Repairs BEQ HP135

at the

UNITED STATES MARINE CORPS BASE

CAMP LEJEUNE, NORTH CAROLINA

May 13, 2026

A/E Contract: N40085-22-D-0002

Task Order No.: N40085-25-F-0675

Project No.: 25-0011

BASIS OF DESIGN

Final Submittal

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REFERENCE DOCUMENTS

All work will comply with the latest edition of the following codes and standards:

ACI 318-19	Building Code Requirements for Structural Concrete
ACI 360R-10	Guide to Design of Slabs-on-Ground
ADA/ABA	Americans with Disabilities Act (ADA) and Architectural Barrier Act (ABA) Accessibility Guidelines
ASCE 7-22	Minimum Design Loads for Buildings and Other Structures
ASHRAE 55 – 2023 – Thermal Environmental Conditions for Human Occupancy	
ASHRAE 62.1 – 2019 – Ventilation for Acceptable Indoor Air Quality	
ASHRAE 90.1 – 2019 – Energy Standard for Buildings except Low Rise Residential Buildings	
ASTM	American Society for Testing and Materials
AWS D1.1-20	Structural Welding Code
IBC 2024	International Building Code
IMC 2021	International Mechanical Code
NCDENR	North Carolina Department of Environmental and Natural Resources
NFPA 54	National Fuel Gas Code, 2024 edition
NFPA 70	National Electric Code, 2023 edition
NFPA 90A	Installation of Air-Conditioning and Ventilation Systems, 2024 edition
NFPA 101	Life Safety Code, 2024 edition
SDI-17	Code of Standard Practice for Composite Deck, Form Deck, and Roof Deck Construction
SMACNA	HVAC Duct Construction Standards – Metal and Flexible, 3rd edition
SMACNA	HVAC Air Duct Leakage Test Manual, 2nd edition
TMS D1.1-20	Building Code Requirements and Specifications for Masonry Structures
UFC 1-200-01	DoD Building Code, with Change 4, 17 December 2024
UFC 1-200-02	High Performance and Sustainable Building Requirements, with Change 3, 08 July 2025
FC 1-300-09N	Navy and Marine Corps Design Procedures, with Change 1, 17 April 2025
UFC 3-101-01	Architecture, with Change 4, 08 January 2024
UFC 3-110-03	Roofing, with Change 5, 12 June 2020
UFC 3-120-01	Design: Sign Standards, with Change 4, 01 February 2023
UFC 3-120-10	Interior Design, with Change 3, 22 May 2025
UFC 3-190-06	Protective Coatings and Paints, 01 March 2021
UFC 3-201-01	Civil Engineering, 20 December 2022
UFC 3-210-10	Low Impact Development, 28 August 2023
UFC 3-230-01	Water Storage, Distribution, and Transmission, with Change 3, 01 July 2021
UFC 3-240-01	Wastewater Collection and Treatment, with Change 4, 01 October 2024
UFC 3-250-01	Pavement Design for Roads and Parking Areas, 14 November 2016
UFC 3-250-04	Standard Practice for Concrete Pavement Construction, 29 January 2024
UFC 3-301-01	Structural Engineering, Change 4, 3 June 2025

UFC 3-401-01 Mechanical Engineering, 28 July 2025
UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems, 28 July 2025
UFC 3-420-01 Plumbing Systems, 01 April 2021
UFC 3-450-01 Noise and Vibration Control, 08 December 2022
UFC 3-501-01 Electrical Engineering, 27 November 2024
UFC 3-520-01 Interior Electrical Systems, 16 January 2025
UFC 3-530-01 Interior and Exterior Lighting Systems, Change 1, 15 December 2023
UFC 3-550-01 Exterior Electrical Power Distribution, Change 3, 01 Nov 2019
UFC 3-560-01 Electrical Safety, O&M, Change 3, 15 May 2023
UFC 3-575-01 Lightning and Static Electricity Protection Systems, Change 1, 01 Oct 2021
UFC 3-580-01 Information and Communications Technology Infrastructure Planning and Design, 21 November 2024
UFC 3-600-01 Fire Protection Engineering for Facilities, with Change 6, 06 May 2021
UFC 4-010-01 Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
UFC 4-022-03 Security Fences and Gates, 01 October 2013
Camp Lejeune Base Exterior Architectural Plan (BEAP) – 2010
Camp Lejeune Mechanical Design Guidance – 01 August 2024
Camp Lejeune Electrical Policies_v20250516
Applicable UL standards (latest editions)
Applicable NEMA standards (latest editions)
Camp Lejeune Base Specification 27 10 00, v04/22
Camp Lejeune Base Specification 33 82 00, v08/22
Applicable EIA and TIA standards (latest editions)
Applicable UL standards (latest editions)

ARCHITECTURAL BASIS OF DESIGN

REFERENCE DOCUMENTS

Architectural work will comply with the latest edition of the following codes and standards:

ADA/ABA Americans with Disabilities Act (ADA) and Architectural Barrier Act (ABA) Accessibility Guidelines
IBC 2024 International Building Code
NFPA 101 Life Safety Code, 2024 edition
UFC 1-200-01 DoD Building Code, with Change 4, 17 December 2024
UFC 1-200-02 High Performance and Sustainable Building Requirements, with Change 3, 08 July 2025
FC 1-300-09N Navy and Marine Corps Design Procedures, with Change 1, 17 April 2025
UFC 3-101-01 Architecture, with Change 4, 08 January 2024
UFC 3-110-03 Roofing, with Change 5, 12 June 2020
UFC 3-120-10 Interior Design, with Change 3, 22 May 2025
UFC 3-190-06 Protective Coatings and Paints, 01 March 2021
UFC 3-450-01 Noise and Vibration Control, 08 December 2022
UFC 3-600-01 Fire Protection Engineering for Facilities, with Change 6, 06 May 2021

UFC 4-010-01 Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
UFC 4-721-10N Navy and Marine Corps Unaccompanied Housing, with Change 1, 24 April 2025

SCOPE OF WORK
This Basis of Design narrative outlines the repair and renovation of building HP135, demolition of existing mechanical building HP136, construction of a new mechanical building adjacent to building HP135, construction of a new trash dumpster enclosure, and manhole rehab between C Street and Building HP250. All buildings are located at United States Marine Corps Base Camp Lejeune.

