UNC GREENSBORO
Board *of* Trustees

Finance *and* Administration Committee
February 4, 2025

Action Item

FAC - 1 Designer Selection - Chilled Water Infrastructure Project Phase 2

Background Information

The project's scope addresses the remaining chilled water infrastructure needs identified in our 2020 campus master plan that could not be addressed as part of an ongoing Phase 01. This includes replacing a 750-ton chiller with a new 1500-ton chiller, supporting infrastructure, and possibly extending the campus chilled water loop to connect additional campus buildings.

The aging chiller needs replacement, and the new chiller and associated equipment will provide reliable chilled water production for the next 20-25 years. This project will also address the potential to extend the loop to additional campus buildings and implement additional equipment to add needed capacity to the plant.

All work will fully integrate with the campus Building Automation Systems (BAS).

Project Cost: **$5,726,250**

The University of North Carolina System website advertised the request for qualifications and letters of interest for engineering services for this project. Seven (7) firms submitted letters of interest, none from Guilford County.

The Designer Selection Committee reviewed the letters of interest and invited three firms to interview on December 9, 2024, to present their qualifications and recommend the following in ranking order.

1. RMF Engineering Inc., Raleigh, NC
2. Affiliated Engineering Inc., Chapel Hill, NC
3. DeVita & Associates, Charlotte, NC

The firm of RMF Engineering is an engineering firm and is recommended as the Designer for the following reasons:

1. RMF demonstrated the most specific chilled water infrastructure expertise and technical excellence for utility projects, like the Chilled Water Infrastructure and Equipment Improvements Phase II project.
2. Their schedule and cost control approach demonstrated the most significant potential benefit to the University.
3. RMF provided the highest level of creative thinking with its approach to strategic equipment use, maintenance standards, and sustainability.

Recommended Action

Based on the above information, the Board of Trustees of the University of North Carolina at Greensboro approves RMF Engineering, Inc., Raleigh, NC, as the Engineering firm for the Chilled Water Infrastructure Phase 2 project. If agreeable terms cannot be met with the recommended firm, the Board authorizes the administration to negotiate terms with the other firms in ranking order.

Robert J. Shea, Jr.
Vice Chancellor for Finance *and*
Administration

Attachments:

- RMF Engineering, Inc. Letter of Interest

UNC Greensboro

Campus Chilled Water Infrastructure and Equipment Improvements Phase II

RFQ: # 287-23-18453-01

November 8, 2024

RMF Engineering

Table of Contents

RMF Engineering

Section 1

UNC Greensboro Information Sheet

RMF Engineering

THE UNIVERSITY of NORTH CAROLINA GREENSBORO

Information Sheet

Firm Name	RMF Engineering, Inc.

☐ HUB Certified

If HUB, Specify Type: ☐ Female ☐ Disabled ☐ American Indian ☐ Asian-American ☐ Hispanic ☐ Black ☐ Socially & Economically Disadvantaged

Point of Contact	Greg Carnathan, PE, CEM, LEED AP	E-mail Address	greg.carnathan@rmf.com
Street Address	8081 Arco Corporate Drive, Suite 300		
City	Raleigh	State NC / Zip Code 27617 / County Wake	
Phone #	919.941.9876	Fax #	919.941.9957
Type of Firm (e.g. Architectural, Civil Engineering, Surveying, Etc)	MEP Engineering		

Consulting Firms

Architectural:		☐ Check If HUB	Mechanical:		☐ Check If HUB
Electrical:		☐ Check If HUB	Plumbing:		☐ Check If HUB
Structural:		☐ Check If HUB	Civil:		☐ Check If HUB
Landscape:		☐ Check If HUB	Interior Design:		☐ Check If HUB
Other (specify type):		☐ Check If HUB			
Other (specify type):		☐ Check If HUB			

Section 2

Letter of Interest

RMF Engineering

RMF Engineering

8081 Arco Corporate Dr
Suite 300
Raleigh, North Carolina 27617

919.941.9876
919.941.9957 fax
www.rmf.com

November 8, 2024

Bill Chatfield
UNC Greensboro Facilities Design and Construction
Gray Home Management House
105 Gray Drive
Greensboro, NC 27412

RE: Campus Chilled Water Infrastructure and Equipment Improvements Phase II – RFQ: # 287-23-18453-01

RMF Engineering, Inc. (RMF) is pleased to have the opportunity to submit one electronic copy of RMF's qualifications for Phase II of UNC Greensboro's (UNCG) Campus Chilled Water Infrastructure and Equipment Improvements project. We are familiar with the UNCG campus and have enjoyed a 20-year working relationship with the University. RMF has completed over 40 projects for UNC Greensboro, including Phase I of the Campus Chilled Water Infrastructure and Equipment Improvements project. As you review our qualifications, we wish to highlight the following which we believe makes us uniquely qualified for this project:

Infrastructure Utility and District Energy Experts

Our proposed team includes RMF's thermal utility, district energy, medium voltage and civil engineers who have dedicated their careers to chilled water and utility distribution system renovations on higher education campuses across North Carolina and the Southeast.

Campus Infrastructure Systems Experience

Over our 41-year history, RMF has become nationally recognized for our efforts in campus infrastructure systems master planning, analysis, design and construction administration for clients including UNC Greensboro, UNC Charlotte, North Carolina State University, Duke University and The University of North Carolina at Chapel Hill. RMF successfully provides the design of phased upgrades, with minimal interruption to the campuses of our clients.

Responsive Service, Attention to Detail

Our firm's core values include best effort for clients and technical excellence. Our team will provide UNCG with a level of service and attention to detail that sees to high quality results. Our positive working environment and skillful determination has helped us conduct exceptional renovations for higher education clients throughout the state similar to this project.

We sincerely appreciate your consideration of RMF for this project and look forward to a continued successful relationship with UNC Greensboro. If you should need any additional information, please contact me at 919.941.9876 or greg.carnathan@rmf.com.

Sincerely,

Greg Carnathan, PE, CEM, LEED AP
Principal in Charge
RMF Engineering, Inc.

Section 3

Project Team Organization Chart

RMF Engineering

Project Organizational Chart

UNC Greensboro

Greensboro, NC

Bill Chatfield
UNC Greensboro Facilities Design and Construction

Greg Carnathan, PE, CEM, LEED AP
Principal in Charge

Matthew Boatwright, PE
Project Manager /
Lead Civil Engineer

Chris Skillestad, PE
Lead Electrical Engineer

Jonathan Eveleth, PE, CEM, LEED AP
Lead Mechanical Engineer

Jim Riches, PE
Lead Structural Engineer

3.1 - Adequate Staff for the Proposed Project Design Team

RMF's proposed design team, led by principal in charge Greg Carnathan, PE, CEM, LEED AP and project manager Matt Boatwright, PE, are well-qualified and experienced in the evaluation, design and operations of higher education facilities. RMF's personnel will be committed to the contract, ensuring a high level of technical insight and quality. This contract will have a high priority with our firm.

RMF's Raleigh, North Carolina office is backed by nearly 350+ employees in 11 offices. RMF is 100% employee owned with 23 actively working partners. Our team has adequate workload and support to carry out projects from this contract successfully.

Resumes provided are for our key personnel on this submission only and can be located in tab 6, section E of the attached SF-330 and standard resumes on the following page. Additional support staff resumes can by provided upon request. RMF's staff is composed of over 90 licensed professional engineers and more than 230 engineering college graduates.

Principal in Charge

Greg Carnathan, PE, LEED AP, CEM

Professional Experience

25
YEARS AT RMF

27
YEARS OF EXPERIENCE

Education

BS, Mechnical Engineering
1998, MESSIAH COLLEGE

Registrations/Certifications

Professional Engineer
NC: #028322

LEED Accredited Professional

Certified Energy Manager

Mr. Carnathan has experience leading planning and design efforts for central energy plants, power and thermal utility distribution infrastructure for educational, industrial, healthcare, commercial, government and military facilities. His responsibilities regularly include project management, strategic planning, energy modeling, options analysis and quality control.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
UNC Greensboro

Steam Distribution System Replacement
UNC Greensboro

District Energy Plant 2 - Expansion Phase 1
University of Georgia

Little Library Chilled Water Connection
Elizabeth City State University

Yarbrough Chiller Plant Expansion
North Carolina State University

Thermal Utilities to Partners II and Toxicology
North Carolina State University

Centennial Campus Thermal Utilities Infrastructure
North Carolina State University

North Chiller Plant Transformation
Wake Forest University

Downtown Complex CHW-HPS Systems Infrastructure
North Carolina Department of Administration

Exterior Hydronic Piping and Regional Plant 2 Equipment Addition
Wake Technical Community College

Holland Plant Chilled Water System Modernization and Expansion
Georgia Institute of Technology

Publications & Speaking Engagements

"Blue Devils Go Green: Duke Converts Steam Plant From Coal to Gas", HPAC Engineering, June 10, 2015

"Wake Forest University – An Investment Renewed", APPA Business Partner Whitepaper Series, 2014

"District Cooling and Heating Comes to a 100-year old campus for the First Time," IDEA Co-Authored Article

"NC State adds thermal energy storage to its energy assets," IDEA Magazine, January 2019

Project Manager / Lead Civil Engineer

Matthew Boatwright, PE

Professional Experience

14
YEARS AT RMF

15
YEARS OF EXPERIENCE

Education

BS, Civil Engineering
2011, NORTH CAROLINA STATE UNIVERSITY

Registrations/Certifications

Professional Engineer
NC: #041981

Mr. Boatwright is a project manager and civil engineer with experience in the design of civil utilities and solid knowledge of electrical, steam and chilled water distribution systems. His design experience is focused primarily on complex utility installations in congested sites. He also has experience with general site planning, design and permitting involving storm drainage analysis, stream buffer intrusions, site grading and hardscape restorations.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
UNC Greensboro

Steam Distribution System Replacement
UNC Greensboro

Chiller Plant Expansion and Upgrades
Clemson University

Little Library Chilled Water Connection
Elizabeth City State University

Yarbrough Chiller Plant Expansion
North Carolina State University

Thermal Utilities to Partners II and Toxicology
North Carolina State University

Centennial Campus Thermal Utilities Infrastructure
North Carolina State University

North Chiller Plant Transformation
Wake Forest University

Downtown Complex CHW-HPS Systems Infrastructure
North Carolina Department of Administration

Exterior Hydronic Piping and Regional Plant 2 Equipment Addition
Wake Technical Community College

North Energy Plant Expansion and Chilled Water Loop Extension
University of South Carolina

Publications & Speaking Engagements

"Navigating Campus-Wide Power Upgrades with Smart Solutions," Facilities Net, February 2024

"Earth and Energy. Bridging the Gap Between Civil and Mechanical Challenges of Thermal Distributions Systems," Facilities Net, November 2022

Lead Electrical Engineer

Chris Skillestad, PE

Professional Experience

10
YEARS AT RMF

13
YEARS OF EXPERIENCE

Education

BS, Electrical Engineer
2012, NORTH CAROLINA STATE UNIVERSITY

Registrations/Certifications

Professional Engineer
NC: #043882

Mr. Skillestad is an electrical engineer responsible for medium-voltage system analysis and design and the design of power generation, medium voltage distribution, utility infrastructure, energy plants and SCADA systems for the higher education market. He has specialized training in SKM analysis software to perform short circuit, coordination and arc flash studies.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
UNC Greensboro

Steam Distribution System Replacement
UNC Greensboro

Yarbrough Chiller Plant Expansion
North Carolina State University

Thermal Utilities to Partners II and Toxicology
North Carolina State University

Centennial Campus Thermal Utilities Infrastructure
North Carolina State University

North Chiller Plant Transformation
Wake Forest University

Downtown Complex CHW-HPS Systems Infrastructure
North Carolina Department of Administration

Exterior Hydronic Piping and Regional Plant 2 Equipment Addition
Wake Technical Community College

District Energy Plant 2 - Expansion Phase 1
University of Georgia

Athletics Precinct Infrastructure
Duke University

Holland Plant Chilled Water System Modernization and Expansion
Georgia Institute of Technology

Publications & Speaking Engagements

"Navigating Campus-Wide Power Upgrades with Smart Solutions," Facilities Net, February 2024

"Keeping the Lights On: Thoughtful planning can help ensure the success of upgrades to active campus electrical systems" District Energy, Spring/Summer 2021

Lead Mechanical Engineer

Jonathan Eveleth, PE, CEM, LEED AP

Professional Experience

11
YEARS AT RMF

18
YEARS OF EXPERIENCE

Education

BS, Mechanical Engineer
2007, GEORGIA INSTITUTE OF TECHNOLOGY

Registrations/Certifications

Professional Engineer
NC: # 041582

LEED Accredited Professional

Certified Energy Manager

Mr. Eveleth is a mechanical engineer and project manager who specializes in the analysis, design and construction of complex infrastructure systems serving educational, industrial, healthcare and commercial facilities. He is most knowledgeable in the areas of thermal utilities including steam and chilled water. His background as a design-build contractor gives him a unique perspective on the need for high quality documents with a focus on constructibility.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
UNC Greensboro

Health and Human Performance Facility Chiller Replacement
UNC Greensboro

District Energy Plant 2 - Expansion Phase 1
University of Georgia

Chiller Plant Expansion and Upgrades
Clemson University

Yarbrough Chiller Plant Expansion
North Carolina State University

Thermal Utilities to Partners II and Toxicology
North Carolina State University

Centennial Campus Thermal Utilities Infrastructure
North Carolina State University

North Chiller Plant Transformation
Wake Forest University

Exterior Hydronic Piping and Regional Plant 2 Equipment Addition
Wake Technical Community College

Wagoner Chiller Plant Transformation
UNC Wilmington

North Decatur Chiller Replacement
Emory University

Publications & Speaking Engagements

"Coal-to-Natural-Gas Conversion of Industrial Steam Plant"
HPAC Engineering Magazine, 2017

"Chiller Plant Cooling"
Consulting Specifying Engineer, 2019

"How To Do a Major HVAC Upgrade on Campus"
Facilities Maintenance Decisions, 2019

