# Repairs G703

at the

UNITED STATES MARINE CORPS BASE

CAMP GEIGER, NORTH CAROLINA

May 29, 2026

A/E Contract: N40085-25-D-2528

Task Order No.: N40085-25-F-0820

Project No.: 25-0051

# 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(22) 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
NFPA 780 Standard for the Installation of Lightning Protection Systems, 2023 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 402/602-16 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 4-721-10N Navy and Marine Corps Unaccompanied Housing, with Change 1, 24 April 2025
Camp Lejeune Base Exterior Architectural Plan (BEAP) – 2010
Camp Lejeune Mechanical Design Guidance – 01 August 2024
Camp Lejeune Electrical Policies_v20220308
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
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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
Camp Lejeune Base Exterior Architectural Plan (BEAP) – 2010

**SCOPE OF WORK**
This Basis of Design narrative outlines the repair and renovation of Building G703. It also includes the construction of a new mechanical building adjacent to Building G703, construction of a new trash dumpster enclosure, and the demolition of Building G713. All buildings are located at United States Marine Corps Base Camp Geiger, North Carolina.

Building G703 is a Bachelor Enlisted Quarters (BEQ). The facility is a 3-story BEQ building with six squad bay living spaces, each housing up to sixty occupants. The facility includes 36,851 gross square foot, 35,861 square foot of conditioned space, and a 15,127 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 G703 is currently served by Building G713, a 1-story, 750 square foot, mechanical building with 308 square foot chiller yard. As part of this scope, Building G713 and its chiller yard will be demolished.

**TYPE OF CONSTRUCTION**
The occupancy classification for building G703 is Group R-2 Residential (Dormitory) with Type IIIB (unprotected 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 G703 is a standing seam metal roof with a roof pitch of 4 vertical to 12 horizontal.

**Exterior work includes the following:**
- Existing exterior aluminum windows will be replaced with new aluminum-framed fixed window units. While blast resistance is not required, the new windows will comply with the applicable Minimum Antiterrorism Standards of UFC 4-010-01, including frame bite and laminated glazing, and will meet the large missile impact requirements for windborne debris regions.

- Exterior doors and door hardware will be replaced. New doors will be aluminum storefront or painted steel insulated units. Existing steel lintels will be replaced on an as-needed basis.

- 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.

- All existing exterior stairs and concrete 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 remain in place but will be fully covered by new retrofit-style metal stair treads, sized to fit within new handrail / guardrail units where required.

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

- Prefinished metal gutters and downspouts will be installed at the 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 standing seam metal 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 or roof structure will be replaced.

**EXTERIOR CONCRETE**
All existing exterior concrete, including exterior stairs and landings, will be inspected and repaired where concrete spalling and/or cracking occurs.

**RAILINGS**
Existing metal handrails and guardrails will be inspected. Damaged sections will be removed and replaced. New and repaired sections will be galvanized to match the existing finish and will be similar in design

**EXTERIOR WALL SYSTEM**
The exterior wall system consists of brick and architectural block veneer backed by reinforced CMU walls. Repairs or modifications will be addressed as needed.

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

A fall protection system will be installed as part of the roofing scope.

**THERMAL INSULATION**
Thermal insulation consists of existing wall and roof insulation. Exterior CMU walls contain one inch of rigid insulation with a minimum R-value of 5. The roof contains approximately R-30 batt insulation. Existing insulation will be retained unless damaged or deficient

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

All existing textured ceilings will be removed throughout the building. Ceilings will be cleaned and repainted. Gypsum board ceilings will be removed as needed to accommodate new plumbing and mechanical installations and will be replaced with new gypsum board ceilings.

The existing laundry facility will be reconfigured within the same footprint to accommodate one washer and two dryers per 15 occupants. A total of twenty-four washers and forty-eight dryers will be provided. Dryers will be double-stacked and backed up to a double-loaded service chase.

Six existing service sinks will be removed and relocated to accommodate additional laundry equipment. Three service sinks and three floor-mounted mop sinks will be provided.

The lounge/briefing, laundry, offices, lobby, corridor, and duty rooms 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 new gypsum board ceilings.