Building HP135 is a Bachelor Enlisted Quarters (BEQ). The facility is a 3-story BEQ building with 90 living spaces, 49,986 gross square foot, 39,405 square foot of conditioned space, and a 13,303 square foot footprint. The scope of renovation includes selected exterior improvements and comprehensive interior renovations. The renovations will provide adequate living spaces for permanent active-duty Marines located at MCB Camp Lejeune. The Governments objective is to improve the condition of the barracks to an acceptable standard in accordance with the United States Marine Corps Bachelor Enlisted Quarters Campaign Plan to improve the Single Marine standard of living.

Building HP135 is currently served by two mechanical buildings, HP136 and HP140. Building HP135 will be disconnected from Building HP140 will remain operational and will continue to serve Building HP105. Building HP135, an existing 1-story, 192 square foot, mechanical building will be demolished. A new 196 square foot mechanical building with an approximately 750 square foot fenced-in chiller yard will be constructed. The new mechanical building will serve building HP135.

TYPE OF CONSTRUCTION
The occupancy classification for buildings HP135 is Group R-2 Residential (Dormitory) with Type IIIB unprotected combustible construction.

The occupancy classification for building HP136 is Group F-1 (Industrial) with Type II-B unprotected non-combustible construction.

The occupancy classification for building HP140 is Group F-1 (Industrial) with Type II-B unprotected non-combustible construction.

LIFE SAFETY CODE ANALYSIS
Reference the Fire Protection narrative herein.

ACCESSIBILITY
The facility design meets the requirements of the Architectural Barriers Act and UFC 1-200-01.

ARCHITECTURAL COMPATIBILITY
Buildings will comply with the MCB Camp Lejeune Base Exterior Architectural Plan (BEAP), dated 2010.

Building facades are modular-sized, red smooth-faced brick.

The roof for building HP135 is an asphalt shingle roof with a roof pitch of 5 vertical to 12 horizontal.

Exterior work includes the following:

- Existing exterior slider windows will be replaced with new aluminum framed single-hung units. While new windows for this building are not required to meet blast criteria, they will comply with the applicable Minimum Antiterrorism Standards of UFC 4-010-01, including frame bite, laminated glazing and also meet the requirements of the large missile test for windborne regions.

- Exterior doors and door hardware will be replaced with new out-swinging doors. Sleeping room door hardware will be RFID electronic lock systems. New doors will be painted steel insulated units. Existing steel lintels will be replaced on an as-needed basis.

- New exterior signage will be provided at each sleeping room. Typical exterior signage will include permanent (non-changeable) room number and changeable panels for room occupant names and/or rank.

- All existing exterior construction and expansion joints will be cleaned of existing sealant, backer rod (where it exists) and debris and resealed with backer rod and an appropriate exterior joint sealant.

- All previously painted exterior surfaces that remain, including, but not limited to, steel lintels, prefinished ceiling and soffit panels, fascia, and gable end siding panels will be cleaned and painted.

- Existing gable ventilation louvers will be replaced on each side of the building.

- All existing stairs will be inspected and repaired where concrete cracking, spalling, pitting, and breakage has occurred. All stair treads and risers will be resurfaced with an acrylic modified cementitious resurfacing system. Existing stair treads at all stairs will be replaced with new “retrofit” style metal stair treads. The existing tread insets will remain but will be covered completely by the new treads. New retrofit style treads will be sized to fit within new handrail / guardrail units where required.

- All elevated concrete walkways and corridor will be refinished with an acrylic modified cementitious resurfacing system.

- The existing first floor perimeter concrete sidewalk will be removed and replaced.

- The entire building’s exterior including exterior stairwells will be pressure washed.

- Prefinished metal gutters and downspouts will be installed at the existing roof. Prefinished downspouts will feed into galvanized downspouts from approximately the existing roof line to below grade and tied into the stormwater drainage infrastructure.

- The existing asphalt shingle roof and underlayment will be removed to expose the existing roof sheathing. The existing roof sheathing will be cleaned and prepared for installation of a new standing seam metal roof. Any damaged or deteriorated roof sheathing and/or roof structure will be replaced with new. Two new roof access hatches and a roof fall protection system will be installed.

PRECAST CONCRETE
Existing vertical precast concrete guardrail walls at elevated concrete walkways will be removed and replaced with new galvanized guardrails. One removable guardrail panel will be installed per floor to allow easier access for loading and unloading of furniture and equipment via forklift, sky track or other methods.

All existing exterior precast beams, balcony plank, and exterior stairs will be inspected and repaired where concrete spalling and or cracking occurs.

RAILINGS
The existing metal guardrails on the second and third floors will remain. Guardrails will be inspected, and any damaged sections and/or infill panels will be removed and replaced. New and repaired guardrail sections will be aluminum to match existing and will be similar in design.

