

**Shultz Engineering Group**

212 North McDowell Street  
Suite 204  
Charlotte, NC 28204



PO Box 37008, Charlotte, NC 28237 • Phone: 704-334-7363 • Fax: 704-347-0093 • www.shultzeg.com • info@shultzeg.com

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**July 7, 2023**

**Visioneering Studios  
1530 Riverside Dr.  
Nashville, TN 37206**

**Attn: Barry Morris**

**Subject: Mechanical, Electrical, and Plumbing Schematic Design Narrative for North Roanoke Baptist Church, Roanoke VA.**

Following is our schematic narrative for the mechanical, electrical, and plumbing systems.

**A. Mechanical/HVAC General Conditions:**

1. Shultz Engineering Group will perform load calculations for the spaces receiving new HVAC system. ASHRAE 0.4% summer weather data of 92.1 degree dry bulb, 73.1 degree wet bulb for our cooling loads; and ASHRAE 99.6% winter weather data of 16 degree winter dry bulb are the basis of design. Interior temperatures for the load calculations is 75 degrees and 50 % rh for summer design and 72 degrees for winter design. Our building load program is Trace 700.
2. All duct work will follow the SMACNA guidelines for duct construction. The minimum duct gauge will be 26 gauge. Exposed duct work inside the building envelope for Supply Air (SA) will be double wall round rigid metal duct with 1" internal lining. Concealed SA duct work inside the building envelope will rigid metal with 1½" external flexible blanket insulation. External insulation shall be applied with welded pins and washers and UL listed tapes. Flexible duct will be used for final connections to ceiling diffusers. Return Air (RA) and Exhaust Air (EA) inside the building envelope will be rigid metal with no insulation. Supply Air and RA duct outside of the building envelope will be externally insulated with rigid urethane board applied with mastic and welded pins. An aluminum jacket shall be applied to all duct work outside of the building envelope. Duct hangers and supports will be per SMACNA guidelines. Wire hangers will not be permitted.
3. New HVAC units will be roof top DX/gas heat packaged commercial units. A typical unit is a Trane Precedent Y4C. Units will specified with enthalpy economizer, power relief fan, hot gas reheat, and CO2 duct sensor. Programmable thermostats will be used. Demand Controlled Ventilation (DCV) will be used to minimize the outside air requirements for ventilation. DCV measures the quantity of carbon dioxide (CO2) in the return air duct and compares it to a regional standard. If the CO2 measured is at or below the standard the OSA quantity can be reduced to the code compliant minimum volume. If the CO2 measured is trending above the standard the OSA is gradually increased until the measured quantity meets the standard. DCV is a very good energy saving control strategy.
4. New natural gas piping will be schedule 40 A53 black steel pipe. Connections will be either threaded or pressed fittings. Gas pressure is 2 psi. The contractor shall provide regulators at each unit to reduce the pressure to that used by the appliance. Pipe roof penetrations will be through Pate pipe curbs (or equal).
5. Diffusers will be based on Titus manufacturing models. Use model TMS diffusers for ACT grid ceilings. Use model 300FS for open ceiling applications on lined duct. Use model 55FL for



return and exhaust grills. Provide balancing dampers at all runout connections to the main.  
Provide extractors at 300FS grills.

**B. Mechanical/HVAC Area Requirements:**

1. Area 1 – Reconfiguration of existing chapel into gathering room and breakout rooms.
  - a. Gathering Room will be served by a new 12.5 ton (estimate) RTU located on the flat roof area to the west of the existing chapel. Duct work will enter the space through existing clerestory windows. The windows will be framed around the ducts. Round double wall duct will be used for SA. Return Air will be located as a high side wall grill at the clerestory window.
  - b. Area 2 – Rooms 212 through 219, and RR's 209, 212, and 213 will be served by a new 10 ton (estimate) RTU located on the flat roof area west of the existing chapel. Duct work will enter the space through existing clerestory windows. The windows will be framed around the ducts. Duct will be rigid metal installed above a new ACT ceiling. Return air will be plenum return to a new grill at the clerestory window. Ceiling diffusers will be utilized in the spaces. Exhaust fans at 150 cfm each and interlocked to the light switch will be used in 212 and 213. A 75 cfm exhaust fan will be used in 209.
  - c. Area 3 – Play area, Lobby, and Corridor. With the large glass wall facing south, SEG is recommending a separate unit for the play area and adjoining lobby and corridor. A new 6 ton (estimate) RTU located on the flat roof area to the west of the existing chapel will be used for this area. Duct work will enter the space through existing clerestory windows. The windows will be framed around the ducts. Round double wall duct will be used for SA. Return Air will be located as a high side wall grill at the clerestory window.
  - d. Area 4- Central area between the existing Chapel and the Gymnasium building. This area is currently served by RAC-2 (10 ton unit) and RHP-4 (7.5 ton unit). RAC-2 is a 1998 vintage Carrier unit. These unit is well past its useful life span at 25 years old and does not meet the current ventilation requirements and energy codes. RHP-1 is a vintage 2016 Carrier heat pump. One new 10 ton RTU's (estimated) located on the roof above on a curb adapter. RHP will remain. As much as possible of the existing duct work will be reused. The existing duct to remain will be cleaned. The existing RHP-1 will serve the 4 new classrooms and the corridor in between. Duct run outs to diffusers will be reworks for the new room layout and rebalanced. Balancing Dampers will be added as necessary. The new unit will serve the new lobbies and check-in areas. Duct will be rigid metal installed above a new ACT ceiling. Return air will be plenum return. Ceiling diffusers will be utilized in the spaces. Three new restrooms will be exhausted with new 75 cfm exhaust fans interlocked to the light switch. Fans will discharge through a common exhaust stack through the roof.
  - e. Area 6 – Kitchen 107 and Lobby 106. Duct work will be revised for new floor plans. Diffusers in kitchen will be rebalanced to redistribute the SA flow. Balancing dampers will be added as necessary. Diffusers will be relocated to accommodate the new ceiling grid and lighting layouts.
  - f. Area 7 – Gymnasium added spaces. Supply air will be ducted to Storage rooms 102 and 103 from the existing SA on the south of the gym. Green Room 105 and AVL room 104 will each be served by mini split systems. The AVL mini split will be sized to accommodate any new additions to electronics in the space. SEG suggests that a door remain in place between the Green Room and the AVL room as they are two separate AC zones.