Existing heads will be completely renovated with all fixtures, accessories, and finishes removed. New tamper-resistant, ligature-resistant stainless steel fixtures and accessories will be installed. Existing ceramic floor and wall tile will be removed and replaced with new large format porcelain tile.

Common area heads will receive new stainless steel vanities with a vanity mirror and stainless steel shelf above. Floor-mounted stainless steel water closets with hinged toilet seats, no covers, will be installed. Where applicable, common area heads will include showers with solid surface surrounds and bases and will include an anti-ligature shower rod with hooks, a shower curtain, and an anti-ligature robe hook. Sleeping room showers are not designed to meet ADA/ABA accessibility requirements and are provided as standard, non-accessible units. Porcelain tile (approximately 7’-0” high) will be provided on remaining wall surfaces with linear porcelain tile on the floors. Ceilings will be finished with painted gypsum board. Accessories will include wall-mounted toilet tissue dispensers and soap dispensers.

Squad bay heads will receive individually mounted stainless steel lavatories with a vanity mirror and stainless steel shelf above. Wall-mounted stainless steel urinals and floor-mounted stainless steel water closets with hinged toilet seats, no covers, will be installed. Wall-mounted urinals and floor-mounted water closets will have exposed flush valves to aid in leak monitoring and will be separated by HDPE partitions with floor-to-ceiling mounted bracing. The shower room will include ten individual showers, each separated by HDPE shower partitions and equipped with solid surface surrounds and bases, individual floor drains, anti-ligature shower rods with hooks, a shower curtain, and an anti-ligature robe hook. Showers will not be accessible. Porcelain tile (approximately 7’-0” high) will be provided on

remaining bathroom wall surfaces and linear porcelain tile will be provided on the floors. Ceilings will be finished with painted gypsum board. Accessories will include anti-ligature robe hooks, semi-recessed toilet tissue dispensers, and soap dispensers.

All existing flooring throughout the building will be removed and replaced with new.

An attic access catwalk will be installed to permit access to attic areas and minimize disturbance of insulation. Existing attic access hatches will remain. Draftstopping doors will be installed or repaired in attic draftstopping separations where missing, removed, or non-compliant, to complete draftstopping assemblies.

**HAZARDOUS MATERIAL TESTING**

ECS Carolinas has performed lead and asbestos testing at building G703. Specifications will be developed to ensure proper removal and disposal of identified hazardous materials in accordance with applicable regulations. Refer to the Asbestos and Lead Paint Survey for additional information.

**SECURITY REQUIREMENTS**

No special physical Security requirements have been identified for this project.

**ANTI-TERRORISM/FORCE PROTECTION**

The facility will be designed in accordance with UFC 4-010-01, Minimum Antiterrorism Standards for Buildings, and all other applicable standards. In accordance with UFC guidance, the facility occupancy classification has been analyzed. Building G703 is classified as Primary Gathering due to overall occupancy and occupant density.

The facility site is exempt from Standard 1: Standoff Distance as Building G703 is an existing structure located within a controlled perimeter.

Building G703 will comply with Standard 9: Exterior Masonry Walls. Both Building G703 and the new mechanical building will comply with Standard 10: Glazing and Standard 12: Exterior Doors. All exterior doors will swing outward in accordance with Standard 12. All glazing will consist of laminated glass with panes adhered to frames in accordance with 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. Mechanical systems shall be 20% more energy efficient than ASHRAE 90.1-2013 standard.

**DOOR AND WINDOW FENESTRATION**

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

**INTERIOR PARTITION SYSTEM**

Interior partitions will be selected to meet structural, acoustical, fire-resistance, and durability characteristics specific to each space or wall location within the footprint. Typical partition assemblies will consist of gypsum board on metal stud framing with acoustical insulation, and concrete masonry unit (CMU) partitions where applicable. 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 or aluminum storefront. Typical interior doors will be flush hollow metal units matching existing conditions. Exterior doors will be hollow metal at service and squad bay entrances, and aluminum storefront at common entrances.