"NC State adds thermal energy storage to its energy assets"
IDEA Magazine, 2019

Lead Structural Engineer

Jim Riches, PE

Professional Experience

31
YEARS AT RMF

31
YEARS OF EXPERIENCE

Education

BS, Civil and Architectural Engineering
1993, DREXEL UNIVERSITY

Registrations/Certifications

Professional Engineer
NC: #039436

Mr. Riches has extensive experience in performing structural and civil engineering for large infrastructure projects and buildings. He has designed steel framed buildings and reinforced concrete structures. These include utility tunnels, underground vaults and chiller and boiler plants with stacks, cranes, and hoists. Multi-discipline coordination is an essential aspect in all of his projects. Structural anchoring and support of various mechanical piping systems and equipment is a common detail in his designs. He has also performed site planning and utility design for underground piping systems and electrical ductbanks and vaults.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
UNC Greensboro

Steam Distribution System Replacement
UNC Greensboro

Health and Human Performance Facility Chiller Replacement
UNC Greensboro

Chiller Plant Expansion and Upgrades
Clemson University

Yarbrough Chiller Plant Expansion
North Carolina State University

Thermal Utilities to Partners II and Toxicology
North Carolina State University

Centennial Campus Thermal Utilities Infrastructure
North Carolina State University

North Chiller Plant Transformation
Wake Forest University

New Central Chilled Water Plant
Winston-Salem State University

Science Hill Chilled Water Extension
Yale University

Central Ground Chilled Water Plant
University of Virginia

Ping Chilled Water Study
Ohio State University

Publications & Speaking Engagements

"Out On a Ledge", Civil + Structural Engineer Magazine, 2014

Section 4

Relevant Experience & Other Important Factors

RMF Engineering

Firm Overview

350+ employees

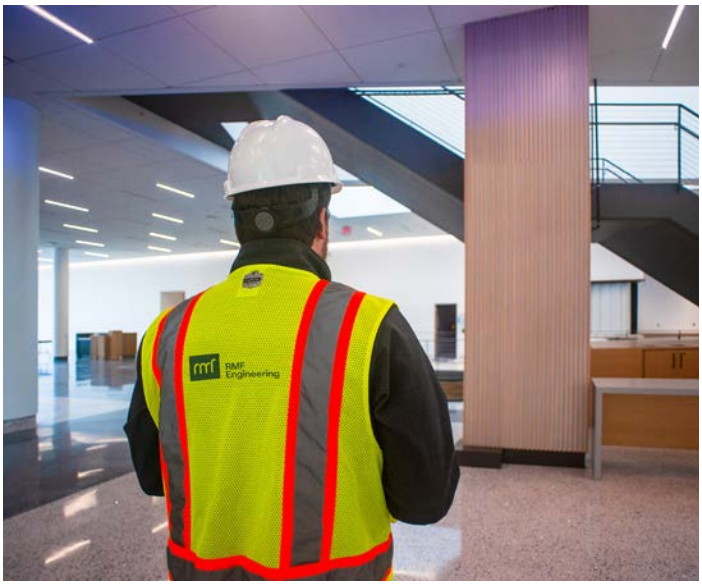
11 offices

41-year history

Founded in 1983, RMF Engineering (RMF) has been on the forefront of complex Mechanical, Electrical and Plumbing engineering solutions since before terms like efficiency, sustainability, LEED and green requirements were common terminology.

In our 41-year history, RMF has become nationally recognized for our quality analysis, planning, design and commissioning of buildings, as well as campus utility generation and distribution systems.

With over 350 staff in 11 offices, RMF is a client-focused practice routinely ranked as one of the top MEP firms in the country. We are proud of our prompt responsiveness, industry-leading tech savvy and project teams who have extensive history of working together as specialized units. As a result, you can expect to receive the highest quality contract documents, the most intelligent engineering solutions and a team that is known for seeing every project through to completion.



Full Service Engineering

We provide our clients a full range of engineering services to provide maximum energy efficiency and sustainability across their entire operational portfolio. Starting with Energy Master Planning all the way through to Commissioning, our focus is to provide technical expertise and a high level of service that leads to long-lasting relationships.

RMF's full range of services includes:

- Energy Master Planning & Decarbonization
- District Energy
- Thermal Utilities Distribution
- Power System Analysis & Design
- MEP Building Engineering
- Commissioning & Construction Quality Management

2024 » BD+C
Giants 400
RMF Ranked 27th out of 400 top US Engineering Firms

2024 » CSE
MEP Giants
RMF ranked 33rd out of 100 top North American MEP Firms

2024 » ENR
Top 500
RMF ranked 297th out of 500 top Design Firms

2024 » EC&M
Top 40
RMF ranked 28th out of 40 top Electrical Design Firms

Additional Information

4.1 - Specialized or Appropriate Expertise in the Type of Project

CHILLED WATER SYSTEM EXPERIENCE

The survey, analysis, planning, design and start-up of chilled water systems including chillers, cooling towers, pumping systems, thermal storage, piping and valving has become the lifeblood of RMF. We have provided this expertise for over 100 major chilled water plants and distribution systems in the last 10 years.

Most of the existing chilled water systems investigated have had generation deficiencies, however, poor distribution is a major contributing factor to the lack of adequate terminal cooling. The firm utilizes two independent computer programs to model chilled water pumping and distribution systems. Not only is this modeling excellent in analysis and design, but it also provides the user with an interactive tool for system operation and future planning efforts.

RMF approaches each chilled water plant as an independent and site-specific application concepts which are cost effective at one installation may not be applicable at another institution.

Some innovative concepts that have been effectively utilized include:

- Primary / Secondary Pumping
- Variable Speed Pumping
- Non-Electric Prime Movers
- High Efficiency Machines (Low KW per Ton)
- Free Cooling Utilizing Flat Plate Technology
- Control Optimization of Loading Parallel Machines
- Cooling Tower Optimization
- Automatic Condenser Cleaning System
- Water Treatment Programs
- Thermal Storage

CENTRAL PLANT EXPERIENCE

RMF's core business is focused on the development, rehabilitation and expansion of central utility plants (chilled water, steam, cogeneration, hot water and electric) for colleges, universities, hospitals and institutional campuses. In the past 5 years, RMF has designed significant heating plant upgrades in over 50 heating plants, including boiler upgrades at two Wright Patterson Air Force Base Plants, with capacities of 528 MMBTUH and 549 MMBTUH.

Recent campus chilled water renovation, expansion and new construction projects have been provided for nearly 60 campus systems with total plant capacities up to 60,000 tons.

RMF has provided utility distribution designs including steam, chilled water, domestic water, sewer and storm drain on over 50 campuses in the past five years ranging in size from a 2000 acre campus to a 20 acre campus.

UTILITY DISTRIBUTION EXPERIENCE

Many utility distribution systems have been evaluated, planned and designed by RMF. Computerized hydraulic models of hot water, steam, condensate, chilled water, domestic water, natural gas, sewer and storm water systems are routinely developed. This modeling approach can be used to determine optimum system configurations (loops, radials, etc.) as well as pipe size. A major design issue in utility distribution systems is the configuration of the piping whether to direct bury, install trenches, construct tunnels or install above ground. The firm has developed detailed economic modeling of these various installation techniques to determine the most cost effective site-specific application. RMF has designed new and rehabilitated systems for all types.

RMF has performed condition assessments of the distribution lines for mechanical, electrical and civil utilities. The condition assessments determine deficiencies inclusive of leaks, physical deterioration, prioritization of repair work including immediate notification when serious problems are found and remaining useful life. Assessments include a review of existing documentation and reports, interviews with facility personnel and field surveys using nondestructive and destructive testing.

Additional Information

Finding The Right Path

Utility distribution is dependent on well-planned underground alignment, attention to rights of way, boundaries and site sensitivities, and careful coordination with end-users. With our civil-mechanical-electrical-structural design team working together under one roof, RMF ensures the accuracy of these systems. We have designed hundreds of miles of underground utility systems, and our vast experience includes hydraulic analysis for water, storm drain and sanitary improvements.

DOMESTIC WATER EXPERIENCE

The first step in planning domestic water systems is the determination of water loads. Key information includes:

- Flow and pressure measurements
- Projection of existing and future building demand. On research campuses, this may include several streams
- Domestic requirements
- Process requirements
- Fire protection requirements

Often, individual building surveys are conducted to get a more detailed account of usages and sensitivity to disruption of service. Building use / occupancy estimates are used in conjunction with metering to determine actual usage. When available, this metered data is compared with sanitary system flow measurement.

The second planning step is the evaluation of existing conditions. This is accomplished through a variety of techniques including:

- Site Survey – Develop an accurate set of existing conditions.
- SUE - Subsurface Utility Engineering – Testholes – to mitigate construction risk.
- Review of As-built documentation and campus records
- Fire Flow Tests – Verify pressure, and life safety code compliance

Comparative analysis of distribution networks is performed using hydraulic modeling. This is a computerized analysis that takes into account existing conditions and future requirements, and is calibrated to be indicative of actual fire-flow tests.

Alternatives are evaluated to improve the distribution piping system. Options may include loops / reliabiliy, radial feeds, or multiple water sources. In older systems, a comparison of replacements or reline is performed. Multiple different pipe materials are available and each have their own competitive benefits and costs.

STRUCTURAL ENGINEERING FOR UTILITIES

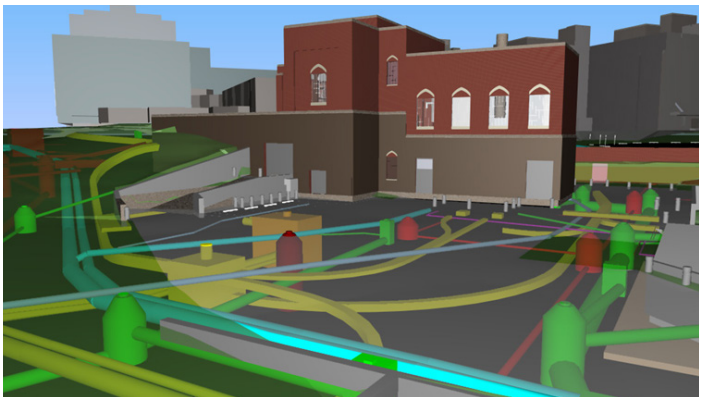
RMF specializes in providing customized structural engineering designs for the unique requirements of large educational, healthcare, military, federal, and industrial clients located on campus or large multi-building environments. RMF's wide range of structural engineering design experience includes numerous examples of specialty structural design for utility distribution tunnels, access vaults, transmission duct banks and support requirements for industrial and central power plants. Services encompass designs that range from standard steel frame structures to concrete structures to complicated blast proof manufacturing facilities. RMF's approach to design services includes the coordinated delivery of multi discipline engineering services followed by our experienced construction administration division to assure the project is seamless from beginning to completion.

Additional Information

ELECTRICAL UTILITIES EXPERIENCE

RMF's core business is focused on the development, rehabilitation and expansion of central utility plants (chilled water, steam, electric) for colleges, universities, hospitals and institutional campuses. RMF's in-house electrical expertise includes planning, designing and supervising construction of the following:

- Medium Voltage Switchgear
- Emergency Generators
- Ductbanks
- Medium Voltage Underground Distribution
- Overhead Distribution
- Cogeneration
- Uninterruptible Power Supplies (UPS)
- Telecommunications
- Central Automation (Power Management and Control Systems)
- High Efficiency Indoor and Outdoor Lighting
- Power Factor Correction
- Arc Flash, Short Circuit and Coordination Studies
- Load Flow and Peak Shaving Studies



West Campus Steam Plant Renewal and Conversion / Duke University

3D MODELING EXPERIENCE

RMF has experience using 3D modeling software since 1995 including Bentley Triforma, AutoCAD MEP and Revit MEP. RMF has been using AutoCAD Civil3D software built for BIM as a tool for design, analysis and simulation of its pipe network (steam, chilled water, storm drain, sanitary sewer, water, gas, electrical/telecom ductbank, etc.) to facilitate project performance. RMF's recent experience with Civil 3D Modeling includes:

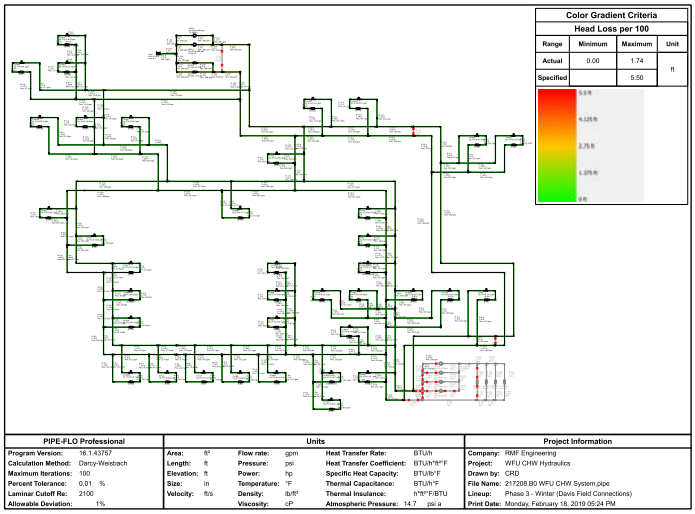
- **Steam Distribution System**
  Appalachian State University
- **Centennial Campus Infrastructure Medium Voltage Electrical Distribution**
  North Carolina State University
- **Greek Village Medium Voltage Electrical Distribution and Site Lighting I-III**
  North Carolina State University
- **Centennial Campus Thermal Utilities & Infrastructure**
  North Carolina State University
- **Centennial Campus Biomedical Campus Chiller Plant Expansion**
  North Carolina State University
- **Centennial Campus Power, Steam and Chilled Water**
  North Carolina State University
- **Yarbrough Chiller Plant Utilities**
  North Carolina State University
- **Cates Chiller Plant Utilities**
  North Carolina State University
- **Wolf Village Upperclassman Apartments Utilities**
  North Carolina State University
- **Hunt Library Utilities**
  North Carolina State University
- **Athletics Precinct Utility Infrastructure**
  Duke University
- **Duke Hollows Utility Infrastructure**
  Duke University
- **West Campus Steam Plant**
  Duke University
- **Steam and Condensate Piping Design**
  Winston-Salem State University
- **Northern Wake Campus Regional Plant Expansion**
  Wake Technical Community College

Additional Information

HYDRAULIC MODELING

In order to determine if a heating or cooling distribution pumping and piping system is effectively and efficiently delivering the product, RMF will perform a hydraulic nodal analysis. RMF utilizes this model to simulate the campus piping network, determine the capacity of the existing system and identify bottlenecks, excessive velocities and risks. Models are then prepared to determine if a distribution and pumping system can support proposed load growth and different scenarios (Primary variable, etc.) can be applied. The performance of the system is modeled in several ways using different temperature differentials. RMF will perform the necessary hydraulic computer-based simulations using Pipe-Flo to optimize the distribution piping.

