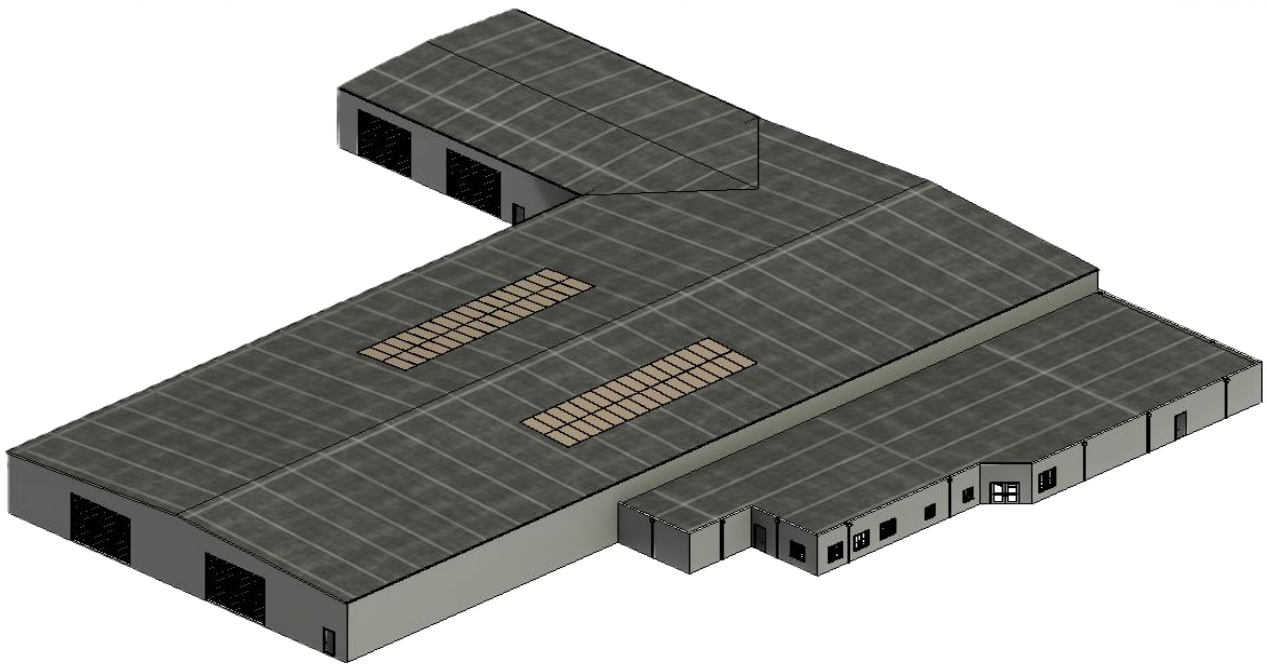
Park and Forestry Office and Maintenance Building Design Report



CITY OF BURLINGTON
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Section I Executive Summary

The City of Burlington, Iowa, has initiated a project to construct a new Park, Forestry & Maintenance Building that will consolidate three aging, overcrowded, and inefficient facilities into a single, centralized, multifunctional structure. The current facilities are outdated, limited in storage capacity, and no longer support the evolving operational and spatial needs of the Parks and Forestry departments. The proposed new facility is designed to enhance day-to-day operational efficiency, ensure safety and comfort for city staff, accommodate modern maintenance practices, and include a community center component that supports public engagement and community resilience. The design also prioritizes energy efficiency, long-term durability, and architectural integration with the natural park environment in which the facility will be located.

The facility has been planned with three core functions in mind: 1) large-scale equipment storage and maintenance, 2) administrative office, and 3) a community center. A 225-ft by 100-ft garage and a 75-ft by 50-ft wide section maintenance portion of the facility will serve as the operational core, designed to store and service between 20 to 25 pieces of large and medium-sized city equipment, such as freightliners, trailers, tractors, and other forestry vehicles. Multiple large drive-through garage bays, each equipped with overhead remote-operated doors measuring at least 16 feet by 18 feet, ensure that vehicles can access and maneuver through the facility with ease. The structural design supports 100-foot clearance spans, reducing internal obstructions and maximizing usable interior space. This area includes seven specialty drive-through stalls angled at 60 degrees and sized for trailers and large trucks, along with additional interior parking bays ranging from compact (8’ x 11’) to oversized (11’ x 26’). Maintenance functions are supported by a 2-ton vehicle service crane, a vehicle lift, a 500-gallon used oil disposal tank, dedicated wash bays, and specialized spaces for welding and woodworking, each outfitted with ventilation, tool storage, and safety features. These zones are interconnected to allow efficient transitions between operations and minimize downtime.

The office wing is located on the east side of the facility, separated from the garage to reduce noise and enhance safety. This section includes four private offices, a shared flex office for visiting staff, a secure and welcoming reception area, a conference room for staff meetings and training, a breakroom with kitchenette, a copy and storage area, and restrooms with shower facilities. All spaces are designed with ADA-compliant access and follow local and national building codes. The building will also feature a future-phase community center designed as an open-plan gathering space with a tornado shelter rating. This space will be used for public events, staff development, rental opportunities, and emergency response, and will include a warm kitchen, storage for supplies, and additional dedicated restrooms.

The building envelope is composed of high-performance insulated metal panels (IMPs) with factory-applied coatings over galvanized steel faces and a rigid foam core that provides thermal insulation values compliant with ASHRAE 90.1. IMPs form a continuous air and vapor barrier,

reducing thermal bridging and increasing energy efficiency. The building will be equipped with heating and cooling systems, and the roof is solar-ready for future photovoltaic system installation.

The structural design prioritizes a steel framing system with wide flange beams and columns to effectively handle long spans and high roof elevations, ensuring structural integrity and load distribution. Cold-formed C-studs and Z-purlins provide efficient support for office spaces and roof decking, while X-bracing in strategic bays enhances lateral stability against wind and seismic forces. Shallow spread and strip footings were selected based on geotechnical coordination, optimizing foundation performance while adhering to IBC 2021 and ACI 318-19 standards.

Site selection was a critical component of this project. The client proposed two sites. The first is the location of the current facility. Its terrain is characterized by a notable slope at the rear of the property, descending toward a wooded area that will require proper grading, erosion control, and possible retaining walls or other slope stabilization measures. The front of the site is relatively level, with a mix of gravel and paved surfaces providing access to the existing structures. The second site at 2612 S. 5th Street presents a favorable layout for construction due to its flat terrain and open space, minimizing the need for extensive site preparation or demolition. Its proximity to the public pool and recreational areas enhances its strategic location for community-focused facilities, making it highly accessible and well-positioned for public use.

The team selected the second site, which also offers two access points, Blackhawk Drive and Parkway Drive, allowing for separation of public and operations traffic. The site layout includes a total of 43 exterior parking stalls: 8 for the public along S 5th Street (including 5 ADA spaces), 8 reserved for office staff, and 27 for maintenance employees. A circulation loop around the building supports large vehicle movement without backing maneuvers. The site also features a fenced plant and tree storage area, mulch and dirt material bays, additional trailer parking, fuel storage, a garbage disposal area, and a secure perimeter fence with two automated access gates.

Stormwater management was designed using both Rational and SCS (NRCS) methods to evaluate runoff under pre- and post-development conditions. A flat roof with wall scuppers routes water toward a detention basin located in the northern section of the site. The detention system is designed to handle runoff from a 100-year storm event, mitigating flow into surrounding infrastructure and complying with local water quality and flood protection standards.

The total construction cost for the project is estimated at $3,388,795, comprising $300,000 for site development and $2,056,849 for architectural services, resulting in a subtotal of $3,080,723. Through collaborative feedback with the City of Burlington, the final design was iterated to meet operational, aesthetic, and financial goals, integrating the strongest elements from multiple proposed alternatives.

Section II Organization Qualifications and Experience

Organization and Design Team Description

We are a dynamic and versatile team specializing in transportation infrastructure, civil engineering, and project management. We bring a comprehensive blend of technical expertise, project management proficiency, and innovative design solutions, making us exceptionally qualified to perform the required work activities outlined in the RFP.

Ben Soldwisch serves as the Project Manager, bringing extensive experience in managing civil projects from inception to completion. His expertise includes drafting and modeling civil projects using Civil 3D, road design production with Open roads and Bentley MicroStation, and traffic simulation with Synchro to optimize traffic flow management. He also has strong skills in pavement design through Pav Express, cost estimation and project scheduling using Procore, and structural analysis with Robot Structural Analysis, ensuring project integrity and efficiency. Experience includes cost estimation for the Hawkeye Parking Ramp as part of transportation infrastructure construction and management. This project required a detailed understanding of materials, labor, and scheduling to develop correct cost projections, proving ability in budget planning and financial analysis for large-scale infrastructure projects.