EXTERIOR WALL SYSTEM
Exterior wall construction consists of brick and architectural block veneer backed up by reinforced concrete masonry unit walls. Construction assemblies will integrate a moisture barrier at floors, walls, and roofs.

ROOFING
The existing asphalt shingle roof and underlayment will be removed to expose the existing roof sheathing. The existing roof sheathing will be cleaned and prepared for installation of a new standing seam metal roof.

Existing roof access hatches will be removed. The roof access hatches on each end of the building will be replaced with new roof access hatches. New roof access ladders will be installed to provide roof access.

A fall protection system will be installed.

THERMAL INSULATION
Thermal insulation for the building consists of existing wall and roof insulation. Existing exterior CMU walls contain one inch of rigid insulation with a minimum R-value of 5. The existing roof contains R-30 batt insulation.

Interior work includes the following:
Existing interior finishes will be updated and/or replaced as required. All existing painted interior concrete masonry will receive new paint. All other existing interior painted surfaces will be repainted.

The first floor lounge will be reconfigured to accommodate eight washers and fifteen stack dryer units. All systems (lighting, electrical, plumbing, fire alarm, and sprinkler protection) will be upgraded. All existing flooring will be replaced.

Existing laundry facilities on all floors will be reconfigured within the same footprint to accommodate four washers, three dryers, and one service sink. Existing casework and service sinks within these laundry areas will be removed. Total building washer/dryer count to be 20 washer and 24 dryers.

The multi-purpose rooms, restrooms, lobbies, and offices will receive new paint. All systems (lighting, electrical, plumbing, fire alarm, and sprinkler protection) will be upgraded. All existing flooring will be replaced. Ceilings removed for installation of new will be replaced with acoustical ceiling tile systems.

The second and third floor vending areas will be enclosed to provide an additional storage/office area.

Card swipe hardware will be provided on all sleeping room and laundry facility entry doors.

All existing textured ceilings are to be inspected. Gypsum textured ceilings will be removed, ceilings will be cleaned and painted.

Existing heads within the sleeping rooms will be completely renovated. All existing fixtures, accessories and finishes will be replaced with new. Existing ceramic floor tile will be removed and replaced with new large format ceramic tile. Existing showers, shower pans, and drain piping will be removed and replaced with new showers with a solid surface base and surround. Sleeping room showers are not designed to meet ADA/ABA accessibility requirements and are provided as standard, non-accessible units. Ceramic tile (approximately 7’-0” high) will be provided on remaining bathroom wall surfaces and linear ceramic tile will be provided on the floors. Each shower will receive two solid surface corner shelves. Shower curtains with overhead rods and hooks will be provided. Curtain rods will be break away type. New painted gypsum board ceilings will be installed. New accessories, including towel bars, robe hooks and a wall mounted toilet tissue dispenser will be provided. Existing lavatories, vanity cabinets, vanity mirrors, and a full length wall mirror will be removed and replaced with new. A kitchenette with casework, countertop and sink will be provided in each sleeping room. Existing concrete masonry closets and metal closet doors and casework, three per sleeping room, will be removed and replaced with two closets per room. Closets will be provided with hollow metal doors and frames with security locks. Closet will have a shelf and rod and casework.

Sleeping room water closets and piping to be removed. Flooring to be repaired and new floor mounted water closets will be installed.

All sleeping room flooring will be removed and new LVT flooring to be installed.

The existing attic access hatch will be removed, and the opening reconfigured to permit installation of a new rated attic access hatch. New attic access ladders will be provided. A guardrail system will be provided to the existing attic access catwalk where non-existent.

Draftstopping doors will be installed in attic draftstopping separations where existing are missing or have been removed to complete draftstopping assemblies.

HAZARDOUS MATERIAL TESTING

ECS Carolinas has performed lead and asbestos testing at building HP135. Specifications will be prepared to address proper disposal if asbestos and lead paint is found.

SECURITY REQUIREMENTS

No special physical Security requirements have been identified.

ANTI-TERRORISM STANDARDS

The facility will be designed in accordance with UFC 4-010-01; Minimum Antiterrorism Standards for Buildings, and all other standards apply. In accordance with UFC guidance, the facility occupancy classification has been analyzed. The classification for building HP135 shall be primary gathering due to overall occupancy and occupant density within the facility. The facility site is exempt from Standard 1: Standoff Distance as an existing building located within a controlled perimeter. Building HP135 will comply with Standard 9: Exterior Masonry Walls. Both buildings HP135 and the new mechanical building will comply with Standard 10: Glazing and Standard 12: Exterior doors. All doors will swing out in accordance with Standard 12. All glazing will be laminated glass with panes adhered to frames per the requirement Standard 10.

HIGH PERFORMANCE AND SUSTAINABLE BUILDING REQUIREMENTS

High Performance and Sustainable Building (HPSB) Requirements will be continually evaluated and coordinated during design in accordance with UFC 1-200-02, High Performance and Sustainable Buildings Requirements. Facilities will be verified by a third party Commissioning Authority selected and paid by the Government.

DOOR AND WINDOW FENESTRATION

Glazed openings will utilize tinted, laminated, insulated glass. Low-E coatings will be used to minimize interior glare and heat gain.

INTERIOR PARTITION SYSTEM

Interior partitions will be selected to meet structural, sound, fire, and durability characteristics specific to a space or wall location within the footprint. Typical partition walls will be gypsum board and metal stud framing with acoustical insulation and concrete masonry unit partitions. Interior design shall comply with UFC 3-120-10. Reference the Interior Design narrative herein.