Each pipe segment is evaluated based upon the flow velocity and pressure loss. The velocity limitation is based upon potential water hammer occurring within the distribution system. The specific pump curves are entered into the model to provide a more accurate energy analysis. The evaluation of the pressure loss within each pipe segment is based upon the required pump size and energy consumption. The modeling can determine if "over-pumping" conditions may be occurring, creating energy inefficiencies. Once a computer based hydraulic model is created, it can be manipulated in several ways to evaluate the effects of new flows associated with new or modified pumps or the extension of branch lines.



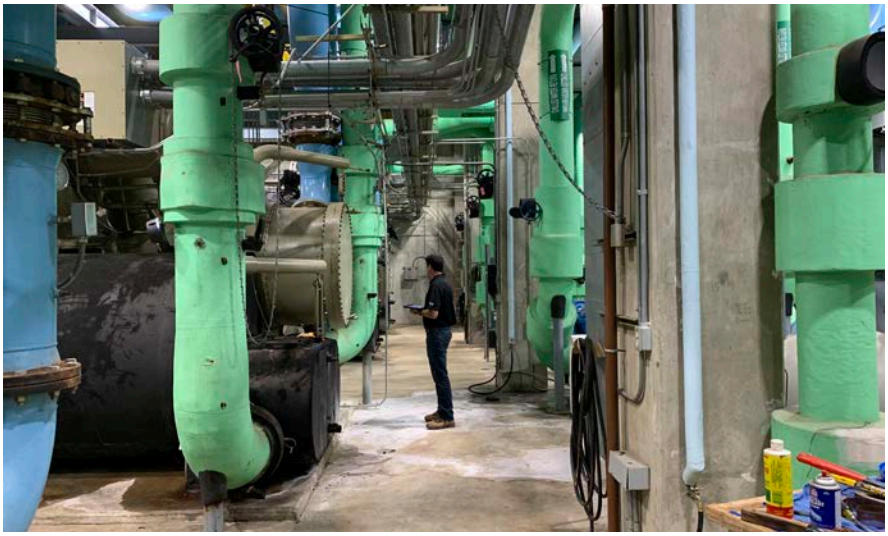
Chilled Hot Water Hydraulic Modeling / Wake Forest University

CHILLED WATER PLANT CONTROLS

RMF's has designed and / or commissioned new and expanded industrial grade controls systems for energy plants for a variety of client, some of which include:

- UNC Chapel Hill Cogen Chiller Plant - Ovation DCS
- UNC Wilmington - Kiltech Chiller Control System operating on a Tridium Backbone
- NCSU Cates, Yarbrough, Centennial Plants - Honeywell HC900 PLCs
- Winston-Salem State University Chiller Plant - Siemens with Tridium Backbone
- University of Georgia Riverbend and Vet Med Loops - Delta Controls
- University of Georgia NW Chiller Plant - ALC Controls
- University of Connecticut - Allen Bradley PLC Based Controls with Intellution Front End and PI Historian. 12,000 tons - York/Allen Bradley Andover PLC Based - DCS
- George Mason University - Siemens DCS For Control And Monitoring Of 10 Chiller Systems (Including Thermal Ice Storage) and 5 High Temperature Hot Water Generator Systems.
- University of Maryland Baltimore County (UMBC) - Siemens DCS for Control and Monitoring of 5 Chiller Systems (Including 1.6 Million Gallon Thermal Storage Tank) and 4 High Temperature Hot Water Generator Systems.

Campus Chilled Water Infrastructure and Equipment Improvements Phase I



Relevant Scope

- Phase I
- UNC Greensboro Experience

Project Location

Greensboro, NC

Completion Date

2025 (Est.)

Construction Cost

$11.4 Million (Est.)

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Reference

David Freidman
UNC Greensboro
336.334.5269

UNC Greensboro distributes chilled water to campus from two existing chiller plants on the north and south sides of campus. The goal of this project is to complete the loop between these two plants to improve campus reliability and hydraulics and to also connect four buildings in the area to the campus chilled water distribution loop. It will also allow the UNC Greensboro to remove several building chillers and cooling towers, lowering campus maintenance and improving energy efficiency.

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. New chilled water connections will be provided to four buildings on campus: Bryan, Mossman, Walker Deck and Elliott building. The Alumni building is currently fed chilled water through Elliott and will also be connected to the campus distribution system by this project through the Elliott building loop transition. A tap for future connection will also be provided for Jackson Library. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

Each building's tie-in point required close coordination between underground conflicts and interior building restrictions. At several locations, the team employed creative solutions to access the building including utilizing liner plate tunnels to access basement area, routing piping through office space in a new pipe chase and utilizing void space below stairways for accessing mechanical rooms. The mechanical rooms were designed to accommodate phasing while also placing new equipment in logical and ideal locations. At Elliott, one of the existing chillers and building controls were reconfigured so that it could provide building backup and backfeed into the loop during times of low demand.

The civil design required permitting with City of Greensboro for traffic detour and road closure review and with their Public Works group for utility separation review.

UNC Greensboro

Steam Distribution System Replacement

Relevant Scope

- UNC Greensboro Experience
- Campus Distribution

Project Location

Greensboro, NC

Completion Date

2020

Construction Cost

$1.5 Million

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jim Riches, PE

Reference

Bill Chatfield
UNC Greensboro
336.334.5269

As part of a multi-phased replacement of deteriorating steam distribution in the heart of their campus, the University of UNC Greensboro contracted RMF to provide design services to replace approximately 600 LF of eight-inch HPS and four-inch PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). Approximate budgets, schedules and long term comparisons were provided for each methodology, allowing UNCG and RMF to select the system best suited for the project.

In order to accommodate the University's desired system of shallow trench distribution, RMF developed a phased approach that would provide the necessary flexibility to accommodate the available budget and construction schedule. The two phase approach was coordinated with traffic and pedestrian control requirements, bus routes and available laydown space; working to split the project due to budget and schedule restrictions at an area that would also help minimize impact to campus operations. Pedestrian phasing and traffic control was of high importance as the alignment was located directly adjacent the Elliot University Center, under a busy walkway just south of the Kaplan Commons courtyard. The utility alignment was also laid out to utilize z-bends and loops to avoid utility conflicts and sensitive areas. These features allowed the team to avoid the use of mechanical expansion joints and associated ongoing maintenance.

Multiple temporary service options were investigated and provided for consideration, including temporary electrical hot water heaters, temporary above ground stream distribution, and temporary FO Boilers. UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.

University of Georgia

District Energy Plant 2 - Expansion Phase 1

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Project Location

Athens, GA

Completion Date

2019

Construction Cost

$4.8 Million

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Jonathan Eveleth, PE

Reference

Eric Sherman
University of Georgia
706.542.7485

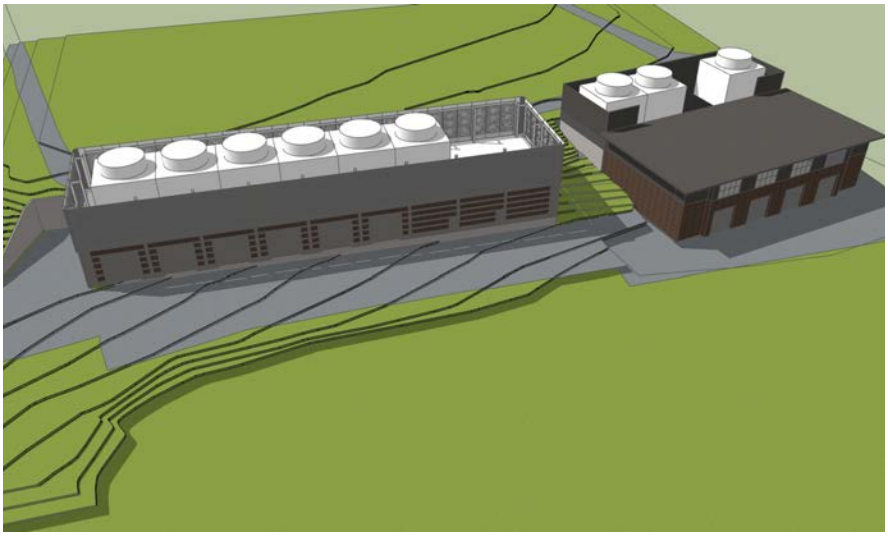
This project was the first step of a phased plan to expand the production capacity of the south campus chilled water system by 6,000 tons. The additional chilled water generation equipment was to be installed in a new building adjacent to the existing District Energy Plant #2 (DEP-2) located at the intersection of East Campus Rd. and Cedar Street. DEP-2 was expanded to handle the new building loads added to the south campus loop, particularly the addition of the science learning center that is scheduled to come online in April 2016. Over time, the plant would also absorb capacity void associated with retirement of aging, decentralized building chillers.

The first phase included the civil, structural and architectural infrastructure for the first 3,000 tons of cooling. All infrastructure systems were setup for simple and thoughtful expansion with no shut-down requirements moving forward. The mechanical portion of the first phase of the DEP-2 expansion includes a 1,000 Ton variable speed electric water-cooled centrifugal chiller. Chiller selection and selection parameters including condenser water flow rates, variable speed drives, etc. were economically evaluated using a net present value life-cycle methodology. Associated cooling tower, pumps, piping, and controls were carefully designed for ease of service. The chilled water system was configured using a variable primary hydraulic arrangement. A variety of water filtration systems were evaluated during the design process which led to implementation of a SpiroTherm air-dirt separator on the chilled water system, along with an Arkal disc type condenser water filtration system. Electrical service for the first phase of the DEP-2 expansion came from the existing 12.47kV medium voltage (MV) campus loop feed. Options were developed to allow dual-ended electrical services including back-up transformer and switchgear capabilities.

RMF adapted templates to utilize Revit MEP 3D modeling software for chiller plant design. The team regularly provided virtual, animated, 3D tours to UGA during the design process for best review of layout, fit and function. In addition to providing full design services, RMF's deliverables include full cost estimating and back-up calculations for each submission phase. RMF and the design team coordinated with a construction manager during the process, and provided support for bidding and construction administration involvement that included bi-weekly site visits.

Clemson University

Chiller Plant Expansion and Upgrades



Relevant Scope

- Chilled Water Plant
- Campus Chilled Water System

Project Location

Clemson, SC

Completion Date

2026 (Est.)

Construction Cost

$22 Million (Est.)

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Matthew Boatwright, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Reference

Kailash Munoth
Clemson University
864.283.7105

Clemson University identified the need for additional chilled water generation capacity to support the masterplanned campus growth. This project will provide 1,500 tons of generation capacity in a new 12,980 SF central chilled water plant sized to allow for 9,000 tons of full buildout capacity.

The new facility is sited to the east of the current West Campus Chiller Plant and is arranged in an east to west linear arrangement abutting the intramural fields to the south. A new 24 inch chilled water connection will be made to the existing main on Highway 93. Access to the plant will be via a drive aisle to the north of the plant in front of rollup doors serving each chiller bay, the pump aisle and electrical room.

Mechanical generation equipment installed in this phase will consist of a single 1,500 ton chiller, cooling tower, variable-primary chilled water pump and condenser water pump. In addition, filtration systems will be installed for both the open (condenser water) and closed (chilled water) loop systems. This system is designed to provide top-tier energy efficiency and reliability through fully headered systems, ulta-high efficiency equipment, variable frequency drives installed on all motors, and a state-of-the art optimization suite layered on the control system.

Power for the plant will be provided from the West Campus Switching Station. A long term three bus system planned with the option for an N+1 sparing transformer connection to each bus. This arrangement, coupled with the headered system will allow electrical maintenance and expansion to take place without losing plant generation capacity

Elizabeth City State University

Little Library Chilled Water Connection

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Project Location

Elizabeth City, NC

Completion Date

2024

Construction Cost

$750,000

Services Provided

- Civil Engineering
- Mechanical Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE

Reference

Ryan Strickland
Elizabeth City State University
252-567-8608

RMF provided Elizabeth City State University with engineering services to install new chilled water service to Little Library.

RMF designed underground HDPE chilled water piping to Little Library, and extended the chilled water piping to two separate mechanical rooms, where existing chillers were removed and the building was connected to the central chilled water network.

Connecting Little Library to the campus chilled water system improves campus energy efficiency and chilled water reliability at Little Library, while the existing chillers can be used elsewhere on campus for emergency replacements of failing chillers.

Little Library consists of a main building and an addition. Two separate chilled water connections were made, and connectivity and understanding of how the two separate spaces operate was required. Coordination with future water and power infrastructure was also required.

North Carolina State University

Yarbrough Chiller Plant Expansion

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Project Location

Raleugh, NC

Completion Date

2025 (Est.)

Construction Cost

$6 Million (Est.)

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Reference

David Hammock
North Carolina State University
919.515.2030

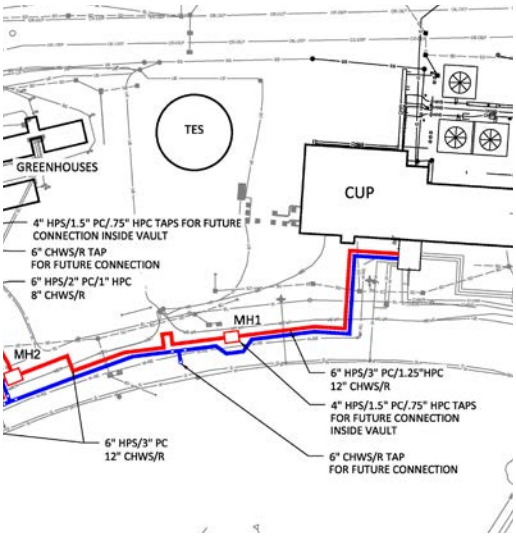
North Carolina State University is increasing their chilled water production capacity and system reliability due to the construction of additional high-intensity labs being added to their North Campus. NCSU's mandate is to maintain N+1 capacity on their central utility systems to insure reliability and uptime. In addition to equipment additions, modifications to the control system are taking place which will increase energy efficiency of the system.