**CEILING SYSTEMS**

Administrative and building support spaces will utilize suspended metal grid systems with gypsum board ceilings. Gypsum board soffits and 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 applied over concrete slabs. Finishes will be provided in specific spaces as follows:

- Acrylic modified cementitious resurfacing system: Exterior stairs and stair landings
- Porcelain tile: Common area and squad bay heads
- Epoxy resinous flooring: Open squad bays, offices, closets, corridors, laundry, duty, vending, storage, interior stairs and landings, and multi-purpose rooms/lounges
- Sealed concrete: Telecommunication room, mechanical rooms, electrical rooms, and janitor rooms

**NOISE AND ACOUSTIC CONTROL**

Spaces will be evaluated, and appropriate STC-rated wall and ceiling systems will be provided where necessary to meet acoustic performance requirements.

## 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 G703. 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 and drainage 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
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).
8. Paving of an adjacent existing gravel parking lot.

**EXISTING SITE CONDITION**

Building G703 is a BEQ located in the Camp Geiger area of New River Air Station. The building is 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. Underground hydronic piping serving the building will be removed. The existing dumpster enclosure will be removed.

The existing mechanical building, G713, will be demolished.

**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. Underground Gutter Leader System
d. Underground Hydronic Piping

4. Construction of site grading features to ensure proper runoff of stormwater.
5. Replacement of asphalt surfaces in the adjacent parking area at the front entrance of G703.
6. Construction of a new dumpster enclosure.
7. Construction of Landscaping Improvements (to be solicited as a Bid Option).
8. Paving improvements to the existing gravel parking area on the western side of G703.

**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 sewer service to the BEQ will remain to a point 5 feet outside of the BEQ. The existing sewer service will be reconnected to the new BEQ plumbing system.

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.

STORMWATER

A new roof leader system will be installed and connected to the existing storm drain system surrounding the building.

**PROJECT PERMITTING**

STORM DRAINAGE SYSTEM

Development of the G703 project area was permitted under two Coastal Stormwater Permits. Permit SW8 960501 was issued for the construction of the G702 and G703 complex in 1996. Stormwater Basin SWP23 was constructed on the eastern side of “C” Street to treat the runoff from the development. In 2008, Permit SW8 080126 was issued. Stormwater Basin SW107 was constructed on the eastern side of “C” Street to treat the runoff from the Parade Deck area between G702 and G703.

Maintenance deficiencies that exist with these two basins will be corrected as a part of a separate project.

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. A total of 176,215 SF, 4.05 acres of land will be disturbed to execute the project. 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 is not required to be secured associated with the installation of a new building water service.

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 02/602-16 | 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, Pg = 28 psf
Snow Exposure Factor, CE = 1.0
Thermal Factor, Ct = 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 cast-in-place concrete frame with elevated concrete slabs at the second and third floor and attic levels. The hipped roof is framed with prefabricated wood trusses that bear on the concrete framing and slab at the attic level.

The renovation consists of the repair of cracked and spalling concrete primarily at the exterior of the building and at the exterior concrete stairs. A new wood framed attic access catwalk will also be framed within the existing wood roof trusses.

**MECHANICAL BUILDING ADDITION**
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
- Service 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 installed 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**

<u>Building G702</u>

(32) Water Closets – 10 F.U.'s each – 320 F.U.'s
(30) Urinals – 5 F.U.'s each – 150 F.U.'s
(62) Lavatories – 2 F.U.'s each – 124 F.U.'s
(61) Showers – 2 F.U.'s each – 122 F.U.'s
(3) Water Coolers - .25 F.U.'s each – .75 F.U.
(6) Laundry Sinks – 2 F.U.'s each – 12 F.U.'s
(3) Mop Sinks – 2 F.U.'s each – 6 F.U.'s
(20) Washing Machines – 2 F.U.'s each – 40 F.U.'s

774.75 Water Supply Fixture Units (WSFU)
180 GPM, 4" Diameter Main is being provided.

**PRESSURE CALCULATIONS**:

| | |
|---|---|
| STATIC PRESSURE IN MAIN: | 52 PSI |
| PRESSURE LOSS THRU BACKFLOW: | 9 PSI |
| PRESSURE LOSS THRU METER: | 2.7 PSI |

REMAINING PRESSURE AVAILABLE: 40.3 PSI

| | |
|---|---|
| MINIMUM PRESSURE REQUIRED AT LAST FIXTURE: | 25 PSI |
| STATIC HEAD LOSS (33 FEET X .43): | 14.19 PSI |
| AVAILABLE STATIC PRESSURE: | 1.11 PSI |

Water pipe sizes are based on a minimum working pressure of 52 psi at a flow rate of 180 gpm at the location where the main service enters the building. Although available static pressure is minimal, all existing fixtures seemed to be performing as designed. We do not foresee any issues with not providing a domestic booster pump to raise the incoming pressure to the building.