OPENINGS

Interior and exterior wall opening frames will be hollow metal. Typical interior doors will be flush hollow metal to match existing. Typical exterior doors will be hollow metal at all building and service entrances.

CEILING SYSTEMS

Administrative and building support spaces will utilize suspended metal grid systems with mineral fiber lay-in tiles to provide the most appropriate combination of acoustics and light reflectance. Gypsum board soffits/bulkheads will be provided as needed to conceal building utilities. Head and shower rooms will be finished with moisture resistant, gypsum board ceilings. Mechanical and electrical rooms will have partitions that extend to the deck with unfinished, exposed structure above.

FLOOR SYSTEMS

Floor systems will consist of typical commercial finishes on concrete slabs. Finishes in specific spaces to be as follows:

- Porcelain tile: Sleeping room bathrooms and toilet rooms adjacent to common areas
- Luxury Vinyl Tile (LVT): Sleeping rooms

- Epoxy resinous flooring: Laundry, duty rooms, restrooms, vending, storage rooms, and Multi-purpose rooms/lounges
- Acrylic modified cementitious resurfacing system: Exterior corridors and elevated walkways, stairs and stair landings
- Sealed concrete: Telecommunication room, mechanical rooms and chases, electrical room, and janitor rooms

NOISE AND ACOUSTIC CONTROL

Spaces will be evaluated, and appropriate STC rated wall and ceiling systems will be employed where necessary.

CIVIL BASIS OF DESIGN

REFERENCE DOCUMENTS

Civil work will comply with the latest edition of the following codes and standards:

UFC 3-201-01	Civil Engineering, 20 December 2022
UFC 3-210-10	Low Impact Development, 28 August 2023
UFC 3-230-01	Water Storage, Distribution, and Transmission, with Change 3, 01 July 2021
UFC 3-240-01	Wastewater Collection and Treatment, with Change 4, 01 October 2024
UFC 3-250-01	Pavement Design for Roads and Parking Areas, 14 November 2016
UFC 3-250-04	Standard Practice for Concrete Pavement Construction, 29 January 2024
UFC 3-600-01	Fire Protection Engineering for Facilities, with Change 6, 06 May 2021
UFC 4-010-01	Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
ASTM	American Society for Testing and Materials
ADA/ABA	Americans with Disabilities Act (ADA) and Architectural Barrier Act (ABA) Accessibility Guidelines
NCDENR	North Carolina Department of Environmental and Natural Resources

PROJECT SCOPE AND DISCUSSION

This project proposes the renovations of Building HP135. The building is currently and will continue to be used as a Bachelor Enlisted Quarters (BEQ).

The civil scope of work for this work included the following:

1. Completion of a physical and topographic survey of the project area.
2. Utility locate for the project area.
3. Development of plans associated with building renovations including sidewalk repairs, grading improvements, and the addition of a new mechanical building.
4. Extension of utilities to serve the facility including:
    a. Public Sewer
    b. Domestic Water
    c. Mechanical Piping
    d. Natural Gas

5. Rehabilitation of the adjacent vehicle parking area.
6. Design of a dumpster enclosure.
7. Development of site landscaping improvements (to be bid as an option).

As a part of the project, existing deteriorated manholes on a segment of sewer main between "C" Street and Building HP250 will be replaced. A total of four manholes will be replaced.

EXISTING SITE CONDITION

Building HP135 is a BEQ located in the Hadnot Point area of the Base off of "A" Street. The building is a hotel-style barracks, three stories in height. Public utilities are available in the area and serve the facility. The surrounding site has a gentle topographic relief away from the building.

PROPOSED DEMOLITION

The proposed demolition needed to execute this project included the clearing and grubbing of miscellaneous vegetation. Existing damaged sidewalks and sidewalks conflicting with other work will be removed and replaced. The existing roof leader system will be removed and replaced. The existing water service to the facility will be capped. A new domestic water service will be established to the facility. The existing mechanical buildings serving the building will be demolished. Underground hydronic piping serving the building will be removed.

PROPOSED CONSTRUCTION

The proposed site improvements for this project include the following major elements:

1. Construction of a new mechanical building.
2. Replacement of damaged sidewalk areas.
3. Installation of support utilities to serve the facility including:
   a. 4" Domestic Water Service to Mechanical Building
   b. 4" Gravity Sewer Service to Mechanical Building
   c. 8" Gravity Sewer Service to HP135
   d. Underground Gutter Leader System
   e. Underground Hydronic Piping
   f. Natural Gas Service to Mechanical Building
4. Construction of site grading features to ensure proper runoff of stormwater.
5. Replacement of asphalt pavement and stone base in the adjacent parking area.
6. Construction of a new dumpster enclosure.
7. Construction of Landscaping Improvements (to be solicited as a Bid Option).
8. Replacement of three deteriorated manholes on a gravity sewer main between "C" Street and Building HP250.

UTILITY CONNECTIONS

WATER SUPPLY

A new 4-inch domestic water service will be provided to the facility. The existing 4-inch domestic water main to the facility will be removed. Backflow prevention is provided on the water service within the mechanical building. The installation and testing of the backflow prevention device is specified in the project specifications and will be completed in accordance with the Safe Drinking Water Act (15A NCAC 18C .0406).

A Public Water Permit approval is not required to properly execute the project. No new water mains or water demand will be generated by the project. The existing 4" water service to the building is being replaced with a new service connection.

