = 1.0
  - Thermal Factor, Ct = 1.2 for unheated and open-air structures
  - Exposure Factor, Ce = 1.0
- Rain-on-snow Surcharge (Slope < ½ inch/foot) =5 psf
- Snow Drifts at low-high roof transitions per ASCE 7-16, Chapter 7

1.1.2 Wind Load

Wind load for the facility is based on ASCE 7-16, which is incorporated by reference in the IBC.

- Ultimate Design Wind Speed (3 second gust), V = 110 MPH
- Occupancy Category II
- Wind Exposure C
- Internal Pressure Coefficient = +/- 0.18 MWFRS
- Main Wind Force Resisting System (MWFRS) wind load design pressures will be calculated for simple shear diaphragm provisions of ASCE 7-16 Chapters 26 and Chapter 27
- Shear wall MWFRS

1.1.3 Seismic Load

Seismic load for the structure is based on ASCE 7-16, which is incorporated by reference in the IBC.

Seismic response parameters were determined using

- Occupancy Category II
- Site Soil Class D
- Seismic Importance factor I_E = 1.0
- SDS = 0.048 g
  - SS = 0.045 g
- SD1 = 0.027 g
  - S1 = 0.017 g
- Seismic Design Category A
- Basic Seismic Force Resisting System – Shear walls

1.1.4 Design Stresses

- Concrete minimum compressive strength (28 days)-all footing concrete – f'c = 3,500 psi
- Slabs on grade and slabs on metal deck – f'c=4,000 psi
- Reinforcing Bars (ASTM A615, Grade 60) – Fy = 60,000 psi
- Welded Wire Fabric (ASTM A185) – Fy = 60,000 psi
- Structural Wide Flange Shapes – Fy = 50,000 psi A992
- HSS Rectangular shapes – ASTM 500 Grade B, fy=46,000 psi
- HSS Round Pipe shapes- ASTM A500 Grade B, fy=42,000 psi
- Cold-formed structural steel studs - Fy =33 ksi (minimum), G60 galvanized coating for interior placement, G90 for exterior placement

1.1.5 Foundation Systems

Until a geotechnical report is completed, the most likely option is to use steel piles advanced to end bearing at interior columns.

Steel piles options include:

- Driven steel HP12x53
  - $55-$60/lf
  - Loud, disruptive with potentially harmful soil vibrations
  - Inexpensive, and very readily available from local markets
  - Very common
  - Have decent flexural capacity if needed
  - Welded section joints less likely to have fit-up issues at splices
  - Mobilization probably cost $20,000, and is less than other options due to local availability of very good installers
  - If we need piles, I will try to get these to work since they are the least cost option available
  - Load verifications are easy to do with a dynamic test, costs about $8,000

- Hydraulically advanced high capacity drilled piles, 7” OD x 0.408” wall thickness 65T-70T capacity
  - $110-$120/lf
  - Low disturbance with little to no induced soil vibrations
  - Bolted section splices, can be prone to fit up
  - No flexural capacity
  - Very little if any uplift/tensile capacity
  - Mobilization likely more, about $30,000
  - If we need piles, I would use them judiciously to manage costs
  - If load verifications are needed, we need a static load test that cost about $40,000

- Driven steel pipe piles
  - Have the same general pro and cons as driven steel HP12x53
  - Have the same general pro and cons as driven steel HP12x53, except they will cost more.

If conventional shallow foundations are possible, we assume the allowable bearing capacity will not exceed of 1,200 psf. Final confirmation will be made by a completed geotechnical report.

Shallow footings and foundation walls will be reinforced cast in place structural concrete. Minimum footing thickness will be 12” and minimum width will be 20”. Minimum wall thickness will be 8”.

It is likely that shallow foundations will be acceptable at lightly loaded non-bearing wall or walls that support only wall finishes, and that piles will be used at interior columns.

1.1.6 Equipment Foundations

Heavily loaded equipment pads or other specialty foundations are not anticipated.