Cameron Czupek is a versatile engineering professional specializing in Civil 3D for drafting and modeling, with expertise in cost estimation, scheduling, and report production for transportation infrastructure projects. His skills encompass traffic analysis, roadway design, and structural analysis, with additional experience in hydraulics, hydrology, and water resources engineering. Cameron's background includes technical support in engineering documentation and proficiency in Bentley MicroStation, gained through an internship with STV. Added roadway design experience includes work on the Summer Street Reconstruction project in Burlington, Iowa, where ability in roadway design, site planning, and civil drafting was applied to develop comprehensive project plans. Other site development projects have further refined skills in land grading, structural considerations, and transportation systems planning, all essential to the successful execution of infrastructure projects.

Kimberly Alvarado Lanza supports the team bringing strong technical proficiency and multilingual capabilities. Fluent in Spanish, she enhances communication across diverse project environments. Kimberley is skilled in using Autodesk Civil 3D and AutoCAD for civil design and drafting, along with Robot Structural Analysis and C++ for advanced technical computations. She is proficient in MATLAB for data analysis and modeling and Microsoft Access for efficient database management. Infrastructure inspection experience includes work on the 1st Avenue Diamond Project on I-80, where bridge and roadway inspections were performed for the Department of Transportation. This involved assessing structural integrity, identifying maintenance needs, and ensuring compliance with engineering standards, which are crucial skills for infrastructure project evaluation and execution.

Section III Services

Project Scope

The Burlington Parks and Forestry Facility project aimed to consolidate existing facilities into a centralized, functional structure that addressed space limitations while enhancing operational efficiency for both departments. The design included comprehensive storage solutions to accommodate over 22 vehicles and equipment, along with specialized maintenance bays equipped with a 2-ton service crane, welding and woodworking areas, and designated storage for chemicals and tools. Office spaces provided four private offices, a reception area, breakroom, conference room, and gender-neutral bathrooms with showers, creating a well-rounded workspace that supported administrative functions and staff well-being.

Site development was executed using Civil 3D, focusing on effective grading, stormwater management, and utility connections. The outdoor area was optimized for storage and operational support, including shaded storage, fuel storage, and a secure, fenced perimeter. Landscaping incorporated green spaces, patios, and pathways to complement the building's rustic-modern architectural style. Additionally, a community center was planned for future expansion, featuring a multipurpose room for events, a warm kitchen, and tornado shelter capabilities, enhancing the facility's role as a community asset.

The project design emphasized sustainability through the integration of solar panels, geothermal heating, and eco-friendly materials, aligning with the city's commitment to environmental responsibility. A phased construction plan was implemented to minimize disruptions while ensuring seamless transitions between project stages. The estimated total cost of $3,388,795 covered building construction, site work, utility installations, and landscaping, reflecting a comprehensive investment in modernizing and expanding the city's parks and forestry infrastructure.

The facility's design also incorporated essential infrastructure for vehicle maintenance, repair, and waste management to support operational efficiency. Dedicated working bays were equipped with proper ventilation systems and a comprehensive tool assortment, including welding stations and a vehicle lift to accommodate routine maintenance. Additionally, a 500-gallon tank was designated for the disposal of used oil and grease, ensuring compliance with environmental standards. The exterior design incorporated a rustic-modern aesthetic using metal and wood cladding, with varying shades of brown to blend with the surrounding park environment. The main entrance featured a prominent wooden door, establishing a welcoming yet functional entry point.

The final design deliverables provided to the client included a comprehensive drawing set encompassing all key aspects of the project. This set comprised architectural plans and

cross-sections detailing the building layout, foundation systems, roof structure, and elevations. Structural drawings included framing plans for the drive-through garage bays, vehicle maintenance bays, and office areas, with specific emphasis on load-bearing walls, trusses, and lintels. Site development plans featured grading and drainage layouts, utility connections, parking configurations, and landscaping details, all generated using Civil 3D. Additionally, a 3D rendered facility was produced using AutoCAD Revit to provide a visual representation of the proposed design. The drawing set also incorporated phasing plans outlining the sequence of construction activities and a comprehensive cost estimate, ensuring clarity and alignment with the project's scope and budget.

Work Plan

The project was structured into key tasks, each led by discipline experts to ensure precision and coordination. Kimberly, the structural engineer, managed foundation design, footing calculations, and structural steel framing, integrating these elements into a comprehensive Revit model. Ben, the project manager, developed the architectural layout and site design, emphasizing parking and vehicular circulation while coordinating site demolition. Cameron, the civil engineer, conducted runoff and drainage calculations, ensuring effective stormwater management and regulatory compliance with IBC, AISC, and ADA standards. This collaborative approach facilitated parallel task execution, maintaining alignment across structural, architectural, and civil components.

The work plan for the Park and Forestry Office and Maintenance Building project is structured into key phases, beginning with project kickoff and data collection, which includes defining the project scope, conducting internal and client meetings, and preparing preliminary reports. This phase also encompasses field assessment and concept development, involving site walkthroughs, documentation of site conditions, and the creation of conceptual design alternatives. The design concept development phase follows, integrating field notes and generating design solutions while considering regulatory compliance and client feedback.

The design phase focuses on detailed project plans, including floor plans, elevations, and construction notes, with progressive reviews and client feedback to refine the final design package. Concurrently, project management tasks are ongoing, ensuring regular communication with stakeholders, weekly updates, and coordination of deliverables. The work plan outlines a phased approach with overlapping tasks, facilitating simultaneous development of structural, architectural, and site design components while maintaining a structured timeline for review, approval, and final delivery. For further details, please refer to the Gantt Chart provided in the Appendix, which outlines the project timeline, task sequencing, and key milestones.

Section IV Constraints, Challenges, and Impacts

Constraints

The primary concern of this project are budget constraints. Given the limited budget, strategic arrangements will be necessary to complete all tasks without exceeding financial limits. As previously discussed, there are two potential sites for the building. Both sites contain existing

structures that will need to be demolished. However, Site 1 has larger structures, resulting in higher demolition costs. Additionally, Site 1 presents specific technical considerations due to the steep slope at the back of the site. This slope complicates access and necessitates extensive grading to create a flat area suitable for construction. The grading process will involve significant earthmoving and soil stabilization efforts to ensure a stable foundation for the new structures.

These factors must be carefully considered to ensure the project remains within budget while addressing the unique technical requirements of each site.

Challenges

One of the primary challenges is the integration of three distinct buildings into a single, multifunctional facility. This facility must accommodate offices, a community center, heavy equipment maintenance, and a truck garage. To achieve this, the building will require comprehensive insulation and a robust HVAC system to ensure optimal operation during winter months. Additionally, the maintenance and workshop areas are expected to generate significant noise. Therefore, it is essential to incorporate soundproofing measures, such as specialized walls, to mitigate noise levels and ensure a comfortable environment for all occupants. Furthermore, strategic access points to both sites must be established post-construction. These access points should facilitate safe entry and exit while minimizing any impact on the surrounding neighborhood.

Societal Impact within the Community and/or State of Iowa

For current employees, the new facility represents a fresh start. The modern design and improved infrastructure will streamline tasks. Additionally, enhanced safety features will ensure a safer working environment, addressing the inadequacies of the existing structures. The project also holds the potential to create new job opportunities within the community. The facility's construction and operation will require additional personnel, contributing to local employment and economic growth. Moreover, the new facility will enable cost-effective maintenance of heavy trucks, which can now be performed on-site. This will reduce operational costs and improve the efficiency of city park maintenance and other related services.

In summary, this state-of-the-art facility will not only modernize the existing infrastructure but also bring about a renewed perspective on the maintenance and management of city parks and associated facilities. The project promises to be a catalyst for community development, economic growth, and enhanced public services.