SANITARY SEWER
A new 4-inch sewer service will be extended to serve the new mechanical building. The existing 8" sewer service to the BEQ will be removed. A new 8-inch gravity sewer service will be installed at the same location to replace the existing service to HP135. No additional sewer flow will be created as a result of the completion of this project. As a sewer service replacement, no Public Sewer Permit approval is needed to properly execute the project.

PROJECT PERMITTING

STORM DRAINAGE SYSTEM
Building HP135 is located within the Stormwater Permit Boundary of the Hadnot Point Master Stormwater Permit, SW8 020319. A permit modification package has been prepared and submitted for review to the Government and subsequent submission to NCDEQ for approval.

EROSION CONTROL
An Erosion and Sedimentation Control Permit is required to properly execute this project since more than one acre of land disturbing activities will occur. Appropriate erosion control devices are included in the design to restrain erosion and sedimentation during construction.

An Erosion and Sedimentation Control Permit application has been submitted for the project through the North Carolina Division Energy, Mineral and Land Resources.

PUBLIC WATER
A Public Water Permit approval is not required to properly execute the project. Replacement building services do not require a permit action.

PUBLIC SEWER
As replacement services, no Public Sewer Permit approval is needed to properly execute the project.

STRUCTURAL BASIS OF DESIGN

REFERENCE DOCUMENTS
Note: The active governing codes are as prescribed in UFC 3-301-01 effective on the date of this BOD.

UFC 1-200-01	DoD Building Code, with Change 4, 17 December 2024
UFC 3-301-01	Structural Engineering, Change 3, 3 February 2025
UFC 4-010-01	Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
IBC 2024	International Building Code
ACI 318-19(22)	Building Code Requirements for Structural Concrete

ASCE 7-22 Minimum Design Loads for Buildings and Other Structures
ACI 360R-10 Guide to Design of Slabs-on-Ground
SDI-17 Code of Standard Practice for Composite Deck, Form Deck, and Roof Deck Construction
TMS 402/602-16 Building Code Requirements and Specifications for Masonry Structures
AWS D1.1-20 Structural Welding Code

DESIGN LOAD CRITERIA
Risk Category II

LIVE LOADS:
- Roof = 20psf
- Balconies = 100 psf
- Private Rooms = 40 psf
- Public Rooms = 100 psf
- Mechanical/Electrical Rooms = 125 psf

SNOW LOAD:
Importance Factor = 1.0
Ground snow load, P_g = 28 psf
Snow Exposure Factor, C_E = 1.0
Thermal Factor, C_t = 1.2

WIND DESIGN DATA:
Ultimate Wind Speed = 138 mph
Wind Exposure Category = C

SEISMIC DESIGN DATA:
Seismic Importance Factor = 1.0
Mapped Spectral Response Accelerations:
Ss = 17.0%g
S1 = 5.8%g
Site Class = D
Seismic Design Category = B

STRUCTURAL SYSTEM
The existing building consists of a combination of cast-in-place concrete framing and load-bearing concrete masonry unit (CMU) walls supporting hollow core concrete planks at the floors. The elevated exterior walkways around the perimeter consist of cast-in-place concrete outriggers supporting precast concrete planks. The existing foundation consists of shallow concrete spread footings.

The renovation consists of the repair of the precast concrete planks at the exterior elevated walkways and repair of the concrete outriggers at the exterior walkways where required.

MECHANICAL BUILDING

VERTICAL LOAD RESISTING SYSTEM
The roof system will consist of a steel deck diaphragm atop prefabricated light-gauge metal stud trusses which span between load bearing reinforced concrete masonry unit walls. The foundation will consist of shallow concrete spread footings.

WALLS
The structural exterior walls will be composed of reinforced concrete masonry units.

LATERAL FORCE RESISTING SYSTEM
The lateral force resisting system will consist of a steel deck diaphragm that will distribute lateral loads to reinforced concrete masonry unit shear walls.

FIRE PROTECTION BASIS OF DESIGN

Reference the Fire Protection Design Analysis provided as a separate document with this design submittal.

PLUMBING BASIS OF DESIGN

APPLICABLE DESIGN CRITERIA
UFC 3-420-01 Plumbing Systems, 01 April 2021

PLUMBING SYSTEMS
The plumbing systems within the facilities will consist of the following plumbing fixtures:

- Water Closets
- Lavatories
- Sinks
- Showers
- Mop Sinks
- Bi-level Water Coolers
- Laundry Boxes
- Lint Interceptors
- Hose Bibbs
- Floor Drains

A reduced pressure zone backflow preventer will be provided on the domestic water service and will be in the exterior Mechanical Room. Sanitary sewer piping and vent piping for the building will be connected to the site sanitary system at a point approximately 5’-0” outside of the building.