1.1.7 Structural Framing

1.1.7.1 Gravity Loads

Floor live loads on the 2nd and 3rd floors are typical of this type of occupancy and program:

- 100 PSF exit path loads
- 50 PSF office loads
- 80 PSF corridor loads.

Live loads at storage areas are treated as an area with the same live load as a corridor.

Areas of 50 PSF office load consist of moveable partition walls, making use of the 20 PSF partition wall dead load a reasonable requirement. The sum of the 50 PSF live + 20 PSF partition dead is nearly equal to the effects of the 80 PSF live load. Therefore, the entire floor plate will be designed with an 80 PSF live load.

Live load reduction will be used.

1.1.7.2 Gravity Framing System

Primary gravity framing system for the 2nd and 3rd floor levels will be non-composite hot-rolled steel beams supporting a composite slab on metal deck.

A bay study to compare composite beams to non-composite beams was completed. Criteria of the study

Wide flange steel columns will be used for the columns. Columns on the exterior walls will be loaded with transverse wind loads.

The cantilevered floors and roof that extend from Grid B south to Grid A are proposed to be supported with heavy wide flange columns (W18x65 or similar) on Grid B that supports stub cantilever steel girder beams (W21x62 or similar) extending from Grid B to Grid A. The roof beam will be a continuous beam

Maximum beam framing depth for all areas north of Grid B is 16” with 4” slab and metal deck thickness for a maximum framing depth of 20”.

Roof will be standard 1.5B20 roof deck supported by open-web steel joists. Hot rolled beams will be used at any heavy roof top units to avoid the use of special joists..

1.1.7.2 Lateral Loads

Wind shear will govern over seismic shear.

Shear walls will be used as the main wind force resisting system (MWRFS) throughout the structure.

1.1.8 Required Special Inspections

This project is subject to IBC 2016 special inspections balanced against local practice that delegates much responsibility of defining the required inspections to the structural engineer of record. In general, local municipal inspections will not require as much special inspection as Chapter 17 of the IBC.

Typical quality control testing consisting of pre-construction soil classification approval submittals and field compaction testing, pre-construction concrete mix design submittals and field testing, and pre-construction structural steel material and fabrication submittals are anticipated.

Masonry will be designed to avoid most or all field inspection requirements by using the lower allowable stresses associated with assumptions of no special inspections.

Structural steel moment connections will use field-installed bolts to avoid the inspection requirements of field-welded moment connections.

The backfill of the excavations left after demolition of the existing flight operations building must have continual observation and field testing.

MECHANICAL NARRATIVE

DESIGN NARRATIVE – M01

Date	July 21, 2021
Project #	2020298
Project Name	UND Flight Operations Building & Hanger
Project Location	Grand Forks, ND
Description	Mechanical Schematic Design Narrative

PART 1. MECHANICAL GENERAL INFORMATION

1.1 OVERVIEW

A. This narrative document summarized the design concepts for the major fire protection (Division 21), plumbing (Division 22), and HVAC & Controls (Division 23). It is also intended to serve as a basis to support discussion, further design, and aid in preliminary cost estimating, as it is not exhaustive of all components required to be provided with the systems.

B. The following narrative outlines the fire protection, plumbing and mechanical infrastructure being proposed for this building as part of this project.

1.2 SCOPE

A. This narrative document summarizes the design concepts for the major mechanical systems including Fire Protection (Division 21), Plumbing (Division 22), HVAC & Controls (Division 23)

1.3 TECHNICAL CRITERIA

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

1. International Building Code (IBC) (edition and amendments currently adopted by the state of North Dakota and city of Grand Forks).
2. International Mechanical Code (IMC) (edition and amendments currently adopted by the state of North Dakota and city of Grand Forks).
3. International Fire Code (IFC) (edition and amendments currently adopted by the state of North Dakota and city of Grand Forks).
4. International Energy Conservation Code (IECC) (edition and amendments currently adopted by the state of North Dakota and city of Grand Forks).
5. Uniform Plumbing Code
6. NFPA 13 Installation of Fire Protection Systems
7. ASHRAE 90.1
8. UND Design Guidelines