<u>Section V</u> Alternatives Considered

Site 1, Alternative 1

Site 1 is characterized by a steeper slope at the back of the property, descending toward a wooded area, which will require a lot of grading, The front of the site is relatively level, with a mix of gravel and paved surfaces providing access to the existing structures. The proposed site

layout features a better organized functional design tailored for a combination of storage, maintenance, inside parking lot, fabrication work and administration support. The arrangement emphasizes efficient circulation, clear separation work zones, and accessibility. The garage is the central and largest area of this building prominently located in the middle of the property. Its orientation allows for direct vehicle access from the driveway and is positioned to serve as the core operational hub. This structure supports vehicle storage, mechanical repairs, or equipment housing, forming the backbone of the facility's function. The machine shop is located to the west of the garage, and is subdivided into two areas: welding and Wood. The adjacency of the machine shop to the garage suggests a workflow that integrates fabrication and repair operations efficiently. A looped driveway enters from the main road on the northeast side of the property and curves around the southern edge of the garage. This design supports vehicular circulation, allowing vehicles such as service trucks and trailers, to enter, loop around, and exit without reversing or congestion. The driveway directly serves the garage bays and extends toward the parking and service areas, optimizing movement throughout the site. Parking is located east of the garage, consisting of approximately 10-12 angled parking stalls. The orientation of the stalls allows for one-way traffic, promoting smooth vehicle flow. Behind the parking area aligned along the eastern edge of the site is a row of functional services rooms which includes offices, break room, a janitorial room, conference room, locker room, and some storage supplies.

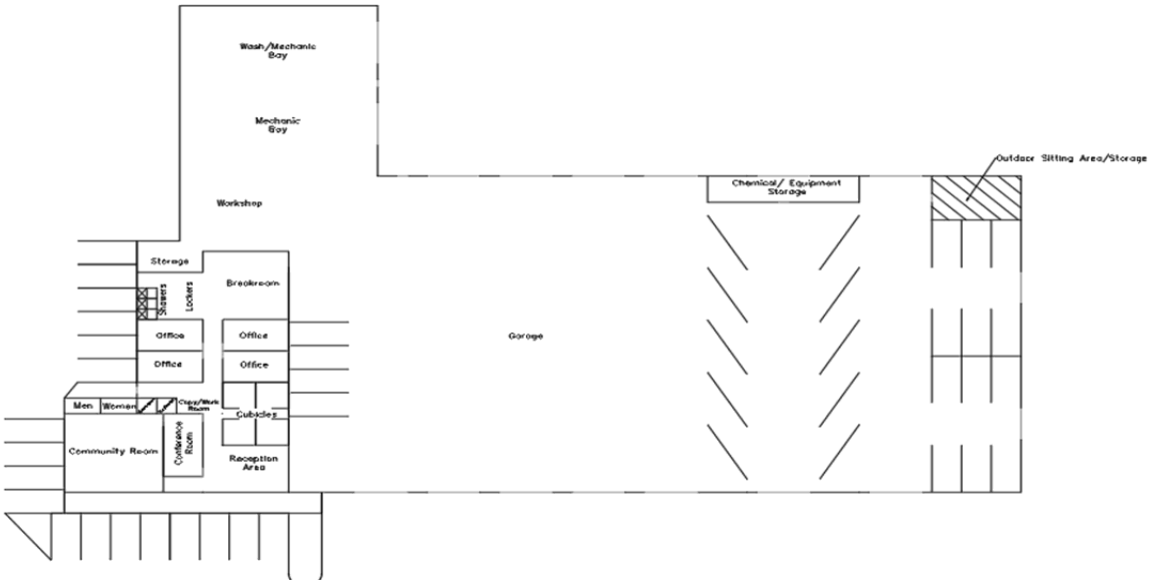

Figure 1. Site Design 1 Alternative 1 Layout

Constraint of this alternative

While this alternative presented several favorable features, including a drive-through, garage, offices separated from the garage area, and angled parking stalls that were well-received by the client, it ultimately posed limitations that impacted its viability. Site 2 offered a larger area and

allowed for a cleaner, more spacious layout, although it was also associated with higher construction costs, particularly due to its scale and design intent. In contrast, Site 1, despite being smaller, proved to be more cost-effective and better aligned with the budgetary parameters for this type of building.

A key constraint of this design is that it was heavily reliant on the open space provided by Site 2, which enabled a neat but rigid layout. However, this layout did not allow for flexible circulation or adaptability, limiting future reconfigurations. Moreover, to adapt this design to Site 1, the overall building footprint would have to be significantly reduced, making it insufficient to meet the client's programmatic and operational requirements.

Site 2 Alternative 1

Site 2 presents a favorable layout for construction due to its flat terrain and open space, minimizing the need for extensive site preparation or demolition. Its proximity to the public pool and recreational areas enhances its strategic location for community-focused facilities, making it highly accessible and well-positioned for public use. The lack of existing structures allows for flexible design and optimal space utilization, making it a prime candidate for new construction projects.

The proposed forestry and maintenance office will seamlessly blend modern and rustic architectural elements to create a warm, functional, and stylish environment. The design emphasizes eco-friendliness, incorporating solar panels and sustainable materials. The main entrance will feature a large rustic wooden door, providing a welcoming and distinctive entry point. Metal and wood cladding will add texture, with most walls covered in siding in various shades of brown. A large overhang garage door will optimize vehicle access to the building, and the entire site will be fenced for security, with a decorative front fence enhancing the modern artistic look. The reception area will have a mix of concrete floors and rustic rugs, adding texture and warmth. Decorative plants will maintain a fresh and modern concept. Large rectangular wooden tables will provide a classic and versatile design, accommodating numerous participants, while smaller tables and modern ergonomic chairs will be used in individual offices.

The offices area will be situated in the left corner of the building, with an open space in which the garage area will be located along with storage rooms, maintenance, welding and wood workshops. The break room will feature a warm-up kitchen concept, including a microwave, ice machine, coffee machine, large wooden cabinets, and a sink. Storage and washing bay areas will have a functional industrial look with exposed steel structures and wooden shelving. Bathrooms will feature water-efficient flushometer-style toilets, wooden-frame mirrors, and warm white lighting. One bathroom will include a shower and lockers for employees' belongings. The garage area will have concrete floors and taller walls to accommodate windows for natural light and ventilation. About 26 parking spaces inside the garage. There will be about 7 garage doors around the building with access to the garage and office areas. A wash bay will be included for washing maintenance and regular trucks. Adjacent to the garage, there will be a

wood and welding workshop separated by a mobile wall. Storage spaces for tools, materials, and a chemical storage room will be provided. A designated maintenance space will be included for efficient task performance. Also, a garbage disposal area and a 500-gallon oil disposal tank will be at the back of the building. The site will have two access points: one from Blackhawk Dr. and another from Parkway Dr. There will be designated parking spaces for the public near the building and additional parking for employees either at the front or back of the building.