DOMESTIC WATER CALCULATIONS

Building HP135

(92) Water Closets – 10 F.U.'s each – 920 F.U.'s
(92) Lavatories – 2 F.U.'s each – 184 F.U.'s
(92) Showers – 2 F.U.'s each – 184 F.U.'s
(93) Sinks – 2 F.U.'s each – 186 F.U.'s
(3) Water Cooler - .25 F.U.'s each – .75 F.U.
(3) Service Sinks – 2 F.U.'s each – 6 F.U.'s
(1) Sink – 2 F.U.'s each – 2 F.U.'s
(20) Washing Machines – 2 F.U.'s each = 40 F.U.'s
(4) Wall Hydrants – 5 GPM each – 20 GPM

1,542.75 Water Supply Fixture Units (WSFU)
272 GPM, 4" Dia. Main

SANITARY SEWER CALCULATIONS

Building HP135

(92) Water Closets – 4 F.U.'s each – 368 F.U.'s
(92) Lavatories – 1 F.U.'s each – 92 F.U.'s
(92) Showers – 2 F.U.'s each – 184 F.U.'s
(93) Sinks – 2 F.U.'s each – 186 F.U.'s
(3) Water Cooler - .5 F.U.'s each – 1.5 F.U.
(3) Service Sinks – 2 F.U.'s each – 6 F.U.'s
(1) Sink – 2 F.U.'s each – 2 F.U.'s
(20) Washing Machines – 2 F.U.'s each = 40 F.U.'s
(13) Floor Drains – 2 F.U.'s each = 26 F.U.'s

905.5 Drainage Fixture Units (DFSU)
This equates to an 8" sanitary sewer main @ 1/8" per foot slope

HOT WATER CALCULATIONS

Building HP135 Hot Water Load

Mixed Water Temperature Equation: P = (Tm – Tc) / (Th-Tc)
Th = Supply hot water temperature
Tc = Inlet cold water temperature
Tm = Desired mixed water temperature
P is the hot water multiplier, which is expressed as a percentage.

P = (122 – 60) / (140 – 60)
P = 62 / 80 = .78

# of Rooms x # of Occupants per Room (OPR) x HW per Occupant x P = GPH Demand

92 Rooms x 2 OPR x 11.25 GPH x .78 = 1,614.6 GPH Demand

The water heaters specified are two (2) 600 gallon (960 gallons available total) with 500,000 BTU input and recover a total of 1,174 GPH at 100-degree rise. Therefore, 2,134 gallons is available to meet the one-hour peak demand.

FIXTURES AND EQUIPMENT
Water closets will be floor mounted, back outlet, manual-operated flush valve, elongated bowl with open front seat less cover. Water usage will be 1.28 gallons per flush.

Lavatories will be counter-mounted, vitreous china, with single-handle faucet, 1-1/2 inch P-Trap and 3/8 inch angle supplies with stop valves for hot and cold water. Faucets will be 0.5 gpm flow.

Sinks will be counter-mounted, stainless steel, with dual-handle faucet, 1-1/2” ince P-Trap and 3/8 inch angle supplies with stop valves for hot and cold water. Faucets will be 1.5 gpm flow.

Showers will be solid surface and provided with anti-scald valves. Shower faucets will be single-handle with 2.0 gpm flow restrictors.

Mop sinks will be terrazzo receptors provided with stainless steel drain strainers, mop hangers, hose, and hose bracket. Mop sink faucets will be heavy-duty, chrome-plated with vacuum breaker, wall brace, pail hook, and hose thread.

Bi-level Water Coolers will be electric refrigerated type provided with a bottle-filling station on one unit.

Floor drains will be provided in laundry rooms, janitor closets and mechanical rooms. Floor drains will be provided in the mechanical rooms to receive condensate from air handling equipment. Condensate piping will be routed to the sanitary.

Materials
The above grade sanitary waste, vent, and storm systems will be PVC pipe and fittings with glued joints. The below grade sanitary waste, vent, and storm systems will be PVC pipe and fittings with glued joints.

Domestic water piping will be copper tubing, ASTM B88; Type L with solder joint fittings fabricated with code approved "lead free" solder for above ground piping and type K copper tubing for below grade applications.

Domestic water piping will be copper tubing, ASTM B88; Type L with solder joint fittings fabricated with code approved "lead free" solder for above ground piping and type K copper tubing for below grade applications. Installation or repair of any piping, fittings, solder or flux providing water for possible human consumption must be "lead-free" as defined by the Reduction of Lead in Drinking Water (RLDWA). The RLDWA revised the definition of lead free to a weighted average of 0.25% of the wetted surfaces of plumbing products and 0.2% lead for solder and flux. A methodology for calculating the weighted average of wetted surfaces can be found at www.epa.gov.

Glass fiber insulation with all service jacket will be applied to all domestic cold and hot water piping.

Elastomeric foam insulation with vapor barrier will be applied to all above grade storm and condensate piping.

Valves will be solder type, ball, for use with the copper tubing, Class 125 in accordance with MSS SP-80.

Testing
Domestic water piping will be tested in sections at 100 psig for two hours.

DWV piping will be subjected to a final air pressure test of 1.0 inches of water column, or a smoke test.

Disinfection will be in accordance with AWWA C651 using a solution containing a minimum of 50 parts per million of available chlorine.

MECHANICAL BASIS OF DESIGN

PROJECT DESCRIPTION
This is a renovation project of a three story barracks building located at Marine Corps Base Camp Lejeune, North Carolina. The building was built in 1979.