PART 2. SPRINKLER SYSTEMS (DIVISION 21)

2.1 SPRINKLER SERVICE

A. A new 6” water line will be brought into the building to provide a fire protection service.

B. The building sprinkler riser will be situated in the water service room on the west side of the building. The riser will have 2 sprinkler zones, with one serving the hanger and the other serving the main building. The service will have a double check valve to protect the potable water supply from the domestic water main.

C. A fire department connection will be located along the south side of the building, in a location coordinated with the local fire department.

2.2 SPRINKLER PIPING:

A. 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, State Fire Marshall, and local authorities, Schedule 10 pipe may be used for main piping only.

2.3 SPRINKLER HEADS

A. Sprinkler heads shall be upright in exposed spaces. The heads in ceiling spaces will be of the concealed type.

2.4 FOAM FIRE SUPPRESSION SYSTEM

A. Full architectural code analysis required to determine needs based on NFPA. At this time, it is assumed that the facility will meet the requirements of NFPA 409 to be Group III and will be protected with a wet sprinkler system. No foam fire suppression system planned for the hanger at this time.

2.5 PRE-ACTION OR CLEAN AGENT SYSTEMS

A. There will not be any pre-action or clean agent suppression systems for any of the server or data rooms within the facility.

PART 3. PLUMBING SYSTEMS (DIVISION 22)

3.1 PLUMBING PIPING

A. The water service piping from 5’ outside the building to the final plumbing fixture is by this contractor. A new 6” water line will be brought into the building to provide a fire protection service. A 2” water line will be brought into the building for the domestic water service. Both lines will be brought into the water entrance/sprinkler room located on the west side of the building.

B. 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.

C. All water piping will be insulated with a minimum of 1” fiberglass insulation.

3.2 SANITARY AND STORM PIPING

A. All sanitary and storm piping from a point 5’ outside the building to the final plumbing fixture is by this contractor. A 4” sanitary service is anticipated to be required.

B. 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. The storm piping from the street to the building will be by the civil contractor. All overflow roof drains will day lighted 18” above grade at areas around

the building. At this point it is anticipated that a 10” storm service will be required to the building.

C. 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.

3.3 DOMESTIC WATER HEATER

A. The single domestic water heater will be installed in the main mechanical room. It will be sealed combustion, gas fired water heater similar to AO Smith BTX, 80 MBH input rating based on preliminary calculations. A recirculation pipe system and pump will be installed to keep the water hot to all fixtures throughout the building.

3.4 SUMP PUMPS

A. The elevator pit will have a dedicated sump pit with duplex sump pumps discharging into the storm sewer service. Drain tile for the elevator pits will be provided by the general contractor.

3.5 NATURAL GAS PIPING

A. Natural gas piping will be provided to serve the gas fired boilers, water heaters, and fireplaces. A gas service will be installed on the south side of the building by the main mechanical room. The service will be 2 PSI pressure and anticipated building load will be 3500 CFH.

B. All gas piping will be schedule 40 steel.

3.6 PLUMBING FIXTURES:

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

B. Plumbing fixtures will be similar to the following

1. Lavatory’s – under counter vitreous china with battery operated motion sensors
2. Urinals – wall hung china with battery operated flush valves
3. Water Closets – wall hung china with battery operated flush valves
4. Water coolers – dual height water cooler with a touch free water bottle filler
5. Sinks – stainless steel of various sizes with gooseneck spouts and wrist blade handles
6. 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 similar to Woodford B67.
7. Hose Bibbs – all mechanical rooms will have hot and cold water hose bibs for maintenance
8. Mop basins – 2x2 fiberglass basin with wall mounted mop sink faucets

PART 4. HVAC (DIVISION 23)

4.1 HEATING AND CHILLED WATER PIPING

A. 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.

B. All hot and chilled water piping may be Type L hard drawn copper tubing at 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

C. The piping will be run in several reverse return loops in the building to allow for partial isolation of the system to keep the rest of the building operational during maintenance of specific equipment or spaces.