**SANITARY SEWER CALCULATIONS**

Building G702

(32) Water Closets – 4 F.U.'s each – 128 F.U.'s
(30) Urinals – 4 F.U.'s each – 120 F.U.'s
(62) Lavatories – 1 F.U.'s each – 61 F.U.'s
(61) Showers – 2 F.U.'s each – 122 F.U.'s
(3) Water Coolers - .5 F.U.'s each – 1.5 F.U.
(6) Laundry Sinks – 2 F.U.'s each – 12 F.U.'s
(3) Mop Sinks – 2 F.U.'s each – 6 F.U.'s
(20) Washing Machines – 2 F.U.'s each – 40 F.U.'s
(20) Floor Drains – 2 F.U.'s each – 40 F.U.'s

530.55 Drainage Fixture Units (DFSU)
This equates to a 6" sanitary sewer main @ 1/8" per foot slope

**HOT WATER CALCULATIONS**

Building FG702 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 = (110 – 65) / (140 – 65)
P = 45 / 75 = .6

# of Occupants x HW per Occupant x P = GPH Demand

360 Occupants x 11.25 GPH x .6 = 2,430 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 1,652 GPH at 70-degree rise. Therefore, 2,612 gallons is available to meet the one-hour peak demand.

**HOT WATER RETURN CALCULATIONS – TABLES 1 AND 2 (FROM JAMES M PLEASANTS)**

**BTUH heat loss per 100 ft for tubing and steel pipe.**

| Pipe or Tube Size | Insulated Copper Tube or Steel Pipe | Non-Insulated Steel Pipe | Non-Insulated Copper Pipe |
|---|---|---|---|
| 1/2" | 1600 | 4,000 | 2,300 |
| 3/4" | 1800 | 5,000 | 3,000 |
| 1" | 2000 | 6,000 | 4,000 |
| 1 1/4" | 2400 | 7,500 | 4,500 |
| 1 1/2" | 2600 | 8,500 | 5,500 |
| 2" | 3000 | 11,000 | 6,500 |
| 2 1/2" | 3400 | 12,000 | 8,000 |
| 3" | 4000 | 15,000 | 9,500 |
| 4" | 4800 | 19,000 | 12,000 |
| 5" | 5700 | 22,500 | |
| 6" | 6600 | 26,000 | |

**TABLE 2: FROM JAMES M. PLEASANTS SIZING GUIDELINES**

| Temperature Drop | BTU/GPM Relationship |
|---|---|
| 10° | 5,000 B/Hr. = 1 GPM |
| 15° | 7,500 B/Hr. = 1 GPM |
| 20° | 10,000 B/Hr. = 1 GPM |

**HOT WATER RETURN CALCULATIONS**

1-1/4" – 110' length - 2400 x 110 ft/100 = 2,399 btuh
1-1/2" – 409' length – 2600 x 409 ft/100 = 10,634 btuh
2" – 50' length – 3000 x 50 ft/100 = 1,500 btuh
2-1/2" – 290' length – 3400 x 290 ft/100 = 9,860 btuh

Total supply heat loss: 24,393 btuh

Required recirculation flow rate: 24,393 / 5000 = 4.88 gpm

Pipe pressure drop:

1-1/4" – 110' X 1.2 = 132' (Total Equivalent Length)
132' @3.2 psi/100' = 4.22 psi

1-1/2" – 409' x 1.2 = 491' (total equivalent length)
491' @2.4 psi/100' = 11.78 psi

2" – 50' x 1.2 = 60' (total equivalent length)
60' @2.1 psi/100' = 1.26 psi

2-1/2" – 290' x 1.2 = 348' (total equivalent length)
348' @1.8 psi/100' = 6.26 psi

23.52 psi loss total x 2.3 ft hd/psi = 54 ft hd

Therefore, a recirculation pump that can provide a minimum of 4.88 gpm at a 54' head loss will be selected.