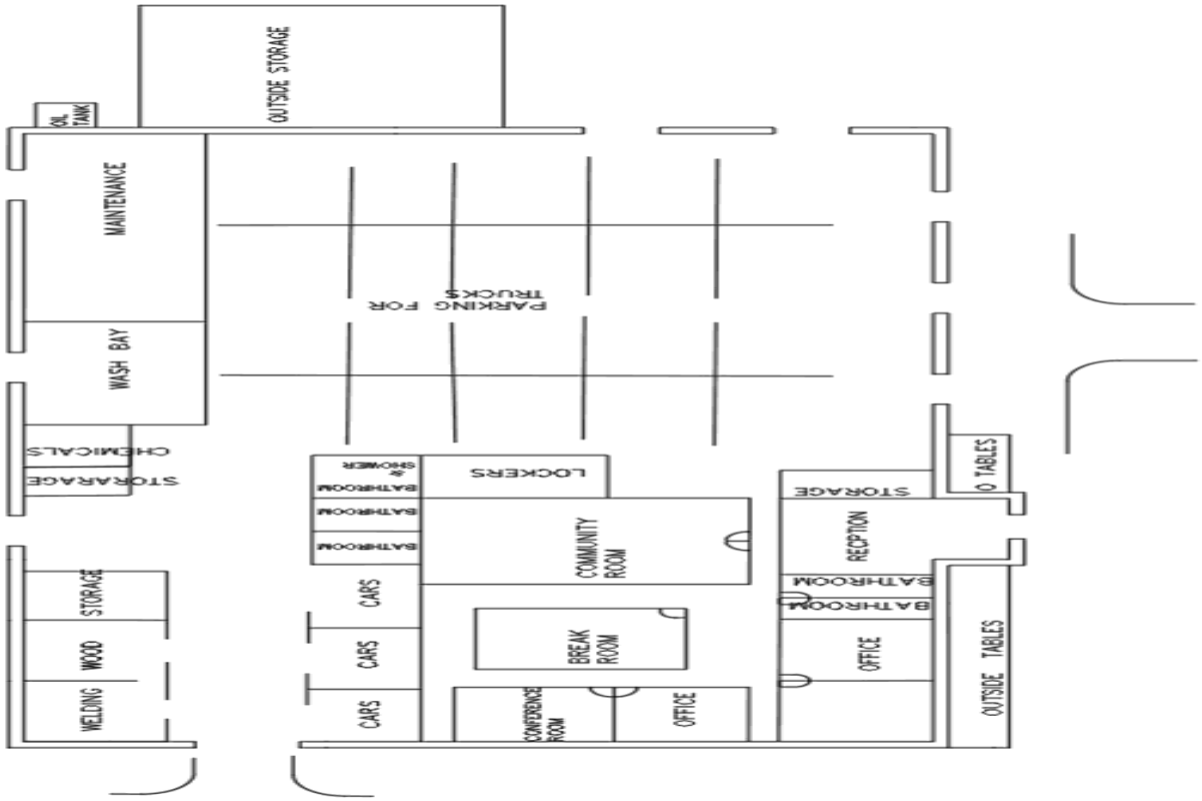

Figure 2. Site 2 Alternative 1 Plan Layout

Constraints of this alternative

Based on the client's feedback, several key spatial and functional concerns were identified in the proposed layout. One of the primary issues was the limited maneuvering space within the garage area, which did not provide adequate room for vehicles to back in and out comfortably. The client expressed a clear preference for a fully open garage layout, ensuring unrestricted movement and improving operational efficiency.

Additionally, the client emphasized the importance of having the office area physically separated from the garage zone. This separation is essential not only for maintaining a professional and quiet working environment but also for ensuring the safety and well-being of employees, minimizing their exposure to noise, fumes, and potential hazards associated with vehicle operations.

Another critical consideration is the strategic use of the two existing road access points on the site. The client prefers positioning the garage area on the west side of the site, which would allow for more efficient traffic flow, better utilization of both access points, and improved segregation between operational and administrative functions.

Site 2 Alternative 2

This layout presents a multi-functional facility designed to support mechanical operations, staff administration, and community use. The plan balances large-scale mechanical work areas with office and support spaces, ensuring workflow efficiency, personnel comfort, and structured circulation throughout the site.

The garage occupies the central open space of the plane, surrounded by angled one-way parking lanes for efficient vehicle flow. The parking layout suggests high-capacity use for a fleet of service vehicles. The garage area is accessible from all sides and is integrated with support structures to the west and specialized vehicle bays to the south. A large, open bay designated for vehicle repair, maintenance, or mechanical work, features wide-door access to accommodate large vehicles or equipment. There is a dual-purpose area that likely includes both mechanical workstations and vehicle washing systems, as well as utility drainage, water supply, and cleaning systems. To the left of the bays is a repair workshop for repair. These three areas are interconnected, promoting efficient workflow and minimizing vehicle movement between work zones.

In the top left of the site, the administrative wing features a reception area, a mix of open and private work environments. The breakroom is centrally located. Next to the office area are men's and women's restrooms, showers, and lockers. A conference room and a community room, both of which will be available for community use, will serve as storm shelter.

The parking design is composed of angled one-way lanes, directing vehicle movement uniformly and reducing traffic congestion. Arrows indicate entry/exit flow, while dedicated drive aisles wrap around the garage area. A Designated Accessible Parking Section is located near the lower right corner for visitors and employees, adjacent to a dumpster area for waste management. The structure is organized logically from community and administrative spaces in the northwest, to garage operations in the center, and mechanical servicing in the south.

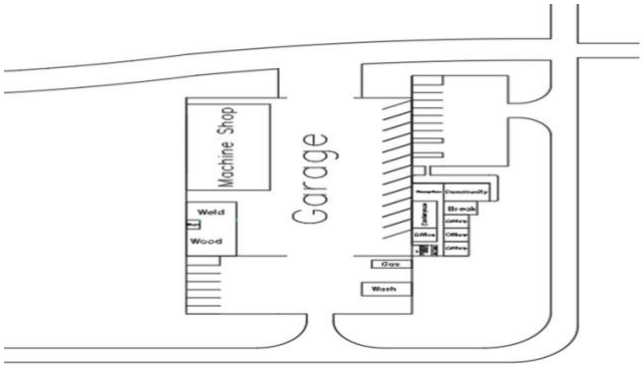

Figure 3. Site 2 Alternative 2 Plan Layout.

Constraints of this alternative

This design was well received by the client and considered one of the strongest proposals, requiring only minor layout adjustments to better meet their needs. The overall configuration aligned closely with their vision, and it served as the primary inspiration for the final design.

However, a few significant concerns were noted during the review. The client pointed out that the excessive number of access doors, particularly leading to both the building and garage areas, raised issues related to security, circulation control, and thermal efficiency. Reducing and strategically consolidating access points became a key recommendation moving forward.

Additionally, the spacing between vehicle stalls was deemed insufficient, restricting maneuverability and disrupting the natural flow of traffic within the garage. This was especially problematic given the client's operational needs and the desire for a highly functional and efficient vehicular layout.

Despite these concerns, the foundational layout of this alternative was very close to the client's expectations, and it ultimately influenced the final design, which incorporated the best elements of this model along with selected improvements derived from the other two alternatives.

Final alternative

After some discussion with the client, it became clear that while each of the proposed alternatives presented strengths, none fully captured their vision. The team blended the most effective elements of all three alternatives into a single, cohesive solution. This integrated approach allowed us to better align the client's expectations for functionality, spatial efficiency, operational flow, and adaptability.

Site 2 was ultimately chosen due to its overall advantages in both feasibility and cost-effectiveness. Site 1 required extensive grading and the demolition of existing structures, which would have significantly increased the project's cost and timeline. Site 2, on the other hand, offers a clear and unobstructed development area with minimal demolition needs and favorable grading conditions, resulting in reduced site preparation costs and a more streamlined construction process. Its central location provides improved accessibility for employees and better logistical connections for distribution. Additionally, Site 2 benefits from two separate vehicular access points, which enhance traffic circulation, facilitate deliveries and emergency access, and contribute to a safer, more organized site layout. The natural topography and existing conditions of Site 2 further support construction feasibility in terms of foundational work and stormwater management.

The final design incorporated key features from the proposed alternatives, including the drive-through garage from Alternative 2, angled parking stalls, and a dedicated maintenance and wash bay room. Additionally, the separation between the administrative wing and the garage area, as outlined in Alternative 1, was also integrated to enhance operational efficiency and spatial organization.

The final facility design effectively integrates high-volume maintenance, warehousing, and administrative functions while prioritizing operational efficiency, safety, and employee comfort. The central and western sections accommodate the primary garage and warehouse area, designed to handle large vehicles like freightliners and tractors with angled racking systems to maximize storage and four overhead sliding doors—two on the north and two on the south—

for smooth vehicle flow. The administrative wing on the eastern side is distinctly separated from the operational areas to reduce noise transfer and enhance safety, featuring a welcoming reception area, four private offices, a centrally located conference room, and a break room with kitchenette facilities. ADA-compliant restrooms are strategically positioned to serve both office and maintenance staff. Additionally, a multi-use community room near the main amenity zone supports staff training, community engagement, and can function as an emergency shelter. The design synthesizes the most effective components from previous design alternatives while leveraging the spatial advantages of Site 2, resulting in a comprehensive, flexible facility that meets both current operational needs and future growth.

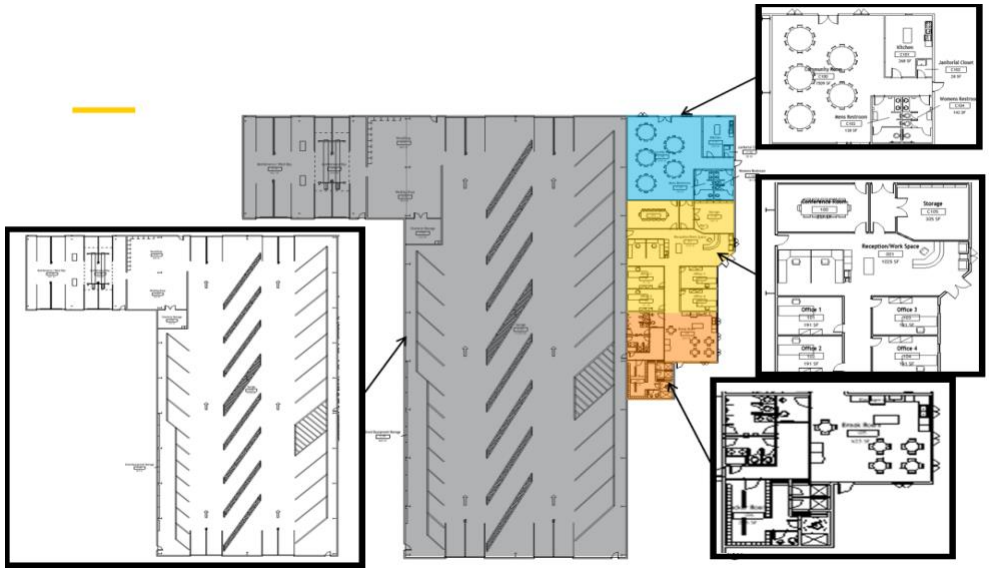

Figure 4. Architectural Plan Layout

The figure above provides a detailed overview of the building layout, showcasing essential features such as the central garage and warehouse area, the administrative wing, and the multi-use community room. It illustrates the vehicle circulation flow through the four overhead sliding doors, the strategic separation between operational and office spaces, and the thoughtfully positioned amenities designed to support both staff operations and community functions. Collectively, these design elements comprehensively address the project's objectives, ensuring that operational, administrative, and community functions are effectively integrated to meet both current and future needs.