D. The entire hot water piping system will have 35% ethylene glycol installed in it for freeze protection.

E. The entire chilled water piping system will have 35% ethylene glycol installed in it for freeze protection.

F. The entire geothermal water piping system will have 25% propylene glycol installed in it for freeze protection.

4.2 PERIMETER SUPPLEMENTAL HEATING EQUIPMENT

A. In exterior offices, huddle rooms, and public spaces with glazing, hot water finned tube radiation will be installed on exterior walls. Where glazing goes down to the floor, pedestal mount fixtures will be used.

B. In stairwells and vestibules, hot water cabinet unit heaters will be installed.

C. In mechanical rooms, hot water unit heaters will be installed.

4.3 GEOTHERMAL WELLFEILD

A. As a sustainability option, geothermal heating and cooling is being explored. As part of this option, a geothermal wellfield would be installed north of the building underneath the apron. The geothermal wellfield header would be installed on the north wall of the mechanical room.

B. A water-to-water heat pump would be required to convert the geothermal water to heating and cooling water. Redundant circulating pumps would be provided for each of the geothermal, heating, and cooling water loops. Expansion tanks and hydronic specialties would be provided for each loop.

C. This option would eliminate the boiler plant and DX cooling (Air Cooled Condensing Units) noted later in this narrative. The heating water piping system and supplemental heating equipment would remain but would be sized for the lower heating water temperatures associated with the geothermal system. The air side system would remain the same.

4.4 WATER TO WATER HEAT PUMP

A. Under the geothermal system option, a water-to-water heat pump will be utilized to generate heating and chilled water from the geothermal wellfield water loop. Heat pump would be similar to Aermec NXP1650, generating 130 tons of cooling and 1300 MBH heating.

B. Water to water heat pump will be located in the main mechanical room. Redundant circulating pumps would be provided for the geothermal, heating, and cooling water loops. The pumps will be base mounted.

4.5 BOILER PLANT

A. With the standard HVAC system option, the heating for the building shall be done with high efficiency hot water boilers similar to Aerco Benchmark. The boiler plant will have two (2) 1,500,000 BTU boilers, depending on final heating load calculations and redundancy requirements.

B. The boiler plant will be located in the main mechanical room.

C. Redundant, variable primary flow heating pumps will be provided for the boiler plant and heating loop in the building. The pumps will be base mounted.

4.6 AIR HANDLING UNITS

A. Air handling units will be indoor units, similar to Daikin vision series model CAH. They will consist of at least the following- direct drive exhaust fans with VFDs, economizer section, MERV 8 and MERV 13 filter sections, DX-cooling coil, hot water heating coil, and direct drive supply fans with VFDs.

B. All units will be Variable Air Volume (VAV) style to maximize efficiency.

C. All air handling units will have the outside air intake and relief air exhaust sized for 100% economizer.

D. The building will be served as follows:

1. Main Building – 1 VAV unit, 35,000 CFM
2. Hanger – 1 single zone unit, 10,000 CFM

4.7 ENERGY RECOVERY AIR HANDLING UNITS

A. Energy recovery air handling unit will be provided to exhaust air from restroom groups and pre-treat the outside air for the building and the hanger air handling units. Energy recovery unit will be indoor unit similar to Oxygen8 consisting of at least the following- direct drive exhaust fan with ECM, MERV 8 filters, fixed enthalpy recovery core, direct drive supply fan with ECM.