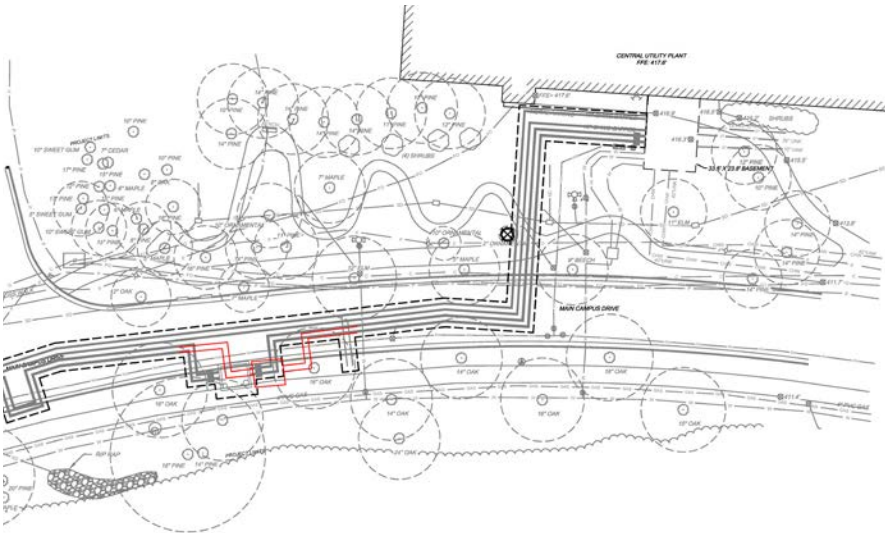
A 2,000 ton chiller and associated support equipment are being added to bring the total chilled water capacity of the Yarbrough plant to 12,000 tons.

This project bring campus chilled water generation capacity up to the N+1 standard to support the addition of the Integrative Sciences Building (ISB). In addition, the control updates will increase overall efficiency and reliability of the chilled water system.

North Carolina State University

Thermal Utilities to Partners II and Toxicology





Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Project Location

Raleigh, NC

Completion Date

N/A

Construction Cost

$9.1 Million

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Reference

David Hammock
North Carolina State University
919.515.2030

The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings. Additionally, building mechanical rooms were converted from stand-alone generating facilities to utility receiving buildings.

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered, Class A, piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults; building mechanical room design for steam PRV stations, hot water heat exchangers, hot and chilled water pumps; suite of flow and energy monitoring systems for new building connections; and design phasing drawings, notes and specifications to maintain building services during the utility transitions.

Two critical research facilities on centennial campus with aged, inefficient and unreliable cooling and heating generation systems were connected to a modern, reliable and efficient energy plant. The central plant boasts chilled water thermal storage along with combined heat and power.

Wake Forest University

North Chiller Plant Transformation

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Project Location

Winston-Salem, NC

Completion Date

2019

Construction Cost

$4.6 Million

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Reference

Mike Draughn
Wake Forest University
336.782.0071

The North Chiller Plant provides chilled water for comfort and process to residential, classroom and laboratory facilities on campus at Wake Forest University. RMF provided planning, design and construction administration services to modernize and transform the aging north chiller plant into a state-of-the-art facility. The project included the replacement of the existing chillers, towers, piping, pumps and electrical system. Utilizing only the existing building shell and medium voltage power supply, 2,400 tons of chilled water generation was added to a facility designed for only 1,200 tons of cooling.

Meticulous attention to equipment selection, layout, accessibility and modeling enabled the new plant to have even better reliability, efficiency and service access than the original design. All plant systems were modeled in AutoDesk Revit MEP. Virtual tours of the plant were made at critical points during the design process. Two 1,200 ton variable speed drive chillers were pre-purchased based on a life-cycle energy model. The model's hours and operating conditions were custom developed based on 12 months of metering and controls data points. Additionally, long lead electrical transformers and switchboards were also pre-purchased to facilitate an accelerated design and construction window.

The variable primary plant features drives on each chiller, pump and tower fan along with chiller plant optimization by Optimum Energy. Additional plant features include chilled water air-dirt separation along with a high-efficiency condenser water filtration system.

Civil and structural design upsized the chiller water distribution mains, expanded the cooling tower yard and provided tower access platforms. Additionally, a screen wall was added to shield views of the new cooling towers from a nearby business school.

North Carolina Department of Administration

Downtown Complex CHW-HPS Systems Infrastructure

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Project Location

Raleigh, NC

Completion Date

2025 (Est.)

Construction Cost

$17.5 Million (Est.)

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE

Reference

Jeff Schmadeke
NC Dept. of Administration
919.807.4110

Chiller Plant

The North Carolina Department of Administration chilled water system features Chiller Plant No. 1 (2200 Tons), Chiller Plant No. 2 (2900 Tons), an above ground 2.75M gallon concrete chilled water thermal energy storage tank (TES), and an underground 750K gallon chilled water TES. This project will replace Chiller Plant No. 2 (currently a modular building on concrete slab) with a new chiller plant designed for initial production of 4500 Tons of chilled water and 6000 Tons at full build out.

Boiler Plant

The North Carolina Department of Administration high pressure steam system features a main steam plant which generates high pressure steam for the State run buildings in downtown Raleigh. When the main steam plant was opened in 1997 the original boiler plant was abandoned in place.

Currently there is no secondary source of steam in the NC DOA system which makes preventative maintenance shutdowns very difficult to plan and execute. This project will renovate the Old Boiler Plant to become a functioning boiler plant which can be used throughout the summer to provide steam to the system and allow a main boiler plant shutdown.

Wake Technical Community College

Exterior Hydronic Piping and Regional Plant 2 Equipment Addition

Relevant Scope

- Plant Equipment Addition
- Infrastructure Utility Connection

Project Location

Raleigh, NC

Completion Date

2022

Construction Cost

$3.1 Million

Services Provided

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Structural Engineering

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE

Reference

Wendell Goodwin
Wake Technical Community College
919.866.5577

This project extended the chilled water and hot water thermal utilities to Building H, extended thermal utilities towards the Automotive building and installed a new chiller, boiler and cooling tower in Regional Plant 2 on Wake Technical Community College's Scott Northern Wake Campus. Regional Plant 2 was originally engineered by RMF to hold three total pieces of each equipment. This project installed the second of each.

The high efficiency, modern Regional Plant 2 is central to the campus thermal distribution system and this equipment addition adds more capacity to support a growing campus. Tying the campus into buildings with existing standalone utilities allows flexibility and redundancy.

The thermal distribution design required careful phasing as it crossed active parking lots, a pedestrian bridge and fire access lane. Vaults are designed with serviceability in mind for both chilled and hot water. Routing piping across an existing pedestrian bridge crossing a creek required careful attention to constructibility and management of thermal expansion on the hot water system.

Additional Information

4.3 - Current Workload & State Projects Awarded

RMF is presently operating at 80% of productive capacity. Our firm strives to maintain a three to six-month steady backlog of work to provide continuity. As evidenced in the individual resumes, the personnel proposed for this project have worked on numerous similar projects and are fully aware of how to plan their work and budget their time accordingly to be efficient and timely. Our current workload is such that RMF could begin working on projects from this contract immediately.

RMF has worked on all 17 of the University of North Carolina System campuses, therefore, our team has extensive experience working on projects through the North Carolina State Construction Office.

4.4 - Proposed Design Approach

PROJECT MANAGEMENT

Subsequent award, the North Carolina Infrastructure team will develop a project execution plan. The management plan will include detailed scope for each discipline, a design and construction schedule and a preliminary construction cost estimate. Our project management approach is to provide early action, responsive communication and a collaborative mindset.

PLANNING OPTIONS

In keeping with our collaborative approach, RMF will kick off the design effort by reviewing the previously submitted McKiver Chiller Addition study, and highlighting key decisions and impacts. Multiple SD level design options will be provided for these decisions, with rough cost and comparative pros and cons to assist the University in understanding how the project goals can be best met in a way that is coordinated with future growth, maintainability, and budget. In parallel, RMF will team with the University to identify other campus improvements, and help prioritize and budget for those scope items. RMF will bring creative solutions to the table for consideration and focus on gathering feedback and concerns from the University design team to develop a Basis of Design to guide the project.

PLANT DESIGN

Additionally, loads analysis and energy modeling will be performed for the plant chiller replacement. A campus hydraulic model and chilled water pipe sizing can be developed to guide future expansion decisions. Of critical importance will be understanding the impact on the existing electrical system and identifying any upgrades necessary. The existing cooling tower capacity must also be reviewed. The work RMF performed during the previous McIver Chiller Replacement study will help accelerate the design of the PrePurchase package for long lead equipment.

DISTRIBUTION DESIGN

Upon completion of a grade B site survey, our team of civil engineers will perform in-field verification of existing site utilities to ensure accuracy. Chilled water valve or manhole locations and building entry points will then be meticulously selected for optimal location. Engineers will utilize PipeFlo for hydraulic modeling along with AutoCAD Civil 3D and Revit MEP for our tightly coordinated design documentation. Detailed documentation will emphasize project phasing, outage restrictions, traffic control and parking control in coordination with UNCG's project management team and building liaisons.

BUILDINGS CONNECTION DESIGN

Significant efforts will be made to ensure building performance post central system connection exceeds current levels. The team will develop a solid understanding of how the building currently operates, inclusive of deficiencies and with consideration for future planned modifications. Design engineering components include intensive field work, laser scanning, cooling loads and hydraulics analysis. When our team leaves this room it will be more organized and spacious than ever before.

CONSTRUCTION ADMINISTRATION

Our design team transforms into the construction team with the same personalities onsite. This avoids any loss of project history. The proposed team is highly experienced and are regularly in the Greensboro area. During similar past projects on campus the construction administration team have been onsite several times per week to provide responsive and timely engineering support.

Additional Information

4.5 - Recent Experience with Project Costs and Schedules

RMF has been very successful in completing projects within the budgetary constraints and design time allocations. Continuous in-house cost estimating is performed to insure the project, at completion, is within the construction cost budget. RMF has a close connection to construction activities and construction costs and has a proven track record of cost control. RMF performs a significant amount of work in a design-build capacity with mechanical contracting firms and is in-tune with actual material and labor costs.

Schedules are maintained by establishing a realistic time schedule with the client, weekly meetings between the design team members to review the schedule and reporting to the client the anticipated obstacles in maintaining the schedule. Our approach to project schedule control is a MS Project schedule used as the primary tool for indicating the sequence of events and allowable time periods for completing specific project phases and elements. The time requirements for the survey, data gathering, analysis, working sessions and conceptual design are tracked. At the beginning of a project, the schedule is reviewed with all engineering disciplines and discussed in depth with the client to ensure that everyone has a clear idea of what progress must be made by key milestones. The schedule is reviewed weekly at the in-house coordination meetings and monthly with the client. The frequent reviews ensure that no members of the design team will lose focus of the scheduled commitments.

RMF can develop total project cost models for renovations and new construction related to the project design options. The modeling can involve a combination of unitary costs (cost per net square foot, linear foot, unit module, or functional unit) and vendor quotes for large equipment (transformers, switchgear, medium-voltage cable, etc.).

Previous examples of meeting project budgets include:

- **UNC Greensboro Human Health Performance Chiller Plant**
  RMF Estimate: $900,000
  Winning Bid: $811,000
- **North Carolina State University Centennial Campus Infrastructure Medium Voltage Electrical Distribution**
  RMF Estimate: $1,255,002
  Winning Bid: $1,338,332
- **Wake Forest University North Campus Chiller Plant**
  RMF Cost Estimate: $4,600,000
  Winning Bid: $4,400,000

4.6 - Construction Administration Capabilities

RMF offers construction administration services on a daily, weekly or less frequent basis as required by the client. RMF believes that the design engineers are best suited to address issues in a timely manner during construction. The design engineers will remain engaged in the project throughout construction.

A key area of RMF's qualify control during construction consists of frequent and timely site observations. Projects often call for numerous site visits throughout the construction sequence until final acceptance. Construction issues are continuously identified to minimize significant punch-list items at the project's closeout.

4.7 - Proximity to and Familiarity with the Area Where Project is Located

RMF's project team is located in Raleigh, North Carolina which is approximately a 60 minute drive to UNC Greensboro. RMF previously completed the design and multi-phased replacement of deteriorating steam distribution systems in the heart of UNC Greensboro's campus and the chiller replacement at the Human Health Performance facility. Both of these projects highlight our understanding of campus guidelines, location and requirements for familiar campus systems.

Additional Information

4.8 - Record of Successfully Completed Projects without Major Legal or Technical Problems

For the past 20 years, no judgments have been made against RMF Engineering. RMF believes in a partnership with our clients. We take great strides to ensure that mistakes do not happen; they are limited through processes such as Quality Control and Design Assurance. We can guarantee that we will be responsive to your requests and we will make certain that a concern is handled to your satisfaction.

4.9 - Energy Conservation / LEED Experience

RMF has extensive experience in energy auditing and identifying methods for reduction in annual utility operating costs. The significance of the mechanical and electrical systems warrants consideration of energy efficient design. RMF takes every opportunity to incorporate energy efficient technology and sustainable design in utility systems. RMF has experience in reducing energy consumption with innovative technologies such as solar and geothermal energy, heat recovery and daylighting, as well as green roofs and rainwater collection.

RMF has designed over 75 LEED certified projects. Recent and relevant projects include:

East Campus Steam Plant
Duke University

West Campus Steam Plant Renewal and Conversion
Duke University

Yarbrough Chilled Water Plant
North Carolina State University

District Energy Facility Hot Water to East Drive
Harvard University

North Chiller Plant
University of Massachusetts Amherst

South Campus Chiller Plant
Ohio State University

Chilled Water Plant No. 3
Ohio State University

East Campus Chiller Plant
Ohio State University

West Plant
College of William & Mary

Chilled Water Plant
Yale University Science Park

West Campus Steam Plant Renewal and Conversion / Duke University

Yarbrough Chilled Water Plant / North Carolina State University

Section 5

Minority Business Participation Plan

RMF Engineering

Additional Information

HUB / MBE Representation

RMF is firmly committed to complying with and meeting the intent of minority participation. We are dedicated to providing HUBs, MBEs, SBs, SBDs and WOSBs opportunities to participate as subcontractors for any contract where subcontracting of work is required by the basic contract and the application of these laws and regulations is specified, or where there is otherwise an opportunity for taking advantage of such services.