Section VI Final Design Details

Parking Lot and Site Plan:

The new centralized facility and site feature a meticulously planned parking system designed to meet the needs of the public and Parks and Forestry staff with both accessibility and functionality in mind. There are a total of 43 parking spaces. On the east side of the site along S. 5th Street, 8 spaces are designated for public parking to provide access to the community rooms and Parks and Forestry office. Of these, 5 spaces are specially reserved for handicap

parking. Additionally, on the east side, a separate parking lot for office staff includes 8 spaces, catering specifically to employees working within the office. On the west side of the site, hidden behind the garage, there are 27 spaces allocated for Parks and Forestry employees, offering privacy and convenient access to their workspace. Inside the garage, there are 29 parking spaces designed to accommodate a variety of vehicle sizes and equipment. These include 7 compact spaces measuring 8 feet by 11 feet, tailored for smaller equipment; 4 medium spaces that are 11 feet by 18 feet; and 11 larger spaces, each measuring 11 feet by 26 feet, ideal for oversized vehicles. All these spaces are angled at 45 degrees, ensuring smooth entry and exit for vehicles. The garage also includes 7 specialty drive-through spaces, crafted to accommodate larger vehicles and trailer combinations. These spaces are 11 feet by 42 feet and angled at 60 degrees to facilitate effortless maneuvering.

The overall site of the new centralized facility is designed to balance accessibility, functionality, and natural aesthetics. It features access roads encircling the building, ensuring smooth navigation and connectivity throughout the property. Within the site, there is a designated, fenced-in area for plant and tree storage, providing secure organization for landscaping materials. Adjacent to this are two material storage bays intended for mulch, dirt, and similar supplies, catering to operational efficiency. A significant portion of the site consists of open space, offering ample room for additional trailer parking as well as storage for equipment and miscellaneous materials. In the northwest corner, the site includes a fenced-in area designated for security purposes, ensuring the protection of critical assets. The perimeter fencing incorporates two meticulously positioned access gates. The first gate is located on the west side of the building, aligned north south, and situated just south of the maintenance bays but north of the employee car park. The second gate is located on the east side, facing east-west, along S. 5th Street, positioned slightly west of the community room space.

The site further enhances accessibility with thoughtfully planned pedestrian pathways. A sidewalk runs along the parking spaces on the east side of the community room, parallel to S. 5th Street, providing a direct connection to the paved patio area adjacent to the community room. This sidewalk extends to S. 5th Street on the north side of the parking spaces, accommodating a crosswalk for safe and convenient access to the existing parking lot across the street. For office staff, the employee parking lot is connected to a private paved patio located outside the breakroom, offering an outdoor space for employees to relax during breaks. Finally, the portions of the site not consumed by built infrastructure are thoughtfully landscaped with grass, prairie plants, and mulched plant beds, blending functional design with an environmentally friendly and visually appealing aesthetic. This cohesive layout reflects careful consideration of both operational needs and the well-being of those using the site.

Figure 5. Site plan layout and parking lot.

Site Runoff and Drainage:

A comprehensive runoff and drainage analysis was conducted to evaluate the impact of proposed building development on existing stormwater drainage patterns and to design appropriate drainage facilities for effective stormwater management. Initial tasks involved a review of site topography and aerial imagery to accurately delineate drainage basins and identify contributing areas while also using ASCE Hazard tool to identify intensity of rainstorms in the area. Hydrologic conditions were assessed by establishing pre- and post-development runoff scenarios, employing rational and SCS (NRCS) methods to estimate peak runoff rates and volumes for standard design storm of a 100-year event.

Stormwater management measures, including detention basins and infiltration features, were incorporated into the site layout to mitigate increases in runoff volumes and peak flows. The analysis ensured compliance with local regulatory standards for stormwater discharge rates and water quality objectives. Recommendations for drainage facility dimensions and placement were developed based on the analysis results to ensure sustainable, long-term functionality of the stormwater management system for the development site.

The final design utilized a flat roof with scuppers in the walls for drainage. There is also a detention pond in the north of the site designed to catch the runoff of a 100-year storm.

Building Envelope and Façade

The building envelope for the Park and Forestry Facility is designed to support the dual objectives of functionality and environmental integration. The envelope system utilizes a high-performance assembly of industrial insulated metal panels (IMPs) for thermal and structural efficiency, complemented by natural wood siding at key elevations to reflect the building's setting within a park and forestry environment.

The entire structure is enclosed using factory-finished insulated metal panels, which provide continuous thermal barriers, structural rigidity and low-maintenance performance. The exterior face 22–26 gauge pre-finished galvanized or galvalume steel in a high-durability PVDF coating for superior UV and corrosion resistance and core insulation is typically 5 inches thick. The interior liner is painted with a steel face forming a clean and washable surface ideal for workspaces, equipment bays, and storage areas. IMPs meet requirements of IBC 2021 (Chapters 14 & 26), ASHRAE 90.1, and NFPA 285, where applicable. Panels are used for both walls and roof, creating a seamless, thermally efficient shell that reduces operating costs and minimizes heat loss during winter months or cooling loads during summer. To enhance the natural character of the building and its relationship to the surrounding park landscape, decorative wood siding is applied over the IMPs on selected elevation particularly at public-facing entries, office zones, or visitor access points. Naturally durable species such as cedar, thermally modified ash, or engineered wood products with exterior-grade finishes. Treated for resistance to moisture, insects, and decay, ensuring long-term durability with minimal maintenance.

Figure 6. Exterior Rendering

A rainscreen assembly will be installed using vertical furring strips over the IMPs, creating a ventilated cavity to promote drainage and air circulation. This configuration preserves the continuous insulation and moisture protection provided by the panels, while giving the building a warm, natural aesthetic that blends into its surroundings. This envelope solution provides a robust, high-performance enclosure tailored to the functional demands of the Parks and Forestry Facility, while expressing a sensitive architectural response to its natural setting. The integration of industrial insulated metal panels with natural wood siding ensures energy efficiency, low maintenance, and an inviting presence within the park landscape.

Footings

Following structural analysis of the building's two primary 100-foot clear span areas, and in conjunction with the calculated column reactions and allowable soil bearing capacity as provided in the geotechnical investigation, consideration was given to the selection of an appropriate foundation system. In accordance with the recommendations of the geotechnical report and through collaborative coordination with the Construction Management division, it was determined that a system utilizing rectangular spread footings for the major structural columns and continuous strip footings for the office and partition wall loads would provide a safe, cost-effective, and structurally sound solution.

The rectangular spread footings are specifically dimensioned as follows:

- *5'-6" x 5'-0"*
- *5'-0" x 5'-0"*
- *4'-4" x 4'-4"*

These are designed to adequately support the axial and moment loads transmitted by the W24x370 steel columns, which carry the large-span roof framing composed of W24x302 beams. The spread footings are distributed to maintain uniform pressure within the allowable bearing capacity limits outlined in the geotechnical report and were evaluated against factors of safety for bearing failure and differential settlement. The footings are located at a minimum depth of 1'-6" below finished grade, as per IBC 2021 Section 1809.4, to protect against frost action and provide adequate embedment for structural stability.