B. The building will be served as follows:

1. Main Building – 1 unit, 3,000 CFM
2. Hanger – 1 unit, 3,000 CFM

4.8 AIR COOLED CONDENSING UNITS

A. Cooling for the building will be generated from roof mounted air-cooled condensing units and paired with direct expansion (DX) cooling coils mounted in air handling units. The condensing units will be sized to match the associated air handling unit load. Condensing units will have scroll type compressors with the ability to offload to reduce cooling capacity and match building load.

4.9 POWER VENTILATORS

A. It is assumed that no cooking activities will be conducted in hanger area serving kitchen and that it will be for catering/serving only. No kitchen hood/grease exhaust/make-up air system is planned for the building.

B. General and bathroom exhaust will be handled through the energy recovery air handling units for the building.

4.10 ELECTRICAL AND SERVER ROOM COOLING

A. Electrical and server rooms that will require cooling year-round will have mini-splits to provide cooling. The evaporator coils will be installed over the doors into the rooms, and the condensers will be located on the mechanical room roof.

4.11 VARIABLE AIR VOLUME (VAV) BOXES

A. VAV boxes will be provided with hot water heating coils in the ductwork to provide separate zoning and space controls for offices and huddle. Zoning will be verified during design. Multiple offices/huddle rooms will be grouped and served by a single VAV boxes if they have similar cooling requirements.

4.12 DUCTWORK & DISTRIBUTION

A. Ductwork and fittings shall be constructed and supported in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 1995 Edition with 1997 Addendum except as modified herein.

B. Ductwork and fittings shall be fabricated from G60 galvanized steel sheets complying with ASTM A527.

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

D. All ductwork shall be built to 4” pressure class prior to VAV boxes, and 2” pressure class in all other instances.

4.13 TESTING AND BALANCING

A. All water and air systems will be tested by a 3rd part Testing And Balancing (TAB) agency. The TAB contractor will be either NEBB or AABC certified for balancing commercial HVAC and Plumbing systems.

4.14 COMMISSIONING

A. Per the requirements of the International Energy Conservation Code, section C408, new buildings are required to undergo commissioning for mechanical, electrical, and power systems. Prior to the final inspections, a commissioning firm shall provide evidence of system commissioning and completion in accordance with the provisions of section C408 of the IECC.

4.15 AUTOMATIC TEMPERATURE CONTROLS

A. A direct digital control (DDC) system will be installed on all HVAC equipment throughout the building. The system will be tied into the University of North Dakota campus system.

B. The DDC system will control all heating and air conditioning equipment to allow for automatic temperature control, 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.

C. Equipment to be controlled and monitored includes:

1. Air Handling Units
2. Variable Air Volume (VAV) Boxes
3. All Pumps
4. Boiler Plant
5. Air Cooled Condensing Units
6. Water to Water Heat Pump
7. Supplemental Perimeter Heating Equipment
8. HVAC Hot Water, Chilled Water, Geothermal Water Temperatures
9. Domestic Hot Water Temperatures
10. Sump Pumps
11. All thermostats and humidity sensors
12. All VFD for pumps and fans.

Respectfully,
Obernel Engineering

Ross Young, PE
Mechanical Engineer

Attachment(s): None
Cc: Obernel, File, JLG

ELECTRICAL NARRATIVE

DESIGN NARRATIVE – E01

Date	July 21, 2021
Project #	2020298
Project Name	UND Flight Operations Building & Hanger
Project Location	Grand Forks, ND
Description	Electrical Schematic Design Narrative

PART 1. ELECTRICAL GENERAL INFORMATION

1.1 OVERVIEW

A. This narrative document summarized the design concepts for the major electrical systems (Division 26), electronic communications systems (Division 27), and electronic safety and security (Division 28). It is also intended to serve as a basis to support discussion, further design, and aid in preliminary cost estimating, as it does not list every piece of electrical or utilization equipment required to be provided with power.

B. The following narrative outlines the electrical infrastructure being proposed for this building as part of this project.