**FIXTURES AND EQUIPMENT**

Water closets will be floor mounted, bottom outlet, stainless steel, manual-operated flush valve, elongated bowl with open front seat less cover. Water usage will be 1.28 gallons per flush.

Lavatories will be wall-mounted, stainless steel, 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.

Service sinks will be vitreous china trap-mounted type. Service-sink style faucets will be provided.

Showers will be solid surface and provided with anti-scald valves. Shower faucets will be push-button anti-ligature type 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 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.

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 37,825 sq.ft. barracks building located at Camp Geiger, Marine Corps Base Camp Lejeune, North Carolina. The building was built in 1999.

**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:

International Mechanical Code – 2021 Edition
NFPA 90A – Installation of Air-Conditioning and Ventilating Systems (2024)
NFPA 54 – National Fuel Gas (2024)
UFC 1-200-02 – High Performance and Sustainable Building Requirements (1 DEC 2020, ch 03, 8 JUL 2025)
UFC 3-401-01 - Mechanical Engineering (1 JUL 2013, ch 10, 28 JUL 2025)
UFC 3-410-01 - Heating, Ventilation and Air Conditioning Systems (1 JUL 2013, ch 10, 28 JUL 2025)
UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings (12 DEC 2018, ch 03, 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 - Marine Corps Design Procedures (17 MAY 2024, ch 01, 17 APRIL 2025)
SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition
SMACNA - HVAC Air Duct Leakage Test Manual, 2nd Edition
Marine Corps Base Camp Lejeune Mechanical Design Guidance – Aug 2024

**MECHANICAL SYSTEM**

The primary HVAC system for this building is 4-pipe chilled water / hot water system with constant volume Air handling (DOAS) units, fixed plate heat exchanger (HX) units and 4-pipe Air Handling Units (AHU) to serve the Core Areas. An air-cooled chiller will be located in the Mechanical Yard and 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 building and equipment. Multiple natural gas fired condensing boilers shall be located in the Mechanical Building, 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 an inline fixed plate heat exchanger and an exhaust fan. The chilled and hot water coils in the DOAS units are sized for failure of the fixed plate heat exchanger. The amount of outside air will be measured, to ensure sufficient quantities are brought into the building to meet ASHRAE 62.1 – 2016 requirements to maintain indoor air quality, and positively pressurize the corridors and all rooms with exterior openings.

<u>Central Laundry</u>

The central laundry will be provided with two (2) manifolded exhaust systems, each with inline lint interceptor, booster exhaust fan and dedicated make-up air fan. The system will respond to dryer operation to ramp up or down to provide the appropriate amount of exhaust and make-up air.

<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.

We have provided separate and independent ductless split-system DX cooling units for the second floor Telecommunication Room.

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 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_v20220308
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. 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 300 kVA PMT to a service-entrance rated, 208 volt, 3-phase, 1600 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**

Existing 50 pair OSP copper is existing and shall remain. New 50 pair copper backbone cabling must be run from the first floor telecommunications entrance room to the new second floor telecommunications room. Existing 12 strand single mode OSP fiber will need to be replaced from closest demarcation point outside the building and run to the new second floor telecommunications room.

**INTERIOR TELECOMMUNICATIONS SYSTEMS**

The new telecommunications scope will create a new telecommunications room on the second floor. New backbone copper and fiber will be run from the service entry point in the existing first floor telecommunications room to the new second floor room. Additional scope 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, with Change 1, 17 April 2025
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
UFC 3-120-01 Design: Sign Standards, with Change 4, 01 February 2023
UFC 3-120-01 Design: Sign Standards, with Change 4, 01 February 2023
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 G702 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. Squad bays, common areas, laundry rooms, and corridors and offices will receive epoxy resinous flooring. Porcelain tile will cover the floors in the head/shower rooms.

Interior partitions will be painted CMU & drywall. Accent walls painted in geometric shapes will be used in the Squad Bays to break up the large open spaces and provide visual variety. Offices will receive a solid accent wall while toilet rooms will receive porcelain tile with a glazed porcelain tile accent band. All wall finishes will be cohesive to adjacent spaces and provide a fresh and upgraded look. Drywall and exposed ceilings will 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.