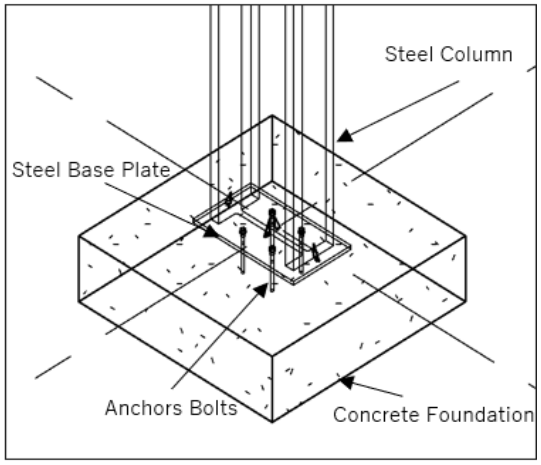

Figure 7. Square footing detailed

For the office and ancillary areas, continuous strip footings were employed beneath load-bearing walls framed with cold-formed C-studs and C-channels. These were designed in accordance with AISI S100-16 and IBC 2021 Section 1809.3, ensuring adequate support for distributed wall loads and alignment with slab-on-grade performance requirements.

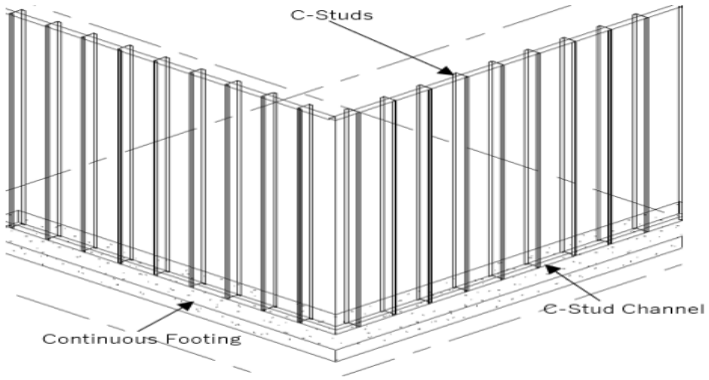

Figure 8. Continuous strip footing

This shallow foundation strategy was made feasible due to updated subsurface conditions, which indicated localized zones of sufficient bearing strength and acceptable settlement characteristics, eliminating the need for deep foundation systems such as driven piles previously considered. Furthermore, the use of shallow foundations helps mitigate long-term issues such as slab-on-grade cracking, wall separation, and uneven settlement, all of which are critical factors in achieving the standards of a High-Performance Building, as defined by durability, resilience, and operational cost-efficiency.

All foundation design criteria, including bearing pressure limits, structural reinforcement, and serviceability checks, were carried out in compliance with ACI 318-19 (Building Code Requirements for Structural Concrete) and the applicable provisions of ASCE 7-16 (Minimum Design Loads and Associated Criteria for Buildings and Other Structures).

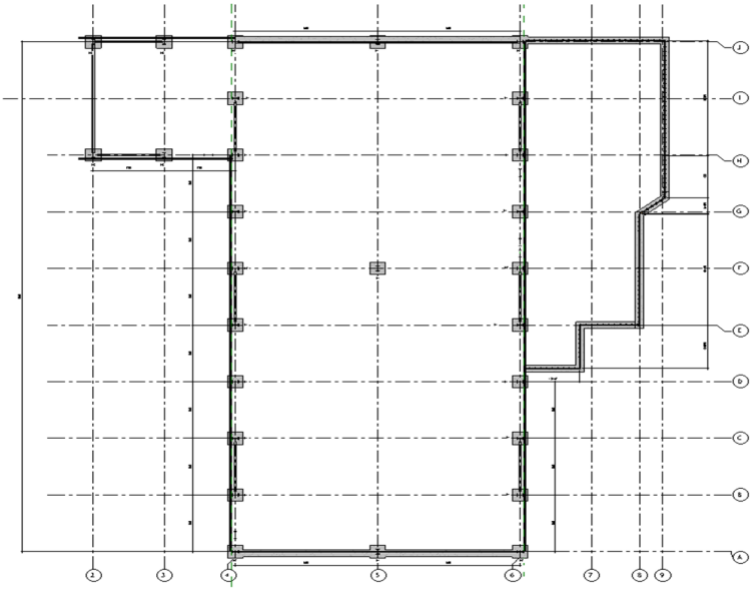

Figure 9. Foundations plan layout.

Steel Frame

After exhaustive research and seeing the pros and cons of some materials to clear spans the best material option would be steel for many reasons. Fewer columns would maximize space. It is also fire-resistant and durable. It is quick construction compared to other materials. The primary structural framing system is composed of W24x302 wide flange beams and W24x370 wide flange columns, selected for their high load-carrying capacity and structural efficiency in areas with large clear spans. These members are designed in accordance with the International Building Code (IBC 2021) and the AISC 360-16 Specification for Structural Steel Buildings, ensuring compliance with nationally recognized standards for strength, stability, and safety.

Framing for the office and auxiliary spaces incorporates cold-formed C-studs and C-channels, suitable for light-frame construction. These components follow the guidelines set forth in AISI S100-16 (North American Specification for the Design of Cold-Formed Steel Structural Members), providing an efficient and flexible system for partitioning and lighter load-bearing requirements. For the roof framing, Z-shaped cold-formed steel purlins (Z-purlins) are utilized as secondary framing members, spanning between the primary steel beams to support the metal roof deck. The use of Z-purlins is advantageous due to their ability to lap and interlock over supports, improving structural continuity and reducing material waste. The purlins are designed in compliance with AISI S100-16 (North American Specification for the Design of Cold-Formed Steel Structural Members) and are spaced to accommodate roof loads in accordance with ASCE 7-16, particularly Chapter 7 for snow loads and Chapter 26 for wind loads. To resist controlling seismic and wind loads, X-braced bays between columns provide the stiffness needed for the structure. For the 225ft long side there are about 10 clear spans for the big garage open area where 3 out of the 9 bays are braced to help with the wind loads from the bottom of the columns up to the roof. In the northwest there is a shorter span 50 ft by 75 ft with 3 bays, one of them being braced as well.

In areas where roof elevations differ, such as transitions between high and low roof planes, snow drift loading was carefully evaluated. Supporting columns in these zones were specifically designed to resist increased lateral and vertical loads due to drift accumulation, as prescribed by ASCE 7-16 (Minimum Design Loads and Associated Criteria for Buildings and Other Structures), particularly Chapter 7 – Snow Loads. This ensures all roof structures comply with the snow load provisions outlined for balanced, unbalanced, and drifting conditions.

This integrated and code-compliant approach to structural design supports long-term performance, safety, and adaptability across all areas of the building.

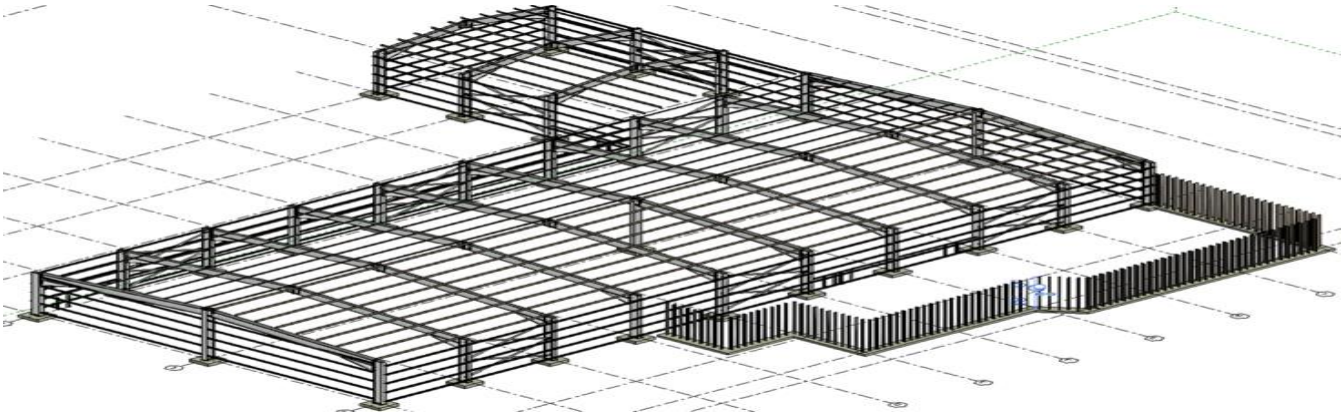

Figure 10. Structural frame 3D view.

Section VII Probable Construction Cost

The total construction cost for the project is estimated at $3,388,795, encompassing comprehensive allocations for site development, architectural design, and overall construction. Site development costs are projected at $300,000, while architectural expenses constitute the largest expenditure at $2,056,849. The resulting subtotal of $3,080,723 serves as the baseline for construction costs. Incorporating a 10% contingency of $308,072, effectively accounting for unforeseen expenses and ensuring financial alignment with the project's scope and objectives.