DESIGN CONDITIONS

Outdoor Summer Design temperatures:	91.0°F DB / 77.0°F WB (1% ASHRAE)
Outdoor Winter Design temperature:	22.0°F DB (99.6% ASHRAE)
Indoor Design Conditions:	Occupied: 76°F Summer / 70°F Winter
	Unoccupied: 84°F Summer / 60°F Winter
Indoor Design Relative Humidity:	30% to 60%

DESIGN CRITERIA

The design shall be in accordance with the latest editions of, but not limited to, the following design criteria:

IMC 2021 International Mechanical Code
NFPA 54 National Fuel Gas Code, 2024 edition
NFPA 90A Installation of Air-Conditioning and Ventilation Systems, 2024 edition
UFC 1-200-01 DoD Building Code, with Change 4, 17 December 2024
UFC 3-401-01 Mechanical Engineering, 28 July 2025
UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems, 28 July 2025
UFC 4-010-01 Minimum Antiterrorism Standards for Buildings, with Change 3, 24 May 2024
ASHRAE 55 – 2023 – Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1 – 2019 – Ventilation for Acceptable Indoor Air Quality
ASHRAE 90.1 – 2019 – Energy Standard for Buildings except Low Rise Residential Buildings
FC 1-300-09N Navy and Marine Corps Design Procedures, with Change 1, 17 April 2025
Marine Corps Base Camp Lejeune Mechanical Design Guidance – 01 August 2024

MECHANICAL SYSTEM

The primary HVAC system for this building is 4-pipe chilled water / hot water system with constant volume Dedicated Outside Air System (DOAS) units, individual heat pump Packaged Terminal Air Conditioner (PTAC) in each Sleeping Room and 4-pipe Air Handling Units (AHU) to serve the Core Areas. An air-cooled chiller will be in the Mechanical Yard and chilled water will be piped above ground through a buffer tank to the new Mechanical Building. Chilled water will then be pumped in a primary only configuration underground to all DOAS units and AHUs. Existing hot water system with natural gas-fired condensing boilers will be utilized, piped primary/secondary and pumped underground to all DOAS units, AHUs, and Unit Heaters (UH). The indoor air handlers serving the Laundry and Lounge areas shall be single zone VAV and have a supply fan, chilled water coil, hot water reheat coil and MERV 8 and 13 filters on the return air. Outside air is pre-conditioned by interior DOAS units on each floor with supply fans, reheat hot water coils, chilled water coils, and pre-heat hot water coils. A standalone fixed plate, total enthalpy heat exchanger with a supply and exhaust fan will be provided in the third-floor mechanical room and ducted to throughout building. The outside air is delivered directly to the spaces served. The amount of outside air will be measured, to ensure enough is brought into the building to meet ASHRAE 62.1 – 2019 requirements to maintain indoor air quality, and to positively pressurize the corridors and all rooms with exterior openings.

<u>General</u>

Air distribution will be via overhead galvanized sheet metal ductwork designed in accordance with SMACNA Duct Construction Standards. Duct will be wrapped with 2”, 1-lb. exterior insulation, no duct liner shall be used. The ductwork systems are designed to provide a low noise environment. Air distribution shall be ceiling mounted. Duct construction shall be for low pressure on all units.

Separate and independent ductless split-system DX cooling units for the second floor Telecommunication Room are to be provided.

All air systems shall have a full Test and Balance performed to verify performance match's design.

Exhaust shall be provided in all Toilet rooms, Shower Rooms, Wardrobe Closets and Janitors closets and shall be routed through the DOAS units and then out the building.

Dryers shall be individually ducted to a lint trap, with an opening through a louver to the exterior and an access panel for clean-out.

ATFP

All applicable requirements of UFC 04-010-01 will be followed. All outside air intakes shall be a minimum of 10' above grade. Low leakage dampers will be installed at all building exterior wall penetrations by the HVAC system. An emergency stop button will be located inside the facility to shut down all air moving systems.

BUILDING AUTOMATION SYSTEM

All control and monitoring points will be connected through a single complete building automation system (BAS) suitable for direct digital control (DDC) of all HVAC system components within the building. The control system within the building shall utilize an open protocol implementation of BACnet technology and will utilize ANSI/CEA 709.1B as the communication protocol between DDC hardware devices. All utility meters shall employ the BACnet protocol, with the water and gas meters outputting to the building DDC system and the electric meters outputting directly to the base wide electric metering system. The DDC system will have the ability to limit the operating hours of any equipment, as well as perform setback functions when parts of the building are unoccupied. The DDC system will be compliant will all Cybersecurity requirements. The Mechanical Room shall be provided with a local display panel for monitoring and schedule program changes. The BAS shall be provided with a router to communicate all building points to the base wide EMCS located in Building 24.

ELECTRICAL BASIS OF DESIGN

REFERENCE DOCUMENTS

Note: The active governing codes are as prescribed in FC 1-300-09N effective on the date of this task order.

UFC 3-501-01	Electrical Engineering, 27 November 2024
UFC 3-520-01	Interior Electrical Systems, 16 January 2025
UFC 3-530-01	Interior and Exterior Lighting Systems, Change 1, 15 December 2023
UFC 3-550-01	Exterior Electrical Power Distribution, Change 3, 01 Nov 2019
UFC 3-560-01	Electrical Safety, O&M, Change 3, 15 May 2023
UFC 3-575-01	Lightning and Static Electricity Protection Systems, Change 1, 01 Oct 2021
NFPA 70	National Electric Code, 2023 edition
NFPA 101	Life Safety Code, 2024 edition
NFPA 780	Standard for the Installation of Lightning Protection Systems, 2023 edition

Camp Lejeune Electrical Policies_v20250516

Applicable UL standards (latest editions)
Applicable NEMA standards (latest editions)

EXTERIOR ELECTRICAL SYSTEMS
A new electrical system will connect the existing 12.47 kV underground primary on site at an existing MV switch and extend to a new above-ground junction box. This will refeed existing building HP112 and feed new PMTs. A new PMT will be provided for both the BEQ and for the mechanical building. Secondary service conductors for the BEQ shall be fed from the new 500 kVA PMT to a service-entrance rated, 208 volt, 3-phase, 2500 amp main breaker switchboard inside the building. Secondary service conductors for the mechanical building shall be fed from a new 225 kVA PMT to a service-entrance rated, 480 volt, 3-phase, 400 amp main breaker panelboard inside the building. Spare conduits will be installed in the service duct banks to allow for future flexibility. A lightning protection system per NFPA 780 will be provided for this building.