DIVERSITY, EQUITY AND INCLUSION

RMF has a strong affirmative action policy and recruits, hires, trains, and promotes persons in all job titles without regard to race, color, religion, age, sex, disability, national origin, veteran status or any characteristic protected by applicable law. We recruit from historically black colleges and universities, including NC A&T State University and Howard University.

RMF is especially excited by the advances by women and minority employees that have resulted in leadership and ownership positions.

RMF's 350+ employees represent the greatest asset to the company, and each is hired and provided mentorship with the goal of achieving the highest possible career growth. Employee development and education has been the largest single focus at RMF for the last decade. A customized Project Management Program and two-year Leadership Development Program have been very successful in training the younger professional staff. **Greg Carnathan, PE, LEED AP, CEM leads the Project Management Program and Project Manager Matthew Boatwright, PE are graduates from the Leadership Development Program.**

Tuition reimbursement has benefited dozens of full-time employees for securing their first and second degrees. Everyone is encouraged at multiple levels to seek their full potential and be the best in their field. It is quite common for members of the RMF team to reach 25, 30 and 35 years of service levels, a testament to the care of employees and their loyalty.

The inclusion and empowerment of all people is recognized and incorporated throughout RMF's core values and business practices. RMF promotes and sustains an environment of belonging, respect and beliefs of our employees. We combine our individual talents, skills and experiences to enhance the lives of our employees and surrounding communities.

$2.4M
of which went to **DBE, WBE, VBE, SDVOB & HUB Zone** local businesses

$9.5M
subcontracted to **170 small businesses**

In 2023, RMF subcontracted approximately $9.5 million to nearly 170 individual small businesses. Almost $2.4 million of this work was subcontracted to Small Disadvantaged, Women Owned, Veteran Owned, Service-Disabled veteran Owned and HUB Zone businesses.

Community Engagement

Many of our staff are active participants in organizations that seek to promote diversity in the AEC professions. A number of these students have continued mentorship with RMF as engineering co-op students. Many have become full-time employees.

Several of RMF's employees have taken active roles in industry organizations to promote the professional development of woman / minorities in the engineering field. Most recently, the Charleston office made a large donation to My Sister's House, a nonprofit organization that provides essential services, programs and resources to empower domestic violence victims and their children to live free from abuse in Charleston and its surrounding counties.

Section 6

SF330

RMF Engineering

ARCHITECT-ENGINEER QUALIFICATIONS

PART I – CONTRACT-SPECIFIC QUALIFICATIONS

A. CONTRACT INFORMATION

1. TITLE AND LOCATION (City and State)

Campus Chilled Water Infrastructure and Equipment Improvements Phase II (Greensboro, NC)

2. PUBLIC NOTICE DATE	3. SOLICITATION OR PROJECT NUMBER
October 11, 2024	287-23-18453-01

B. ARCHITECT-ENGINEER POINT OF CONTACT

4. NAME AND TITLE

Greg Carnathan, PE, CEM, LEED AP - Principal in Charge

5. NAME OF FIRM

RMF Engineering, Inc.

6. TELEPHONE NUMBER	7. FAX NUMBER	8. E-MAIL ADDRESS
919.941.9876	919.941.9957	greg.carnathan@rmf.com

C. PROPOSED TEAM

(Complete this section for the prime contractor and all key subcontractors.)

	(Check) PRIME	(Check) J-V PARTNER	(Check) SUBCONTRACTOR	9. FIRM NAME	10. ADDRESS	11. ROLE IN THIS CONTRACT
a.	[X]	[ ]	[ ]	RMF Engineering [X] CHECK IF BRANCH OFFICE	8081 Arco Corporate Drive Suite 300 Raleigh, NC 27617	Mechanical, Electrical, Civil and Structural Engineering
b.	[ ]	[ ]	[ ]	[ ] CHECK IF BRANCH OFFICE		
c.	[ ]	[ ]	[ ]	[ ] CHECK IF BRANCH OFFICE		
d.	[ ]	[ ]	[ ]	[ ] CHECK IF BRANCH OFFICE		
e.	[ ]	[ ]	[ ]	[ ] CHECK IF BRANCH OFFICE		
f.	[ ]	[ ]	[ ]	[ ] CHECK IF BRANCH OFFICE		

D. ORGANIZATIONAL CHART OF PROPOSED TEAM

[X] (Attached)

D. ORGANIZATIONAL CHART OF PROPOSED TEAM

INSERT ORGANIZATIONAL CHART BELOW OR ATTACH.

RMF Engineering

Project Organizational Chart

UNC GREENSBORO

UNC Greensboro

Greensboro, NC

Bill Chatfield
UNC Greensboro Facilities Design and Construction

Greg Carnathan, PE, CEM, LEED AP
Principal in Charge

Matthew Boatwright, PE
Project Manager /
Lead Civil Engineer

Chris Skillestad, PE
Lead Electrical Engineer

Jonathan Eveleth, PE, CEM, LEED AP
Lead Mechanical Engineer

Jim Riches, PE
Lead Structural Engineer

PROJECT TEAM RESUMES

RMF's proposed design team, led by Principal in Charge Greg Carnathan, PE, CEM, LEED AP and Project Manager Matthew Boatwright, PE, are well-qualified and experienced personnel in the design of higher education campus systems. Additionally, RMF's proposed personnel is the same team that performed on phase I of the UNCG Campus Chilled Water Infrastructure project and are committed to providing a high level of technical insight and quality from start to finish.

Resumes provided are for our key personnel on this submission only and can be located in Section E. Additional support staff resumes can by provided upon request. RMF's staff is composed of over 90 licensed professional engineers and more than 230 engineering college graduates.

E. RESUMES OF KEY PERSONNEL PROPOSED FOR THIS CONTRACT

(Complete one Section E for each key person.)

12. NAME	13. ROLE IN THIS CONTRACT	14. YEARS EXPERIENCE	
		a. TOTAL	b. WITH CURRENT FIRM
Greg Carnathan, PE, LEED AP, CEM	**Principal in Charge**	27	25

15. FIRM NAME AND LOCATION (City and State)

RMF Engineering, Inc. (Raleigh, NC)

16. EDUCATION (Degree and Specialization)	17. CURRENT PROFESSIONAL REGISTRATION (State and Discipline)
Messiah College BS, Mechanical Engineering / 1998	Professional Engineer: NC #028322; LEED Accredited Professional; Certified Energy Manager

18. OTHER PROFESSIONAL QUALIFICATIONS (Publications, Organizations, Training, Awards, etc.)

Mr. Carnathan has experience leading planning and design efforts for central energy plants, power and thermal utility distribution infrastructure for educational, industrial, healthcare, commercial, government and military facilities. His responsibilities regularly include project management, strategic planning, energy modeling, options analysis and quality control.

19. RELEVANT PROJECTS

a.

(1) TITLE AND LOCATION (City and State)

Campus Chilled Water Infrastructure and Equipment Improvements Ph. I

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. RMF provided civil, mechanical, electrical and structural engineering for phase I of the project. Design provides new chilled water connections for Bryan, Mossman, Walker Deck and Elliott buildings on campus. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

SIZE: Campus-Wide | COST: $11.4 Million (Est.) | ROLE: PRINCIPAL IN CHARGE

b.

(1) TITLE AND LOCATION (City and State)

Steam Distribution System Replacement

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2019	2020

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF to provide design services to replace approximately 600 LF of 8" HPS and 4" PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.

SIZE: Campus-Wide | COST: $1.5 Million | ROLE: PRINCIPAL IN CHARGE

c.

(1) TITLE AND LOCATION (City and State)

District Energy Plant 2 - Expansion Phase 1

University of Georgia | Athens, GA

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2018	2019

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

This project was the first step of a phased plan to expand the production capacity of the south campus chilled water system by 6,000 tons. The additional chilled water generation equipment was installed in a new building adjacent to the existing District Energy Plant #2 (DEP-2). DEP-2 was being expanded to handle the new building loads added to the south campus loop, particularly the addition of the science learning center.

SIZE: 6,000 Tons | COST: $4.8 Million | ROLE: PRINCIPAL IN CHARGE

d.

(1) TITLE AND LOCATION (City and State)

Thermal Utilities to Partners II and Toxicology

North Carolina State University | Raleigh, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2020	N/A

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered Class-A piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults. The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings.

SIZE: 1,600 TF | COST: $9.1 Million | ROLE: PRINCIPAL IN CHARGE

e.

(1) TITLE AND LOCATION (City and State)

Electrical and Domestic Water Infrastructure Upgrades Ph 1-2

Elizabeth City State University | Elizabeth City, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2027 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

Design and construction administration services were requested to support upgrades to the medium voltage distribution, domestic water, sanitary sewer and stormwater utility systems on ECSU's campus. RMF is providing various MEP, civil and structural support design for the phased campus infrastructure upgrades. The necessary improvements would also include design and installation of a campus pump station to increase water pressure in support of future planned campus growth.

SIZE: N/A | COST: $34.5 Million (Est.) | ROLE: PRINCIPAL IN CHARGE

E. RESUMES OF KEY PERSONNEL PROPOSED FOR THIS CONTRACT

(Complete one Section E for each key person.)

12. NAME	13. ROLE IN THIS CONTRACT	14. YEARS EXPERIENCE	
		a. TOTAL	b. WITH CURRENT FIRM
Matthew Boatwright, PE	**Project Manager / Lead Civil Engineer**	15	14

15. FIRM NAME AND LOCATION (City and State)

RMF Engineering, Inc. (Raleigh, NC)

16. EDUCATION (Degree and Specialization)	17. CURRENT PROFESSIONAL REGISTRATION (State and Discipline)
North Carolina State University BS, Civil Engineering / 2011	Professional Engineer: NC #041981

18. OTHER PROFESSIONAL QUALIFICATIONS (Publications, Organizations, Training, Awards, etc.)

Mr. Boatwright is a project manager and civil engineer with experience in the design of civil utilities and solid knowledge of electrical, steam and chilled water distribution systems. His design experience is focused primarily on complex utility installations in congested sites. He also has experience with general site planning, design and permitting involving storm drainage analysis, stream buffer intrusions, site grading and hardscape restorations.

19. RELEVANT PROJECTS

a.

(1) TITLE AND LOCATION (City and State)

Campus Chilled Water Infrastructure and Equipment Improvements Ph. I

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. RMF provided civil, mechanical, electrical and structural engineering for phase I of the project. Design provides new chilled water connections for Bryan, Mossman, Walker Deck and Elliott buildings on campus. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

SIZE:	Campus-Wide	COST:	$11.4 Million (Est.)	ROLE:	PROJECT MANAGER / LEAD CIVIL ENGINEER

b.

(1) TITLE AND LOCATION (City and State)

Steam Distribution System Replacement

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2019	2020

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF to provide design services to replace approximately 600 LF of 8" HPS and 4" PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.

SIZE:	Campus-Wide	COST:	$1.5 Million	ROLE:	PROJECT MANAGER / LEAD CIVIL ENGINEER

c.

(1) TITLE AND LOCATION (City and State)

Thermal Utilities to Partners II and Toxicology

North Carolina State University | Raleigh, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2020	2021

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered Class-A piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults. The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings.

SIZE:	1,600 TF	COST:	$9.1 Million	ROLE:	PROJECT MANAGER / LEAD CIVIL ENGINEER

d.

(1) TITLE AND LOCATION (City and State)

Chiller Plant Expansion and Upgrades

Clemson University | Clemson, SC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2026 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

Clemson University identified the need for additional chilled water generation capacity to support the masterplanned campus growth. This project will provide 1,500 tons of generation capacity in a new 12,980 SF central chilled water plant sized to allow for 9,000 tons of full buildout capacity. Mechanical generation equipment installed in this phase will consist of a single 1,500 ton chiller, cooling tower, variable-primary chilled water pump and condenser water pump. Power for the plant will be provided from the West Campus Switching Station.

SIZE:	12,980 SF	COST:	$22 Million (Est.)	ROLE:	LEAD CIVIL ENGINEER

e.

(1) TITLE AND LOCATION (City and State)

Little Library Chilled Water Connection

Elizabeth City State University | Elizabeth City, NC

(2) YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2024

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF provided Elizabeth City State University with engineering services to install new chilled water service to Little Library. RMF designed underground HDPE chilled water piping to Little Library, and extended the chilled water piping to two separate mechanical rooms, where existing chillers were removed and the building was connected to the central chilled water network.

SIZE:	N/A	COST:	$750,000	ROLE:	PROJECT MANAGER / LEAD CIVIL ENGINEER

E. RESUMES OF KEY PERSONNEL PROPOSED FOR THIS CONTRACT

(Complete one Section E for each key person.)

12. NAME	13. ROLE IN THIS CONTRACT	14. YEARS EXPERIENCE	
		a. TOTAL	b. WITH CURRENT FIRM
Chris Skillestad, PE	**Lead Electrical Engineer**	13	10

15. FIRM NAME AND LOCATION (City and State)

RMF Engineering, Inc., (Raleigh, NC)

16. EDUCATION (Degree and Specialization)	17. CURRENT PROFESSIONAL REGISTRATION (State and Discipline)
North Carolina State University BS, Electrical Engineer / 2012	Professional Engineer: NC #043882

18. OTHER PROFESSIONAL QUALIFICATIONS (Publications, Organizations, Training, Awards, etc.)

Mr. Skillestad is an electrical engineer responsible for medium-voltage system analysis and design and the design of power generation, medium voltage distribution, utility infrastructure, energy plants and SCADA systems for the higher education market. He has specialized training in SKM analysis software to perform short circuit, coordination and arc flash studies.

19. RELEVANT PROJECTS

a.

(1) TITLE AND LOCATION (City and State)					(2) YEAR COMPLETED	
Campus Chilled Water Infrastructure and Equipment Improvements Ph. I					PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
UNC Greensboro		Greensboro, NC			2024	2025 (Est.)
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE					[X] Check if project performed with current firm	
The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. RMF provided civil, mechanical, electrical and structural engineering for phase I of the project. Design provides new chilled water connections for Bryan, Mossman, Walker Deck and Elliott buildings on campus. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.						
SIZE:	Campus-Wide	COST:	$11.4 Million (Est.)	ROLE:	LEAD ELECTRICAL ENGINEER	

b.