Type		Total
Demolition	$	28,000
Site	$	300,000
Structural	$	643,874
Architectural	$	2,056,849
MEP	$	52,000
Subtotal	$	3,080,723
10% Contingency	$	308,072
Total Construction Cost	$	3,388,795

Table 1. Construction Cost

Section VIII References

American Concrete Institute. (2019). *Building code requirements for structural concrete (ACI 318-19) and commentary*. Farmington Hills, MI: American Concrete Institute.

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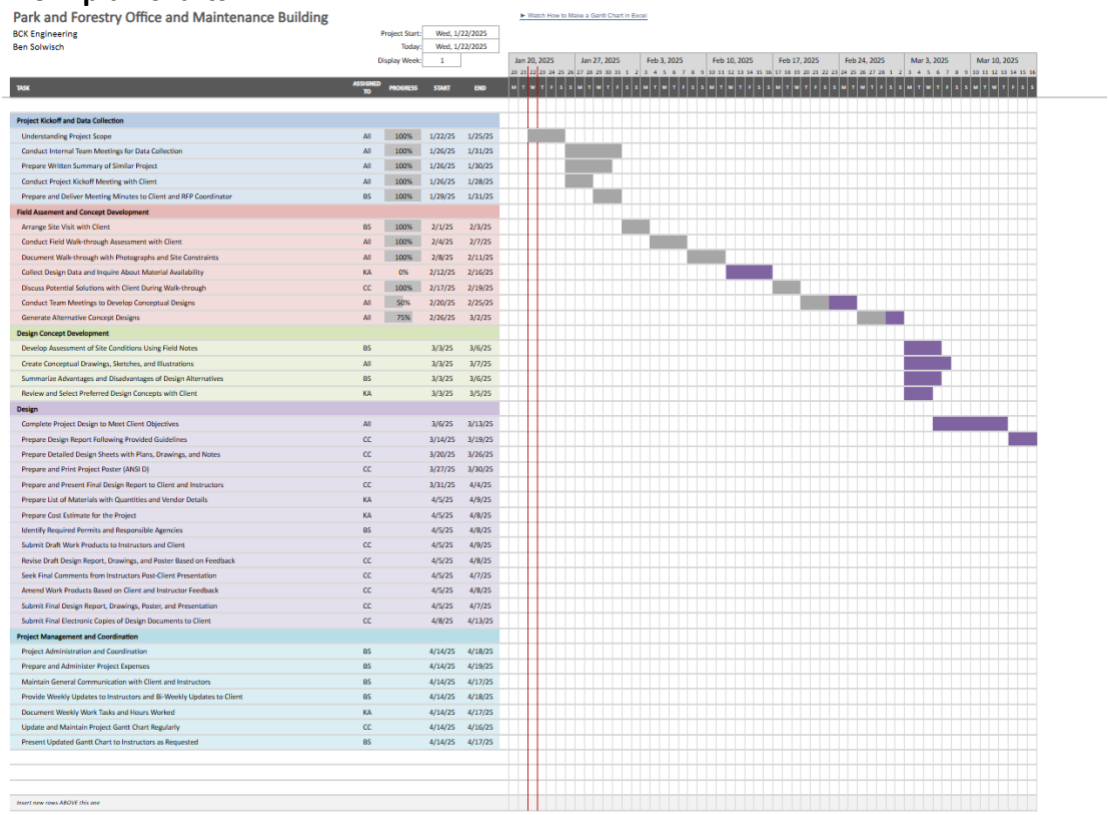
Appendix

Work plan charts



Park and Forestry Office and Maintenance Building

BCK Engineering

Ben Solwisch

Project Start: Wed, 1/22/2025

Today: Wed, 1/22/2025

Display Week: 1

► Watch How to Make a Gantt Chart in Excel

TASK	ASSIGNED TO	PROGRESS	START	END
Project Kickoff and Data Collection				
Understanding Project Scope	All	100%	1/22/25	1/25/25
Conduct Internal Team Meetings for Data Collection	All	100%	1/26/25	1/31/25
Prepare Written Summary of Similar Project	All	100%	1/26/25	1/30/25
Conduct Project Kickoff Meeting with Client	All	100%	1/26/25	1/28/25
Prepare and Deliver Meeting Minutes to Client and RFP Coordinator	BS	100%	1/29/25	1/31/25
Field Assement and Concept Development				
Arrange Site Visit with Client	BS	100%	2/1/25	2/3/25
Conduct Field Walk-through Assessment with Client	All	100%	2/4/25	2/7/25
Document Walk-through with Photographs and Site Constraints	All	100%	2/8/25	2/11/25
Collect Design Data and Inquire About Material Availability	KA	0%	2/12/25	2/16/25
Discuss Potential Solutions with Client During Walk-through	CC	100%	2/17/25	2/19/25
Conduct Team Meetings to Develop Conceptual Designs	All	50%	2/20/25	2/25/25
Generate Alternative Concept Designs	All	75%	2/26/25	3/2/25
Design Concept Development				
Develop Assessment of Site Conditions Using Field Notes	BS		3/3/25	3/6/25
Create Conceptual Drawings, Sketches, and Illustrations	All		3/3/25	3/7/25
Summarize Advantages and Disadvantages of Design Alternatives	BS		3/3/25	3/6/25
Review and Select Preferred Design Concepts with Client	KA		3/3/25	3/5/25
Design				
Complete Project Design to Meet Client Objectives	All		3/6/25	3/13/25
Prepare Design Report Following Provided Guidelines	CC		3/14/25	3/19/25
Prepare Detailed Design Sheets with Plans, Drawings, and Notes	CC		3/20/25	3/26/25
Prepare and Print Project Poster (ANSI D)	CC		3/27/25	3/30/25
Prepare and Present Final Design Report to Client and Instructors	CC		3/31/25	4/4/25
Prepare List of Materials with Quantities and Vendor Details	KA		4/5/25	4/9/25
Prepare Cost Estimate for the Project	KA		4/5/25	4/8/25
Identify Required Permits and Responsible Agencies	BS		4/5/25	4/8/25
Submit Draft Work Products to Instructors and Client	CC		4/5/25	4/9/25
Revise Draft Design Report, Drawings, and Poster Based on Feedback	CC		4/5/25	4/8/25
Seek Final Comments from Instructors Post-Client Presentation	CC		4/5/25	4/7/25
Amend Work Products Based on Client and Instructor Feedback	CC		4/5/25	4/8/25
Submit Final Design Report, Drawings, Poster, and Presentation	CC		4/5/25	4/7/25
Submit Final Electronic Copies of Design Documents to Client	CC		4/8/25	4/13/25
Project Management and Coordination				
Project Administration and Coordination	BS		4/14/25	4/18/25
Prepare and Administer Project Expenses	BS		4/14/25	4/19/25
Maintain General Communication with Client and Instructors	BS		4/14/25	4/17/25
Provide Weekly Updates to Instructors and Bi-Weekly Updates to Client	BS		4/14/25	4/18/25
Document Weekly Work Tasks and Hours Worked	KA		4/14/25	4/17/25
Update and Maintain Project Gantt Chart Regularly	CC		4/14/25	4/16/25
Present Updated Gantt Chart to Instructors as Requested	BS		4/14/25	4/17/25
Insert new rows ABOVE this one				