INTERIOR ELECTRICAL SYSTEMS
The electrical building distribution system shall be designed for the type of loads served. All panels shall be fully rated for fault current and designed with a minimum of 20% spare breaker capacity and 15% space in each panel. All panels shall have copper bus, a separate grounding bus, and will utilize bolt-on type breakers. All feeders shall be sized for a maximum voltage drop of 2%, while branch circuits shall not exceed a voltage drop of 3%. Panels that supply non-linear loads will be provided with a 200% rated neutral. All conductors shall be copper, and MC cabling is not allowed, except per UFC restrictions. All conductors shall be installed in conduit with a minimum conduit size of 3/4”. All electrical devices in this facility shall be U.L. listed and labeled.

Interior lighting shall be designed in accordance with the Illuminating Engineering Society (IES) recommendations. Lighting levels shall meet UFC and user requirements. All new light fixtures shall be energy-efficient LED type. Lighting shall consist of fixtures suitable for the environment in which they are being installed. Emergency lighting shall be separate wall pack fixtures per base standards and shall be spaced to comply with NFPA 101. Test switches shall be integral to fixture. Exit signs shall be LED type, and night lights shall be designed and located according code requirements. Lighting controls, where applicable, will be utilized to meet ASHRAE and UFC requirements, and to maximize energy savings. This could include dual technology occupancy/vacancy sensors, relay panel, timeclock, and/or photocell.

Receptacles and floor boxes for all areas shall follow project and user requirements as it relates to locations, spacing, heights, and type. Connections for all equipment shall be provided for all new equipment per information provided. Dedicated circuits will be run as required for equipment or user needs. Electrical power and infrastructure for mechanical, plumbing, telecommunications, audio/visual (AV), and other low voltage systems will be coordinated and provided to meet project specifications.

TELECOMMUNICATIONS BASIS OF DESIGN

APPLICABLE DESIGN CRITERIA

UFC 3-580-01 Information and Communications Technology Infrastructure Planning and Design, 21 November 2024
Camp Lejeune Base Specification 27 10 00, v04/22
Camp Lejeune Base Specification 33 82 00, v08/22
Applicable EIA and TIA standards (latest editions)
Applicable UL standards (latest editions)
NFPA 70 National Electric Code, 2023 edition

EXTERIOR TELECOMMUNICATIONS SYSTEMS

New OSP infrastructure and cabling must be provided for this facility. This includes 50 pair OSP copper and 24 strand single mode OSP fiber. OSP cabling and infrastructure shall connect to existing manhole on site. All new duct bank shall be concrete-encased.

INTERIOR TELECOMMUNICATIONS SYSTEMS

The new telecommunications service for each building shall include, but not be limited to, vertical, horizontal, and backbone distribution, copper and fiber optic backbone and distribution cabling, termination equipment, workstation outlets, racks, cable trays, cable management, patch panels, conduits, backboards, and grounding. Cable trays may be used for cable distribution throughout the building, and ladder racks will be utilized in the telecommunications rooms. Voice and data connectivity will be provided all workstations, floor boxes, printers, and other equipment per project and user requirements. All telecommunications requirements shall adhere to the applicable design criteria and base standards.

INTERIORS BASIS OF DESIGN

INTERIOR DESIGN CRITERIA

Interior Design work will comply with the latest edition of the following codes and standards:

FC 1-300-09N Navy and Marine Corps Design Procedures, 17 May 2024
UFC 1-200-01 DoD Building Code, with Change 4, 17 December 2024
UFC 3-120-01 Design: Sign Standards, with Change 4, 01 February 2023
UFC 3-120-10 Interior Design, with Change 2, 15 June 2021
UFC 3-190-06 Protective Coatings and Paints, 01 March 2021

INTERIOR BASIS OF DESIGN

This Basis of Design Narrative outlines the proposed Structural Interior Design requirements for Repairs to BEQ HP135 at United States Marine Corps Base, Camp Lejeune. The interior finishes are the most exposed interior elements in a building and must be durable to withstand the daily traffic and demands of the environment. To meet these objectives, the SID package will use all the general requirements for interior finishes that have been applied in similar facilities recently constructed at MCB Camp Lejeune, as

well as best practices recommended by manufacturers for areas requiring enhanced durability. Structural finishes in accordance with the following guidelines will provide longevity and timeless aesthetics without compromising the functional integrity of the facility.

Finishes will be selected because of their high durability and low maintenance requirements. Luxury vinyl tile flooring will be used in sleeping quarters and office spaces, while common lounge areas will receive epoxy resinous flooring. Porcelain tile will cover the floors in the head/shower rooms. The laundry rooms corridors and utility spaces on all floors will receive sealed concrete floors.

Interior partitions will be painted CMU & drywall. Accent walls will be painted in sleeping rooms to provide visual variety. Offices will recieve a solid accent wall while toilet rooms will recieve porcelain tile with a glazed ceramic tile accent band. All wall finishes will be cohesive to adjacent spaces and provide a fresh and upgraded look. Drywall and exposed ceilings will also have a painted finish.

Interior signage will be provided throughout the facility to form a well-organized, comprehensive interior environment that guides users and visitors through the building. Interior Signage will include identification, directional, and informational systems utilizing permanent and changeable signage.