(1) TITLE AND LOCATION (City and State)					(2) YEAR COMPLETED	
Steam Distribution System Replacement					PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
UNC Greensboro		Greensboro, NC			2019	2020
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE					[X] Check if project performed with current firm	
RMF to provide design services to replace approximately 600 LF of 8" HPS and 4" PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.						
SIZE:	Campus-Wide	COST:	$1.5 Million	ROLE:	LEAD ELECTRICAL ENGINEER	

c.

(1) TITLE AND LOCATION (City and State)					(2) YEAR COMPLETED	
Thermal Utilities to Partners II and Toxicology					PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
North Carolina State University		Raleigh, NC			2020	2021
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE					[X] Check if project performed with current firm	
RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered Class-A piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults. The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings.						
SIZE:	1,600 TF	COST:	$9.1 Million	ROLE:	LEAD ELECTRICAL ENGINEER	

d.

(1) TITLE AND LOCATION (City and State)					(2) YEAR COMPLETED	
Yarbrough Chiller Plant Expansion					PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
North Carolina State University		Raleigh, NC			2024	2025 (Est.)
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE					[X] Check if project performed with current firm	
North Carolina State University is increasing their chilled water production capacity and system reliability due to the construction of additional high-intensity labs being added to their North Campus. NCSU's mandate is to maintain N+1 capacity on their central utility systems to insure reliability and uptime. To increase capacity, a 2,000 ton chiller and associated support equipment are being added to bring the total chilled water capacity of the Yarbrough plant to 12,000 tons.						
SIZE:	2,000 Ton Chiller	COST:	$6 Million (Est.)	ROLE:	LEAD ELECTRICAL ENGINEER	

e.

(1) TITLE AND LOCATION (City and State)					(2) YEAR COMPLETED	
District Energy Plant 2 - Expansion Phase 1					PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
University of Georgia		Athens, GA			2018	2019
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE					[X] Check if project performed with current firm	
This project was the first step of a phased plan to expand the production capacity of the south campus chilled water system by 6,000 tons. The additional chilled water generation equipment was installed in a new building adjacent to the existing District Energy Plant #2 (DEP-2). DEP-2 was being expanded to handle the new building loads added to the south campus loop, particularly the addition of the science learning center.						
SIZE:	6,000 Tons	COST:	$4.8 Million	ROLE:	LEAD ELECTRICAL ENGINEER	

E. RESUMES OF KEY PERSONNEL PROPOSED FOR THIS CONTRACT

(Complete one Section E for each key person.)

12. NAME	13. ROLE IN THIS CONTRACT	14. YEARS EXPERIENCE	
		a. TOTAL	b. WITH CURRENT FIRM
Jonathan Eveleth, PE, CEM, LEED AP	**Lead Mechanical Engineer**	18	11

15. FIRM NAME AND LOCATION (City and State)

RMF Engineering, Inc. (Raleigh, NC)

16. EDUCATION (Degree and Specialization)	17. CURRENT PROFESSIONAL REGISTRATION (State and Discipline)
Georgia Institute of Technology BS, Mechanical Engineer / 2007	Professional Engineer: NC #041582

18. OTHER PROFESSIONAL QUALIFICATIONS (Publications, Organizations, Training, Awards, etc.)

Mr. Eveleth is a mechanical engineer and project manager who specializes in the analysis, design and construction of complex infrastructure systems serving educational, industrial, healthcare and commercial facilities. He is most knowledgeable in the areas of thermal utilities including steam and chilled water. His background as a design-build contractor gives him a unique perspective on the need for high quality documents with a focus on constructibility.

19. RELEVANT PROJECTS

a.

(1) TITLE AND LOCATION (City and State)		(2) YEAR COMPLETED	
Campus Chilled Water Infrastructure and Equipment Improvements Ph. I		PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
UNC Greensboro	Greensboro, NC	2024	2025 (Est.)
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE		[X] Check if project performed with current firm	

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. RMF provided civil, mechanical, electrical and structural engineering for phase I of the project. Design provides new chilled water connections for Bryan, Mossman, Walker Deck and Elliott buildings on campus. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

SIZE:	Campus-Wide	COST:	$11.4 Million (Est.)	ROLE:	LEAD MECHANICAL ENGINEER

b.

(1) TITLE AND LOCATION (City and State)		(2) YEAR COMPLETED	
Chiller Plant Expansion and Upgrades		PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
Clemson University	Clemson, SC	2024	2026 (Est.)
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE		[X] Check if project performed with current firm	

Clemson University identified the need for additional chilled water generation capacity to support the masterplanned campus growth. This project will provide 1,500 tons of generation capacity in a new 12,980 SF central chilled water plant sized to allow for 9,000 tons of full buildout capacity. Mechanical generation equipment installed in this phase will consist of a single 1,500 ton chiller, cooling tower, variable-primary chilled water pump and condenser water pump. Power for the plant will be provided from the West Campus Switching Station.

SIZE:	12,980 SF	COST:	$22 Million (Est.)	ROLE:	LEAD MECHANICAL ENGINEER

c.

(1) TITLE AND LOCATION (City and State)		(2) YEAR COMPLETED	
Thermal Utilities to Partners II and Toxicology		PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
North Carolina State University	Raleigh, NC	2020	N/A
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE		[X] Check if project performed with current firm	

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered Class-A piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults. The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings.

SIZE:	1,600 TF	COST:	$9.1 Million	ROLE:	LEAD MECHANICAL ENGINEER

d.

(1) TITLE AND LOCATION (City and State)		(2) YEAR COMPLETED	
Yarbrough Chiller Plant Expansion		PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
North Carolina State University	Raleigh, NC	2024	2025 (Est.)
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE		[X] Check if project performed with current firm	

North Carolina State University is increasing their chilled water production capacity and system reliability due to the construction of additional high-intensity labs being added to their North Campus. NCSU's mandate is to maintain N+1 capacity on their central utility systems to insure reliability and uptime. To increase capacity, a 2,000 ton chiller and associated support equipment are being added to bring the total chilled water capacity of the Yarbrough plant to 12,000 tons.

SIZE:	2,000 Ton Chiller	COST:	$6 Million (Est.)	ROLE:	PROJECT MANAGER / LEAD MECHANICAL ENGINEER

e.

(1) TITLE AND LOCATION (City and State)		(2) YEAR COMPLETED	
District Energy Plant 2 - Expansion Phase 1		PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
University of Georgia	Athens, GA	2018	2019
(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE		[X] Check if project performed with current firm	

This project was the first step of a phased plan to expand the production capacity of the south campus chilled water system by 6,000 tons. The additional chilled water generation equipment was installed in a new building adjacent to the existing District Energy Plant #2 (DEP-2). DEP-2 was being expanded to handle the new building loads added to the south campus loop, particularly the addition of the science learning center.

SIZE:	6,000 Tons	COST:	$4.8 Million	ROLE:	PROJECT MANAGER / LEAD MECHANICAL ENGINEER

E. RESUMES OF KEY PERSONNEL PROPOSED FOR THIS CONTRACT

(Complete one Section E for each key person.)

12. NAME	13. ROLE IN THIS CONTRACT	14. YEARS EXPERIENCE	
		a. TOTAL	b. WITH CURRENT FIRM
Jim Riches, PE	**Lead Structural Engineer**	31	31

15. FIRM NAME AND LOCATION (City and State)

RMF Engineering, Inc. (Raleigh, NC)

16. EDUCATION (Degree and Specialization)	17. CURRENT PROFESSIONAL REGISTRATION (State and Discipline)
Drexel University BS, Civil and Architectural Engineering / 1993	Professional Engineer: NC #039436

18. OTHER PROFESSIONAL QUALIFICATIONS (Publications, Organizations, Training, Awards, etc.)

Mr. Riches has extensive experience in performing structural and civil engineering for large infrastructure projects and buildings. He has designed steel framed buildings and reinforced concrete structures. These include utility tunnels, underground vaults and chiller and boiler plants with stacks, cranes, and hoists. Multi-discipline coordination is an essential aspect in all of his projects. Structural anchoring and support of various mechanical piping systems and equipment is a common detail in his designs. He has also performed site planning and utility design for underground piping systems and electrical ductbanks and vaults.

19. RELEVANT PROJECTS

a.

(1) TITLE AND LOCATION (City and State)

Campus Chilled Water Infrastructure and Equipment Improvements Ph. I

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED	
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. RMF provided civil, mechanical, electrical and structural engineering for phase I of the project. Design provides new chilled water connections for Bryan, Mossman, Walker Deck and Elliott buildings on campus. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

SIZE:	Campus-Wide	COST:	$11.4 Million (Est.)	ROLE:	LEAD STRUCTURAL ENGINEER

b.

(1) TITLE AND LOCATION (City and State)

Steam Distribution System Replacement

UNC Greensboro | Greensboro, NC

(2) YEAR COMPLETED	
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2019	2020

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF to provide design services to replace approximately 600 LF of 8" HPS and 4" PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.

SIZE:	Campus-Wide	COST:	$1.5 Million	ROLE:	LEAD STRUCTURAL ENGINEER

c.

(1) TITLE AND LOCATION (City and State)

Chiller Plant Expansion and Upgrades

Clemson University | Clemson, SC

(2) YEAR COMPLETED	
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2026 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

Clemson University identified the need for additional chilled water generation capacity to support the masterplanned campus growth. This project will provide 1,500 tons of generation capacity in a new 12,980 SF central chilled water plant sized to allow for 9,000 tons of full buildout capacity. Mechanical generation equipment installed in this phase will consist of a single 1,500 ton chiller, cooling tower, variable-primary chilled water pump and condenser water pump. Power for the plant will be provided from the West Campus Switching Station.

SIZE:	12,980 SF	COST:	$22 Million (Est.)	ROLE:	LEAD STRUCTURAL ENGINEER

d.

(1) TITLE AND LOCATION (City and State)

Yarbrough Chiller Plant Expansion

North Carolina State University | Raleigh, NC

(2) YEAR COMPLETED	
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

North Carolina State University is increasing their chilled water production capacity and system reliability due to the construction of additional high-intensity labs being added to their North Campus. NCSU's mandate is to maintain N+1 capacity on their central utility systems to insure reliability and uptime. To increase capacity, a 2,000 ton chiller and associated support equipment are being added to bring the total chilled water capacity of the Yarbrough plant to 12,000 tons.

SIZE:	2,000 Ton Chiller	COST:	$6 Million (Est.)	ROLE:	LEAD STRUCTURAL ENGINEER

e.

(1) TITLE AND LOCATION (City and State)

Thermal Utilities to Partners II and Toxicology

North Carolina State University | Raleigh, NC

(2) YEAR COMPLETED	
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2020	N/A

(3) BRIEF DESCRIPTION (Brief scope, size, cost, etc.) AND SPECIFIC ROLE

[X] Check if project performed with current firm

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered Class-A piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults. The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings.

SIZE:	1,600 TF	COST:	$9.1 Million	ROLE:	LEAD STRUCTURAL ENGINEER

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 1

21. TITLE AND LOCATION (City and State)

Campus Chilled Water Infrastructure and Equipment Improvements Phase I
Greensboro, NC

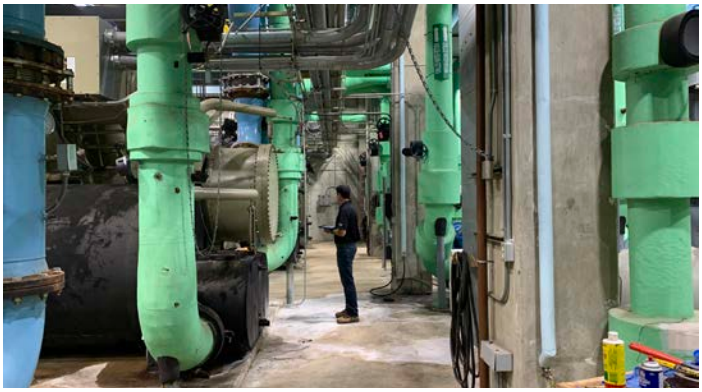
22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
UNC Greensboro	David Freidman	336.334.5269

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)



Relevant Scope

- Phase I
- UNC Greensboro Experience

Construction Cost

$11.4 Million (Est.)

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

UNC Greensboro distributes chilled water to campus from two existing chiller plants on the north and south sides of campus. The goal of this project is to complete the loop between these two plants to improve campus reliability and hydraulics and to also connect four buildings in the area to the campus chilled water distribution loop. It will also allow the UNC Greensboro to remove several building chillers and cooling towers, lowering campus maintenance and improving energy efficiency.

The Campus Chilled Water Infrastructure and Equipment Improvements project will complete the campus chilled water distribution loop by installing approximately 1,200 trench foot of underground 24-inch chilled water mains between McIver Plant and South Plant along Stirling Drive. New chilled water connections will be provided to four buildings on campus: Bryan, Mossman, Walker Deck and Elliott building. The Alumni building is currently fed chilled water through Elliott and will also be connected to the campus distribution system by this project through the Elliott building loop transition. A tap for future connection will also be provided for Jackson Library. Part of the project also includes providing a schematic design level study for replacing the existing 750-ton chiller in McIver Plant with a new 1500-ton chiller.

Each building's tie-in point required close coordination between underground conflicts and interior building restrictions. At several locations, the team employed creative solutions to access the building including utilizing liner plate tunnels to access basement area, routing piping through office space in a new pipe chase and utilizing void space below stairways for accessing mechanical rooms. The mechanical rooms were designed to accommodate phasing while also placing new equipment in logical and ideal locations. At Elliott, one of the existing chillers and building controls were reconfigured so that it could provide building backup and backfeed into the loop during times of low demand.

The civil design required permitting with City of Greensboro for traffic detour and road closure review and with their Public Works group for utility separation review.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil, Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #
2

21. TITLE AND LOCATION (City and State)	22. YEAR COMPLETED	
	PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
Steam Distribution System Replacement Greensboro, NC	2019	2020

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
UNC Greensboro	Bill Chatfield	336.334.5269

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- UNC Greensboro Experience
- Campus Distribution

Construction Cost

$1.5 Million

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jim Riches, PE

As part of a multi-phased replacement of deteriorating steam distribution in the heart of their campus, the University of UNC Greensboro contracted RMF to provide design services to replace approximately 600 LF of eight-inch HPS and four-inch PC. Various distribution methodologies were investigated and presented to UNCG during early design planning (direct buried, shallow trench and walkable tunnel). Approximate budgets, schedules and long term comparisons were provided for each methodology, allowing UNCG and RMF to select the system best suited for the project.