Park and Forestry Office and Maintenance Building

BCK Engineering

Ben Solwisch

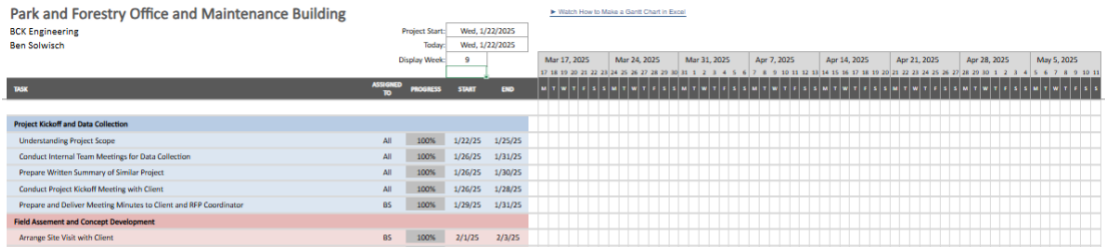
Project Start: Wed, 1/22/2025

Today: Wed, 1/22/2025

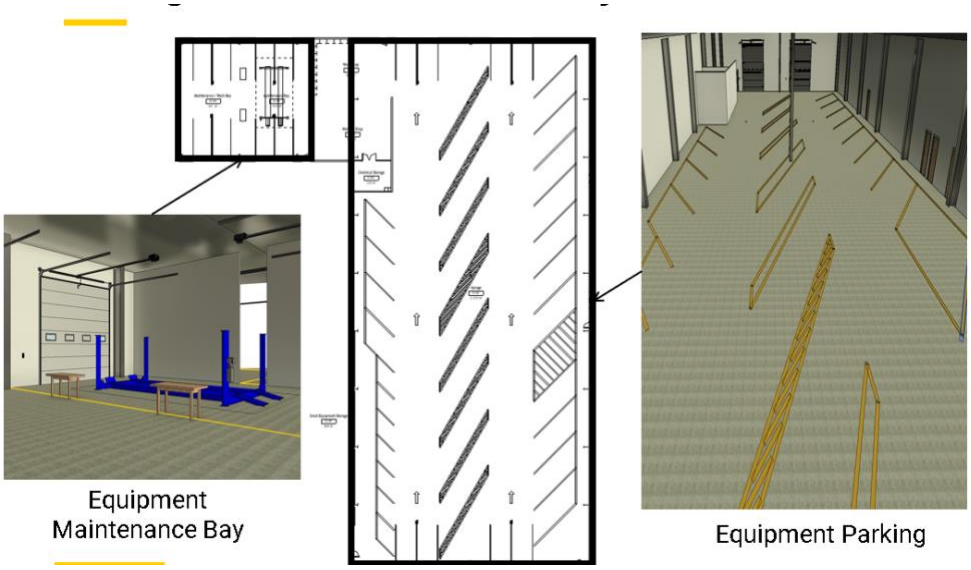
Display Week: 9

► Watch How to Make a Gantt Chart in Excel

TASK	ASSIGNED TO	PROGRESS	START	END
Project Kickoff and Data Collection				
Understanding Project Scope	All	100%	1/22/25	1/25/25
Conduct Internal Team Meetings for Data Collection	All	100%	1/26/25	1/31/25
Prepare Written Summary of Similar Project	All	100%	1/26/25	1/30/25
Conduct Project Kickoff Meeting with Client	All	100%	1/26/25	1/28/25
Prepare and Deliver Meeting Minutes to Client and RFP Coordinator	BS	100%	1/29/25	1/31/25
Field Assement and Concept Development				
Arrange Site Visit with Client	BS	100%	2/1/25	2/3/25
Conduct Field Walk-through Assessment with Client	All	100%	2/4/25	2/7/25
Document Walk-through with Photographs and Site Constraints	All	100%	2/8/25	2/11/25
Collect Design Data and Inquire About Material Availability	KA	0%	2/12/25	2/16/25
Discuss Potential Solutions with Client During Walk-through	CC	100%	2/17/25	2/19/25
Conduct Team Meetings to Develop Conceptual Designs	All	50%	2/20/25	2/25/25
Generate Alternative Concept Designs	All	75%	2/26/25	3/2/25
Design Concept Development				
Develop Assessment of Site Conditions Using Field Notes	BS		3/3/25	3/6/25
Create Conceptual Drawings, Sketches, and Illustrations	All		3/3/25	3/7/25
Summarize Advantages and Disadvantages of Design Alternatives	BS		3/3/25	3/6/25
Review and Select Preferred Design Concepts with Client	KA		3/3/25	3/5/25
Design				
Complete Project Design to Meet Client Objectives	All		3/6/25	3/13/25
Prepare Design Report Following Provided Guidelines	CC		3/14/25	3/19/25
Prepare Detailed Design Sheets with Plans, Drawings, and Notes	CC		3/20/25	3/26/25
Prepare and Print Project Poster (ANSI D)	CC		3/27/25	3/30/25
Prepare and Present Final Design Report to Client and Instructors	CC		3/31/25	4/4/25
Prepare List of Materials with Quantities and Vendor Details	KA		4/5/25	4/9/25
Prepare Cost Estimate for the Project	KA		4/5/25	4/8/25
Identify Required Permits and Responsible Agencies	BS		4/5/25	4/8/25
Submit Draft Work Products to Instructors and Client	CC		4/5/25	4/9/25
Revise Draft Design Report, Drawings, and Poster Based on Feedback	CC		4/5/25	4/8/25
Seek Final Comments from Instructors Post-Client Presentation	CC		4/5/25	4/7/25
Amend Work Products Based on Client and Instructor Feedback	CC		4/5/25	4/8/25
Submit Final Design Report, Drawings, Poster, and Presentation	CC		4/5/25	4/7/25
Submit Final Electronic Copies of Design Documents to Client	CC		4/8/25	4/13/25
Project Management and Coordination				
Project Administration and Coordination	BS		4/14/25	4/18/25
Prepare and Administer Project Expenses	BS		4/14/25	4/19/25
Maintain General Communication with Client and Instructors	BS		4/14/25	4/17/25
Provide Weekly Updates to Instructors and Bi-Weekly Updates to Client	BS		4/14/25	4/18/25
Document Weekly Work Tasks and Hours Worked	KA		4/14/25	4/17/25
Update and Maintain Project Gantt Chart Regularly	CC		4/14/25	4/16/25
Present Updated Gantt Chart to Instructors as Requested	BS		4/14/25	4/17/25
Insert new rows ABOVE this one				



Architectural Renderings



Equipment Maintenance Bay

Equipment Parking

Conference Room

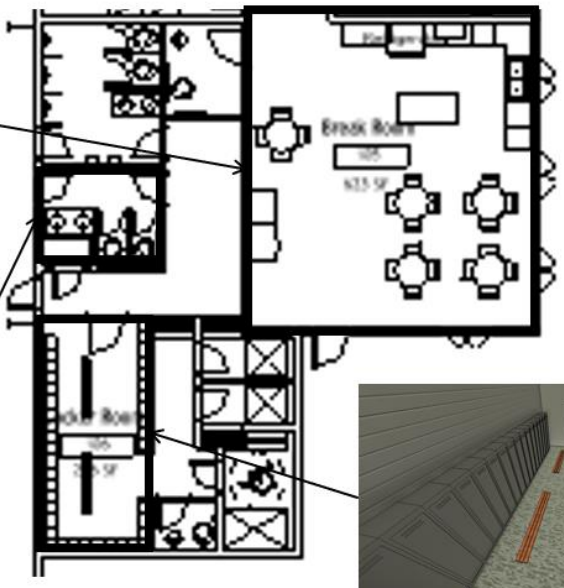
Cubicle Workspace

Reception Space

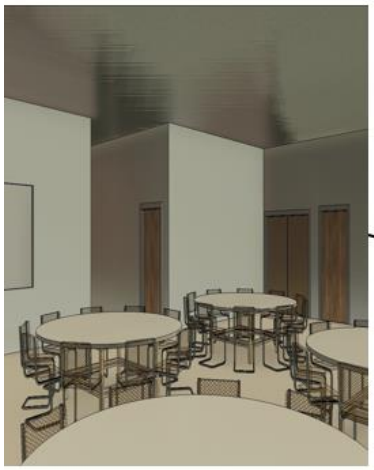
Typical Office

Break Room Seating

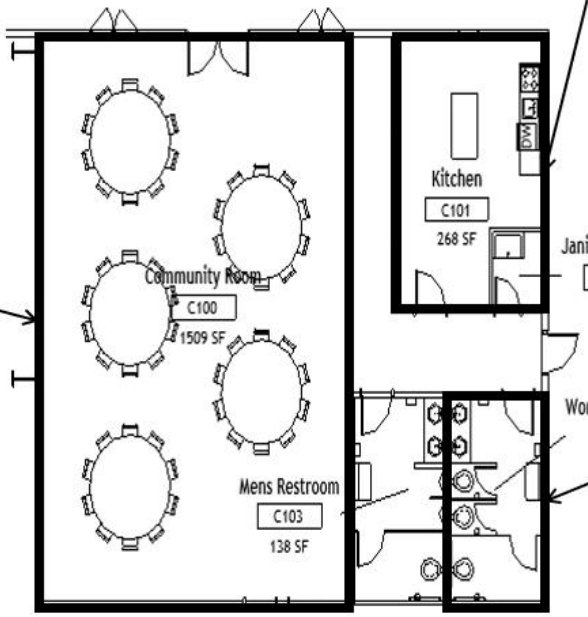
Bathroom



Locker Room



Community Room



Warming Kitchen

Bathroom