1.2 SCOPE

A. Electrical systems (Division 26) included in this document:

1. Low voltage power distribution system.
2. Interior and exterior lighting systems.
3. Lighting control systems.
4. Emergency interior and exterior lighting systems and egress signage (exit signs).

B. Electronic communications systems (Division 27) included in this document:

1. Structured cabling for voice / data communication systems.
2. Intercom Systems

C. Electronic safety and security systems (Division 28) included in this document:

1. Fire alarm system.
2. Rough-Ins for Owner-provided Electronic Access Control and Door Monitoring System.
3. Rough-Ins and structured cabling for Owner-provided Security Camera System.

PART 2. DESCRIPTION OF ELECTRICAL SYTEMS

2.1 LOW VOLTAGE ELECTRICAL POWER DISTRIBUTION

A. Electrical service will consist of electrical meter and service entrance distribution panel located in a first floor electrical space. Panelboard will have a main circuit breaker and be rated suitable for use as service equipment. Anticipated capacity: 800-amps, 208/120 volts, 3-phase, 4-wire.

B. Hand dryers shall be installed within bathrooms.

C. Power for bottle fillers shall be provided at water fountains.

D. Power shall be supplied to all owner-provided equipment, as required.

E. Receptacles will be located around the perimeter walls at regular intervals for convenience.

F. Offices shall have receptacles located at each wall.

G. Exterior receptacles will be provided, per Code.

H. Power will be provided to fire pump, as required by NEC.

I. Power will be provided to all equipment within serving kitchen, as required.

J. Power will be provided for all equipment required for assembly area.

K. Panelboards

1. Distribution panelboards will be circuit breaker type with copper or aluminum bus and lugs, 100% neutral bus, and ground bus.
2. Branch Circuit Panelboards will have bolt-on type branch circuit breakers, 20 ampere minimum, copper or aluminum bus, 100% neutral bus, and hinged cover construction.

L. Raceways

1. All wiring will be in metal conduit except for under floor raceway which will be Schedule 40 PVC. Metal conduit will generally be electrical metallic tubing (EMT) except where exposed to damage where it will be full-weight rigid galvanized steel conduit.
2. Flexible metal conduit will be used at equipment connection where required by the application.

M. Wire and Cable

1. Aluminum wire will be used for feeder circuits 100-amps and larger.
2. All feeder and branch circuit wiring for power, lighting, and control will be copper, 98% conductivity, stranded in sizes #8 AWG and larger, with 600 volt THW or THWN-THHN thermoplastic insulation. The exception on insulation will be on VFD motor circuits where 1000 volt high-dielectric XHHW thermoset insulation will be used. Metal Clad (MC) will be allowed for individual branch circuits where hidden in walls and above ceilings. Home runs are to be in conduit.
3. Minimum wire size will be #12 AWG except #14 AWG for control circuits.
4. Feeders will be designed to limit voltage drop to 2% as noted in ASHRAE 90.1.
5. Voltage drop will be designed to not exceed 3% on branch circuits, 5% overall.

N. Grounding systems shall be provided with 5 ohms maximum.

1. All bonding and grounding wires will be copper. Terminations will be bronze.
2. Grounding electrodes will be 10’-0”, 3/4” copper clad steel.

O. Wiring Devices

1. Duplex receptacles will be 125 volt grounding types with stainless steel cover plates.
2. GFCI type receptacle will be provided where required by Code.
3. Tamper resistant devices will be provided where required by Code.

P. The Division 25 Contractor will provide VFDs for pumps, and other HVAC equipment motors that require VFDs. Generally, across the line enclosed motor controllers will be provided for motors smaller than 3 HP by the Division 26 contractor. Fire alarm shut downs will be wired directly into the VFDs.

2.2 PHOTOVOLTAIC ARRAY

A. Photovoltaic, solar, or other means of sustainable power shall be discussed more in depth in the design development portion of the project.