In order to accommodate the University's desired system of shallow trench distribution, RMF developed a phased approach that would provide the necessary flexibility to accommodate the available budget and construction schedule. The two phase approach was coordinated with traffic and pedestrian control requirements, bus routes and available laydown space; working to split the project due to budget and schedule restrictions at an area that would also help minimize impact to campus operations. Pedestrian phasing and traffic control was of high importance as the alignment was located directly adjacent the Elliot University Center, under a busy walkway just south of the Kaplan Commons courtyard. The utility alignment was also laid out to utilize z-bends and loops to avoid utility conflicts and sensitive areas. These features allowed the team to avoid the use of mechanical expansion joints and associated ongoing maintenance.

Multiple temporary service options were investigated and provided for consideration, including temporary electrical hot water heaters, temporary above ground stream distribution, and temporary FO Boilers. UNCG and RMF worked together to implement the most cost effective temporary solution that still met minimum demand requirements by investigating each building's seasonal usage during the estimated construction window.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil, Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #
3

21. TITLE AND LOCATION (City and State)	22. YEAR COMPLETED	
	PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
District Energy Plant 2 - Expansion Phase 1 Athens, GA	2018	2019

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
University of Georgia	Eric Sherman	706.542.7485

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Construction Cost

$4.8 Million

Key RMF Personnel

- Greg Carnathan, PE
- Jonathan Eveleth, PE

This project was the first step of a phased plan to expand the production capacity of the south campus chilled water system by 6,000 tons. The additional chilled water generation equipment was to be installed in a new building adjacent to the existing District Energy Plant #2 (DEP-2) located at the intersection of East Campus Rd. and Cedar Street. DEP-2 was expanded to handle the new building loads added to the south campus loop, particularly the addition of the science learning center that is scheduled to come online in April 2016. Over time, the plant would also absorb capacity void associated with retirement of aging, decentralized building chillers.

The first phase included the civil, structural and architectural infrastructure for the first 3,000 tons of cooling. All infrastructure systems were setup for simple and thoughtful expansion with no shut-down requirements moving forward. The mechanical portion of the first phase of the DEP-2 expansion includes a 1,000 Ton variable speed electric water-cooled centrifugal chiller. Chiller selection and selection parameters including condenser water flow rates, variable speed drives, etc. were economically evaluated using a net present value life-cycle methodology. Associated cooling tower, pumps, piping, and controls were carefully designed for ease of service. The chilled water system was configured using a variable primary hydraulic arrangement. A variety of water filtration systems were evaluated during the design process which led to implementation of a SpiroTherm air-dirt separator on the chilled water system, along with an Arkal disc type condenser water filtration system. Electrical service for the first phase of the DEP-2 expansion came from the existing 12.47kV medium voltage (MV) campus loop feed. Options were developed to allow dual-ended electrical services including back-up transformer and switchgear capabilities.

RMF adapted templates to utilize Revit MEP 3D modeling software for chiller plant design. The team regularly provided virtual, animated, 3D tours to UGA during the design process for best review of layout, fit and function. In addition to providing full design services, RMF's deliverables include full cost estimating and back-up calculations for each submission phase. RMF and the design team coordinated with a construction manager during the process, and provided support for bidding and construction administration involvement that included bi-weekly site visits.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil, Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 4

21. TITLE AND LOCATION (City and State)

Chiller Plant Expansion and Upgrades
Clemson, SC

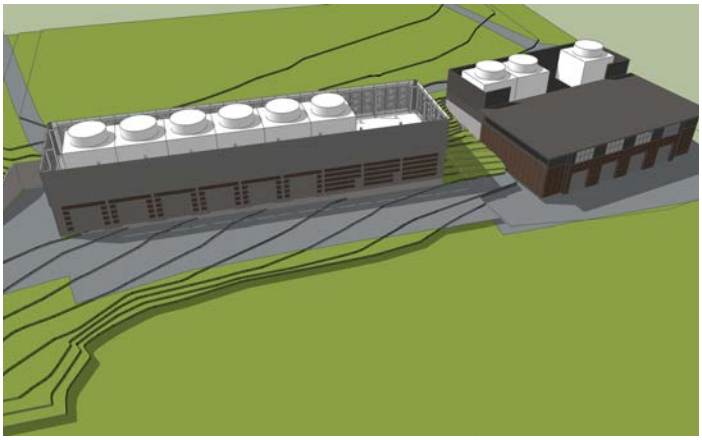
22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2026 (Est.)

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
Clemson University	Kailash Munoth	864.283.7105

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)



Relevant Scope

- Chilled Water Plant
- Campus Chilled Water System

Construction Cost

$22 Million (Est.)

Key RMF Personnel

- Matthew Boatwright, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

Clemson University identified the need for additional chilled water generation capacity to support the masterplanned campus growth. This project will provide 1,500 tons of generation capacity in a new 12,980 SF central chilled water plant sized to allow for 9,000 tons of full buildout capacity.

The new facility is sited to the east of the current West Campus Chiller Plant and is arranged in an east to west linear arrangement abutting the intramural fields to the south. A new 24 inch chilled water connection will be made to the existing main on Highway 93. Access to the plant will be via a drive aisle to the north of the plant in front of rollup doors serving each chiller bay, the pump aisle and electrical room.

Mechanical generation equipment installed in this phase will consist of a single 1,500 ton chiller, cooling tower, variable-primary chilled water pump and condenser water pump. In addition, filtration systems will be installed for both the open (condenser water) and closed (chilled water) loop systems. This system is designed to provide top-tier energy efficiency and reliability through fully headered systems, ulta-high efficiency equipment, variable frequency drives installed on all motors, and a state-of-the art optimization suite layered on the control system.

Power for the plant will be provided from the West Campus Switching Station. A long term three bus system planned with the option for an N+1 sparing transformer connection to each bus. This arrangement, coupled with the headered system will allow electrical maintenance and expansion to take place without losing plant generation capacity

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	MEP, Structural and Utility Engineering

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 5

21. TITLE AND LOCATION (City and State)

Little Library Chilled Water Connection
Elizabeth City, NC

22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2024

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
Elizabeth City State University	Ryan Strickland	252-567-8608

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Construction Cost

$750,000

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE

RMF provided Elizabeth City State University with engineering services to install new chilled water service to Little Library.

RMF designed underground HDPE chilled water piping to Little Library, and extended the chilled water piping to two separate mechanical rooms, where existing chillers were removed and the building was connected to the central chilled water network.

Connecting Little Library to the campus chilled water system improves campus energy efficiency and chilled water reliability at Little Library, while the existing chillers can be used elsewhere on campus for emergency replacements of failing chillers.

Little Library consists of a main building and an addition. Two separate chilled water connections were made, and connectivity and understanding of how the two separate spaces operate was required. Coordination with future water and power infrastructure was also required.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical and Civil Engineering

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 6

21. TITLE AND LOCATION (City and State)

Yarbrough Chiller Plant Expansion
Raleigh, NC

22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
North Carolina State University	David Hammock	919.515.2030

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Construction Cost

$6 Million (Est.)

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

North Carolina State University is increasing their chilled water production capacity and system reliability due to the construction of additional high-intensity labs being added to their North Campus. NCSU's mandate is to maintain N+1 capacity on their central utility systems to insure reliability and uptime. In addition to equipment additions, modifications to the control system are taking place which will increase energy efficiency of the system.

A 2,000 ton chiller and associated support equipment are being added to bring the total chilled water capacity of the Yarbrough plant to 12,000 tons.

This project bring campus chilled water generation capacity up to the N+1 standard to support the addition of the Integrative Sciences Building (ISB). In addition, the control updates will increase overall efficiency and reliability of the chilled water system.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil, Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 7

21. TITLE AND LOCATION (City and State)

Thermal Utilities to Partners II and Toxicology
Raleigh, NC

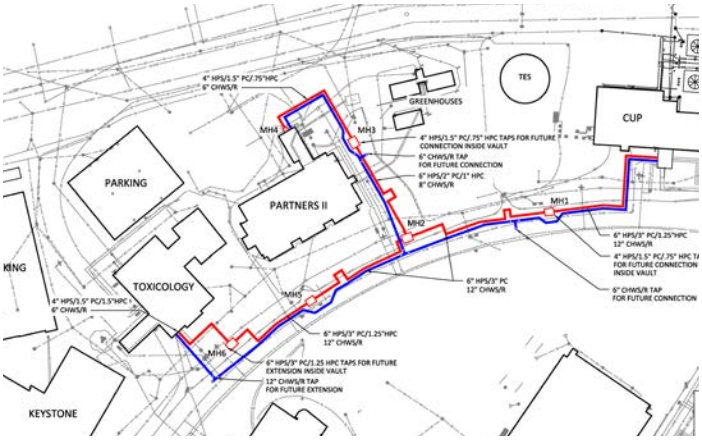
22. YEAR COMPLETED

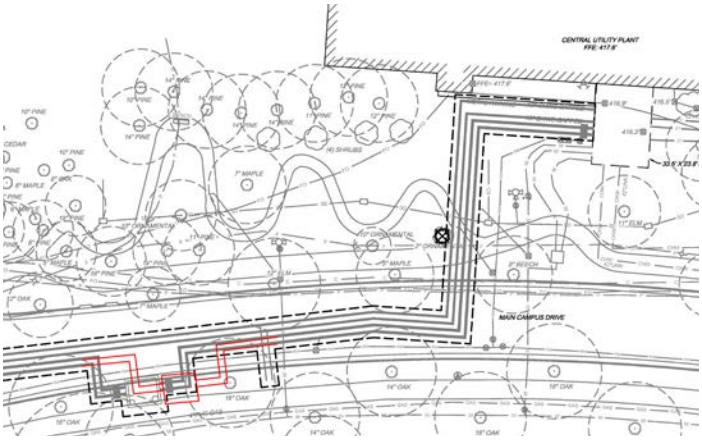
PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2020	N/A

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
North Carolina State University	David Hammock	919.515.2030

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)





Relevant Scope

- Campus Chilled Water System
- Chiller Replacement

Construction Cost

$9.1 Million

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

The goal for this project was to connect Partners II and Toxicology buildings to the central utility plant (CUP). Underground utilities including chilled water (CHS+CHR) and steam (HPS,PC+HPC) were extended from the central utility plant to the buildings. Additionally, building mechanical rooms were converted from stand-alone generating facilities to utility receiving buildings.

RMF provided 1,600 TF of underground thermal distribution design for steam using a pre-engineered, Class A, piping system and a fully restrained mechanical join ductile-iron pipe for chilled water. The design also included structural and mechanical design for six new steam vaults; building mechanical room design for steam PRV stations, hot water heat exchangers, hot and chilled water pumps; suite of flow and energy monitoring systems for new building connections; and design phasing drawings, notes and specifications to maintain building services during the utility transitions.

Two critical research facilities on centennial campus with aged, inefficient and unreliable cooling and heating generation systems were connected to a modern, reliable and efficient energy plant. The central plant boasts chilled water thermal storage along with combined heat and power.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil and Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 8

21. TITLE AND LOCATION (City and State)

North Chiller Plant Transformation
Winston-Salem , NC

22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2017	2018

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
Wake Forest University	Mike Draughn	336.782.0071

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Construction Cost

$4.6 Million

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE
- Jim Riches, PE

The North Chiller Plant provides chilled water for comfort and process to residential, classroom and laboratory facilities on campus at Wake Forest University. RMF provided planning, design and construction administration services to modernize and transform the aging north chiller plant into a state-of-the-art facility. The project included the replacement of the existing chillers, towers, piping, pumps and electrical system. Utilizing only the existing building shell and medium voltage power supply, 2,400 tons of chilled water generation was added to a facility designed for only 1,200 tons of cooling.

Meticulous attention to equipment selection, layout, accessibility and modeling enabled the new plant to have even better reliability, efficiency and service access than the original design. All plant systems were modeled in AutoDesk Revit MEP. Virtual tours of the plant were made at critical points during the design process. Two 1,200 ton variable speed drive chillers were pre-purchased based on a life-cycle energy model. The model's hours and operating conditions were custom developed based on 12 months of metering and controls data points. Additionally, long lead electrical transformers and switchboards were also pre-purchased to facilitate an accelerated design and construction window.

The variable primary plant features drives on each chiller, pump and tower fan along with chiller plant optimization by Optimum Energy. Additional plant features include chilled water air-dirt separation along with a high-efficiency condenser water filtration system.

Civil and structural design upsized the chiller water distribution mains, expanded the cooling tower yard and provided tower access platforms. Additionally, a screen wall was added to shield views of the new cooling towers from a nearby business school.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil and Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #: 9

21. TITLE AND LOCATION (City and State)

Downtown Complex CHW-HPS Systems Infrastructure
Raleigh, NC

22. YEAR COMPLETED

PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
2024	2025 (Est.)

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
North Carolina Dept. of Administration	Jeff Schmadeke	919.807.4110

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Campus Chilled Water System
- Chiller Replacement
- Plant Capacity Increase

Construction Cost

$17.5 Million (Est.)

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE

Chiller Plant

The North Carolina Department of Administration chilled water system features Chiller Plant No. 1 (2200 Tons), Chiller Plant No. 2 (2900 Tons), an above ground 2.75M gallon concrete chilled water thermal energy storage tank (TES), and an underground 750K gallon chilled water TES. This project will replace Chiller Plant No. 2 (currently a modular building on concrete slab) with a new chiller plant designed for initial production of 4500 Tons of chilled water and 6000 Tons at full build out.

Boiler Plant

The North Carolina Department of Administration high pressure steam system features a main steam plant which generates high pressure steam for the State run buildings in downtown Raleigh. When the main steam plant was opened in 1997 the original boiler plant was abandoned in place.

Currently there is no secondary source of steam in the NC DOA system which makes preventative maintenance shutdowns very difficult to plan and execute. This project will renovate the Old Boiler Plant to become a functioning boiler plant which can be used throughout the summer to provide steam to the system and allow a main boiler plant shutdown.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	Mechanical, Electrical, Civil and Structural

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT

(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)

20. EXAMPLE PROJECT KEY #
10

21. TITLE AND LOCATION (City and State)	22. YEAR COMPLETED	
	PROFESSIONAL SERVICES	CONSTRUCTION (if applicable)
Exterior Hydronic Piping and Regional Plant 2 Equipment Addition Raleigh, NC	2021	2022

23. PROJECT OWNER'S INFORMATION

a. PROJECT OWNER	b. POINT OF CONTACT NAME	c. POINT OF CONTACT TELEPHONE NUMBER
Wake Technical Community College	Wendell Goodwin	919.866.5577

24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost)

Relevant Scope

- Plant Equipment Addition
- Infrastructure Utility Connection

Construction Cost

$3.1 Million

Key RMF Personnel

- Greg Carnathan, PE
- Matthew Boatwright, PE
- Chris Skillestad, PE
- Jonathan Eveleth, PE

This project extended the chilled water and hot water thermal utilities to Building H, extended thermal utilities towards the Automotive building and installed a new chiller, boiler and cooling tower in Regional Plant 2 on Wake Technical Community College's Scott Northern Wake Campus. Regional Plant 2 was originally engineered by RMF to hold three total pieces of each equipment. This project installed the second of each.

The high efficiency, modern Regional Plant 2 is central to the campus thermal distribution system and this equipment addition adds more capacity to support a growing campus. Tying the campus into buildings with existing standalone utilities allows flexibility and redundancy.

The thermal distribution design required careful phasing as it crossed active parking lots, a pedestrian bridge and fire access lane. Vaults are designed with serviceability in mind for both chilled and hot water. Routing piping across an existing pedestrian bridge crossing a creek required careful attention to constructibility and management of thermal expansion on the hot water system.

25. FIRMS FROM SECTION C INVOLVED WITH THIS PROJECT

	(1) FIRM NAME	(2) FIRM LOCATION (City and State)	(3) ROLE
a.	**RMF Engineering, Inc.**	Raleigh, NC	MEP, Civil and Structural Engineering

G. KEY PERSONNEL PARTICIPATION IN EXAMPLE PROJECTS

26. NAMES OF KEY PERSONNEL (From Section E, Block 12)	27. ROLE IN THIS CONTRACT (From Section E, Block 13)	28. EXAMPLE PROJECTS LISTED IN SECTION F (Fill in "Example Projects Key" section below before completing table. Place "X" under project key number for participation in same or similar role.)									
		1	2	3	4	5	6	7	8	9	10
Greg Carnathan, PE, CEM, LEED AP	Principal in Charge	X	X	X		X	X	X	X	X	X
Matthew Boatwright, PE	Project Manager / Lead Civil Engineer	X	X		X	X	X	X	X	X	X
Chris Skillestad, PE	Lead Electrical Engineer	X	X				X	X	X	X	X
Jonathan Eveleth, PE, CEM, LEED AP	Lead Mechanical Engineer	X		X	X		X	X	X		X
Jim Riches, PE	Lead Structural Engineer	X	X		X		X	X	X		

29. EXAMPLE PROJECTS KEY

NO.	TITLE OF EXAMPLE PROJECT (From Section F)	NO.	TITLE OF EXAMPLE PROJECT (From Section F)
1	**Campus Chilled Water Infrastructure and Equipment Improvements Phase I** UNC Greensboro	6	**Yarbrough Chiller Plant Expansion** North Carolina State University
2	**Steam Distribution System Replacement** UNC Greensboro	7	**Thermal Utilities to Partners II and Toxicology** North Carolina State University
3	**District Energy Plant 2 - Expansion Phase 1** University of Georgia	8	**North Chiller Plant Transformation** Wake Forest University
4	**Chiller Plant Expansion and Upgrades** Clemson University	9	**Downtown Complex CHW-HPS Systems Infrastructure**North Carolina Department of Administration
5	**Little Library Chilled Water Connection** Elizabeth City State University	10	**Exterior Hydronic Piping and Regional Plant 2 Equipment Addition** Wake Technical Community College

H. ADDITIONAL INFORMATION

30. PROVIDE ANY ADDITIONAL INFORMATION REQUESTED BY THE AGENCY. ATTACH ADDITIONAL SHEETS AS NEEDED.

NORTH CAROLINA BOARD OF EXAMINERS
FOR ENGINEERS AND SURVEYORS
4601 Six Forks Rd Suite 310
Raleigh, North Carolina 27609

RMF Engineering, Inc, P.C.
5520 Research Park Drive, Ste 300
Baltimore, MD 21228

This is to Certify that:

RMF Engineering, Inc. P.C. is licensed with the North Carolina Board of Examiners for Engineers and Surveyors, and is authorized to practice ***engineering*** under the provisions of Chapter 89C and 55B of the General Statutes of North Carolina.

This authorization must be renewed annually, and **expires on June 30, 2025**

License No. : C-1125

THE NORTH CAROLINA BOARD OF EXAMINERS FOR ENGINEERS AND SURVEYORS

Executive Director

POST IN PLACE OF BUSINESS

Issued 06/14/2024

Telephone	FAX	EMAIL Address	WEB Site
(919) 791-2000	(919) 791-2012	ncbels@ncbels.org	***.ncbels.org

Gregory A. Carnathan
RMF Engineering Inc
8081 Arco Corporate Drive, Suite 300
Raleigh, NC 27617
License: 028322
Status: CURRENT
Expires: 12/31/2024

Matthew S. Boatwright
RMF Engineering
8081 Arco Corporate Dr
Suite 300
Raleigh, NC 27617
License: 041981
Status: CURRENT
Expires: 12/31/2024

Chris T. Skillestad
RMF Engineering
8081 Arco Corp Dr Suite 300
Raleigh, NC 27617
License: 043882
Status: CURRENT
Issue Date: 5/24/2016
Expires: 12/31/2024

Jonathan D. Eveleth
RMF Engineering
8081 Arco Corporate Dr Suite 300
Raleigh, NC 27617
License: 041582
Status: CURRENT
Expires: 12/31/2024

James K. Riches
RMF Engineering Inc
5520 Research Park Dr
Baltimore, MD 21228-4791
License: 039436
Status: CURRENT
Issue Date: 8/3/2012
Expires: 12/31/2024

I. AUTHORIZED REPRESENTATIVE

The foregoing is a statement of facts.

31. SIGNATURE

32. DATE
November 8, 2024

33. NAME AND TITLE
Greg Carnathan, PE, CEM, LEED AP – Principal

ARCHITECT-ENGINEER QUALIFICATIONS

1. SOLICITATION NUMBER (If any): 287-23-18453-01

PART II – GENERAL QUALIFICATIONS

(If a firm has branch offices, complete for each specific branch office seeking work.)

2a. FIRM (or Branch Office) NAME	3. YEAR ESTABLISHED	4. UNIQUE ENTITY IDENTIFIER
RMF Engineering, Inc.	1983	Y7YJFTG997E7

2b. STREET	5. OWNERSHIP
8081 Arco Corporate Drive, Suite 300	a. TYPE: Corporation

2c. CITY	2d. STATE	2e. ZIP CODE	b. SMALL BUSINESS STATUS
Raleigh	NC	27617	No

6a. POINT OF CONTACT NAME AND TITLE	7. NAME OF FIRM (If Block 2a is a Branch Office)
Gregory Carnathan, PE, CEM, LEED AP – Principal	RMF Engineering, Inc.

6b. TELEPHONE NUMBER	6c. EMAIL ADDRESS
919.251.6364	greg.carnathan@rmf.com

8a. FORMER FIRM NAME(S) (If any)	8b. YEAR ESTABLISHED	8c. UNIQUE ENTITY IDENTIFIER
Ross Murphy Finkelstein, Inc.	1983	Y7YJFTG997E7

9. EMPLOYEES BY DISCIPLINE

a. Function Code	b. Discipline	c. No. of Employees (1) FIRM	c. No. of Employees (2) BRANCH
02	Administrative	41	3
06	Architect		
12	Civil Engineers	11	3
21	Electrical Engineers	26	4
42	Mechanical Engineers	50	10
57	Structural Engineers	4	
10	Chemical Engineers		
08	CADD Technicians	10	9
15	Construction Engineers	5	
12/21/42	Junior Engineers/Designers	45	
15	Construction Inspector	4	
52	Sanitary Engineer		
	Architectural Designer	1	
	Civil Designer	16	3
	Commissioning Agent	22	5
	Electrical Designer	28	6
	Energy Engineer	4	
	Inspector		
	Information Technology	7	
	Plumbing Engineer	4	1
	Mechanical Designer	72	10
	Total	350	54

10. PROFILE OF FIRM'S EXPERIENCE AND ANNUAL AVERAGE REVENUE FOR LAST 5 YEARS

a. Profile Code	b. Experience	c. Revenue Index Number (see below)
A06	Airports; Terminals; Hangers; Freight Handling	3
A08	Animal Facilities	5
B01	Barracks; Dormitories	5
E02	Educational Facilities; Classrooms	7
F02	Field Houses; Gymnasiums; Stadiums	5
G01	Garages; Vehicle Maint. Facilities; Parking Decks	1
H04	Heating, Ventilating, Air Conditioning	7
H09	Hospitals & Medical Facilities	7
L01	Laboratories; Medical Research Facilities	7
L06	Lighting (Exterior; Street; Memorials; Athletic Fields)	3
P07	Plumbing & Pipe Design	6
P08	Prisons & Correctional Facilities	3
P12	Power Generation, Transmission, Distribution	6
R05	Refrigeration Plants/Systems	7
R06	Rehabilitation (Buildings; Structures; Facilities)	5
R08	Research Facilities	7
S09	Structural Design; Special Structures	3
S11	Sustainable Design	7
T02	Testing & Inspection Services	2
T06	Tunnels & Subways	6
U03	Utilities (Gas & Steam)	6
V01	Value Analysis; Life-Cycle Costing	1

11. ANNUAL AVERAGE PROFESSIONAL SERVICES REVENUES OF FIRM FOR LAST 3 YEARS

(Insert revenue index number shown at right)

a. Federal Work	8
b. Non-Federal Work	9
c. Total Work	10

PROFESSIONAL SERVICES REVENUE INDEX NUMBER

1. Less than $100,000
2. $100,000 to less than $250,000
3. $250,000 to less than $500,000
4. $500,000 to less than $1 million
5. $1 million to less than $2 million
6. $2 million to less than $5 million
7. $5 million to less than $10 million
8. $10 million to less than $25 million
9. $25 million to less than $50 million
10. $50 million or greater

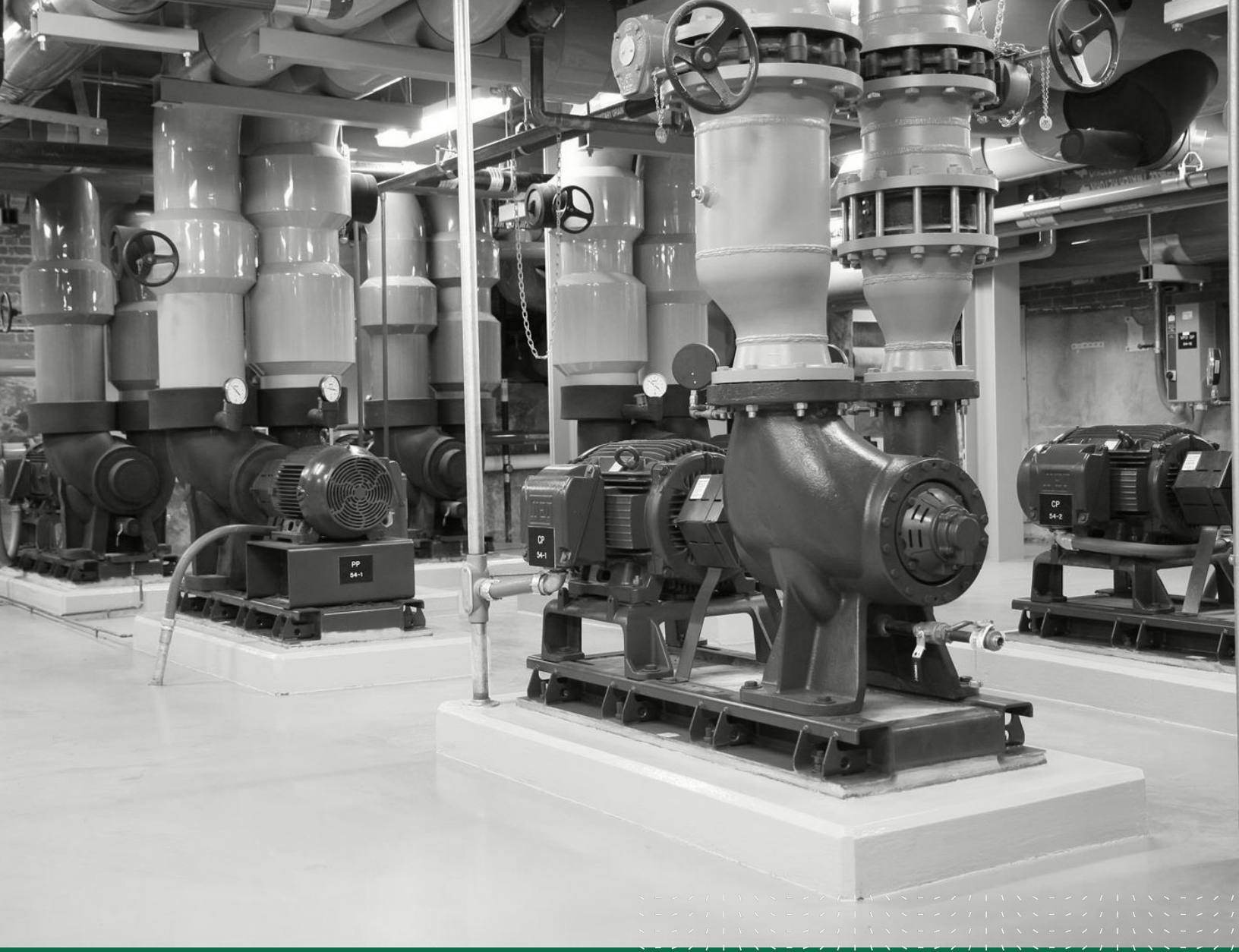
12. AUTHORIZED REPRESENTATIVE

The foregoing is a statement of facts.

a. SIGNATURE

b. DATE: November 8, 2024

c. NAME AND TITLE: Gregory Carnathan, PE, CEM, LEED AP – Principal



CONTACT

Greg Carnathan, PE, CEM, LEED AP

919.251.6364

greg.carnathan@rmf.com

RMF Engineering

8081 Arco Corporate Dr Suite 300

Raleigh, North Carolina 27617

919.941.9876