2.3 EMERGENCY POWER SYSTEM

A. As of now, an emergency power system is not planned for this facility.

2.4 LIGHTNING PROTECTION

A. A Lightning Protection System will not be provided at this facility.

2.5 GENERAL INTERIOR AND EXTERIOR LIGHTING SYSTEMS

A. Interior and Exterior Lighting systems will be designed in accordance with the recommendations of the Illuminating Engineering Society (IES) and the requirements of the MN Energy Code.

1. IES and design team direction will be followed in regards to light level recommendations where appropriate. This is not a code requirement but a design guideline.
2. NFPA 101 and IBC requirements for emergency lighting levels will be followed.
3. The lighting power density requirements listed in the IECC for interior and exterior lighting will be followed.

B. Light sources for interior lighting are to be LED throughout.

C. Anticipated lighting design.

1. Building mounted LED security lights will be provided.
2. Exterior lights will be controlled dusk to dawn and dusk to pre-set off via one central photosensor, contactors and time clock with manual override.
3. Bathrooms will utilize recessed LED can lighting.
4. Decorative architectural lighting in the Grand Lounge and Lobby areas.
5. Recessed 2x4 troffers in office and huddle spaces.
6. Recessed 2x2 troffers throughout corridors with suspended ceilings.
7. 4’ LED strip lighting in back of house spaces, such as janitor and storage.
8. Suspended linear fixtures with supplemented can lighting in board and conference room areas.
9. LED accent lighting within Flight Store.
10. Wall-mount LED lighting with automatic dim in stairwells.

D. The following is a preliminary list of preliminary illumination levels:

SPACE	HORIZONTAL LEVEL	VERTICAL LEVEL
Assembly Area	Variable 7.5 FC to 40 FC	Variable 2 FC to 40 FC
	Presentation Area 100 FC	Presentation Area 50 FC
Office / Workstation / Huddle	Variable 30FC low to 50 FC high	15 FC
Board Room	Variable 3 FC low to 50 FC high	Variable 3 FC low to 20 FC high
Lobby	10-20 FC daytime, 5 FC night time (Entry)	3-6 FC daytime, 2-4 FC night time (Entry)
	10-20 FC (inside)	3-6 FC (inside)
Toilets	15 FC	5FC
Service Spaces	10-20 FC	5 FC
Communication and Electrical Rooms	50 FC	15 FC

2.6 LIGHTING CONTROL SYSTEMS

A. Lighting control shall be provided via Lutron Vive system as is UND standard.

B. Lighting control requirements listed in the Energy Code will be followed including automatic lighting shut-off, lighting reduction controls, and daylight control zones.

1. In rooms with daylight zones, automatic photosensor control will used to control lighting in daylight zones secondary to other lighting in the room.
    a. Daylights zones extend 15' into a space or to the first ceiling height partition, whichever is closer to the window, and extends 2' beyond the window in each direction (right and left).
2. In rooms without occupancy sensors, multiple switches will be provided to allow the lighting load to be reduced by a minimum of 50%.
3. Exterior lighting will be controlled via photosensor and timeclock system.

C. Individual rooms will be provided with stand-alone occupancy sensors. Generally, all rooms with occupancy sensors will include dimmer switches which allow the user to manually dim the lights up and down. Back of house areas that will not require dimming operation will contain on/off toggle switches.

1. Offices.
2. Storage rooms.
3. Restrooms and locker rooms (no manual override).
4. Corridors and hallways (no manual override).
5. All other spaces, as coordinated with Owner.

D. Mechanical rooms and electrical rooms will be controlled via manual switching only.

2.7 EMERGENCY LIGHTING AND EGRESS SIGNAGE

A. LED type exit signs will be provided to mark paths of egress.

B. General use lighting fixtures connected to the emergency power inverters will be used to provide emergency lighting at the building’s interior and exterior.

C. A minimal number of emergency lights will be wired for 24/7 operation.

PART 3. DESCRIPTION OF COMMUNICATION SYSTEMS

3.1 STRUCTURED CABLING FOR VOICE AND DATA COMMUNICATIONS

A. New telecom service entrance shall be coordinate with service provider and Owner.

B. Horizontal cabling to all data drops will be Category 6 cabling equal to Berk-Tek Leviton CX6200 series.

1. A cable support system will be provided above accessible ceilings for horizontal cabling.
2. Cable tray will be used where horizontal cables are concentrated, such as corridors.
3. As horizontal cables branch out, non-continuous cable supports will be utilized.
4. Horizontal cabling will be run parallel or perpendicular to building lines.
5. Horizontal cabling shall be plenum rated.

C. Category 6A horizontal cabling will be provided as required for LAN wireless access points.

D. Voice / Data outlets

1. Each large freestanding copier will be provided with two horizontal cables.
2. Single cable will be provided at front of room for front of classroom technology.
3. Offices will be provided with two data outlets at desk location.
4. Various other areas will be provided data outlets, as coordinated throughout duration of design.

E. All new horizontal cabling and telecommunication services shall be brought from new telecom racks. Service to new racks shall be provided via switch at service entrance location. All telecommunications equipment, outside of cabling and terminations, will be provided by Owner.

F. AV cabling, rough-ins, telecom cabling, etc. will be supplied as required for assembly area equipment.

G. Ladder racking will be provided in new space for telecom equipment.

H. Racks and ladder racks will be grounded.

PART 4. ELECTRONIC SAFETY AND SECURITY SYSTEMS

4.1 FIRE ALARM SYSTEMS

A. A voice-capable fire alarm system shall be installed with a main fire alarm control panel at a back of house location, and annunciator panel near front entrance, as coordinated with fire marshal.

B. The system will meet the requirements of NFPA 72 and ADA.

C. Addressable automatic detectors will be provided in mechanical and electrical rooms, storage rooms, janitor rooms, and similar areas, as required by Code.

D. Addressable smoke detectors will be provided in supply and return air ductwork of air handling units rated 2,000 cfm or greater and within 5’ of any and all fire-smoke dampers.

E. Addressable relays will used for control of fire-smoke dampers and air handling equipment.

F. Addressable relays will be used for supervision of fire sprinkler valves and switches.

G. Notification appliances with a general evacuation signal will be located throughout the buildings.

4.2 ELECTRONIC DOOR ACCESS CONTROL AND VIDEO SURVEILLANCE

A. Access control, security, and video surveillance systems will be contracted directly with an owner selected vendor. Exact rough-in and coordination requirements to be determined via UND standards.

B. At a minimum, a complete empty raceway system will be provided for the security systems. This will include recessed backboxes and vertical conduits stubbed up into accessible ceiling spaces. Category 6 cabling will be provided to security camera locations.

PART 5. TECHNICAL CRITERIA

5.1 CODES AND STANDARDS

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

1. International Building Code (IBC) 2018.
2. International Energy Conservation (IECC) Code 2018.
3. International Mechanical Code (IMC) 2018.
4. International Fire Code (IFC) 2018.
5. NFPA 70 National Electrical Code 2020.
6. NFPA 72 National Fire Alarm and Signaling Code.
7. NFPA 101 Life Safety Code 2012.
8. Americans with Disabilities Act (ADA).

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

1. BICSI Telecommunications Distribution Methods Manual.
2. IES Lighting Handbook, Tenth Edition.
3. International Electrical Testing Association (NETA) Standards.
4. National Electrical Contractors Association (NECA) Standards.

Respectfully,
Obernel Engineering

Travor Fredrickson, PE
Electrical Senior Engineer

Attachment(s): None
Cc: Obernel File, JLG

APPENDIX

PREDESIGN INTERIOR RENDERING | GRAND LOUNGE

PREDESIGN INTERIOR RENDERING | GRAND LOUNGE

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

Mead & Hunt

JLG architects