g. Area 8 – Ground floor classrooms. No HVAC work in this area.

Applicable codes and standards:

2018 VA Mechanical Code  
2018 VA Energy Conservation Code  
SMACA Duct Design Standards - Latest Edition  
NFPA 90A – Latest Edition  
ASHRAE Standard 62.1 Ventilation and Acceptable Indoor Air Quality

### C. Plumbing

Ground Level: The plumbing scope this level will be limited to removing a lavatory and water closet in “Service Room 006” and capping existing plumbing piping serving fixtures at each respective main; and replacing 3 children’s water closets with adult height water closet.

First Floor Level: The plumbing scope this level will be installing children’s height toilets in restrooms located in the Kid’s classrooms along with a lavatory to be installed inside the classrooms. Adult water closets to be installed in all other rooms including new gang toilet room shown in renovation. All water closets shall be tank type, and all lavatories shall be vitreous china or stainless steel and shall have sensor operated faucets. The hot water for the sink has not been determined. We will either provide a new tank type water heater to serve all new fixtures this level, or we will provide an instantaneous water heater at each lavatory location. Sanitary waste piping in Pre-K to tie in to nearby gang toilet restrooms, and all elementary fixtures to be served by a new sanitary line routed out building and tying into existing waste piping in parking lot.

#### Applicable Codes and Standards:

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

- 2018 Virginia Plumbing Code
- Local Codes as Applicable

### D. Electrical

#### GENERAL

**Scope of Work:** This project involves renovating various areas throughout the church building including:

- First floor and ground floor Childrens Ministry areas including classrooms, bathrooms, hallways, fellowship areas. See architectural set for areas of work. Scope includes power to new and/or relocated lighting, receptacles, HVAC equipment, plumbing equipment, AVL equipment, and any owner provided equipment. Conduit/Infrastructure for tele/data and CCTV equipment. Existing circuiting may be re-used after demo phase, if in good working order. New circuiting (including new electrical gear i.e. panels, transformer, disconnects, etc) as required. Fire alarm system to be modified as needed.
- First floor Gymnasium area including multi-purpose room, stage, lobby, kitchen areas. See architectural set for areas of work. Scope includes power to new and/or relocated lighting, receptacles, HVAC equipment, plumbing equipment, AVL equipment, and any owner provided equipment. Conduit/Infrastructure for tele/data and CCTV equipment. Existing circuiting may be re-used after demo phase, if in good working order. New circuiting (including new electrical gear i.e. panels, transformer, disconnects, etc) as required. Fire alarm system to be modified as needed.

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Under this project, the Work covered by Division 26-Electrical consists of providing all labor and material for the installation of complete electrical systems for renovated building space.

**Applicable Codes and Standards:** All of the electrical work will comply with the latest edition of the following codes and standards:

- Virginia Construction Code
- NFPA Standard No. 70, "National Electrical Code" (NEC)
- American with Disabilities Act
- NFPA Standard No. 101, Life Safety Code
- Local and State Codes as Applicable
- Listing: All new electrical equipment, materials and fixtures will be listed by independent laboratory approved by this state.

**EXTERIOR WORK:**

- No exterior work.

**INTERIOR WORK:**

- As described in general scope of work.
- Feeder Circuits, Including Conduits, Conductors and Fittings
- Branch Circuits, Including Conduits, Conductors, Outlets, Boxes, Receptacles, Switches and Fittings
- Replace interior lighting fixtures throughout renovated portions of building.
- Replace HVAC/Plumbing units throughout renovated portions of building.
- Install wiring devices throughout renovated portions of building.
- Grounding System
- Power Connection to all new or relocated equipment requiring electrical power supply.
- Conduit and box system for telecom systems in renovated portions of building.
- Adjust and/or expand existing Fire Alarm and Smoke Detection System throughout renovated portions of building.
- Conduit and boxes and power to AVL, telephone, data, lighting controls, security, video surveillance and door access control systems, as needed in renovated portions of building

**SERVICE EQUIPMENT:**

- Service equipment is existing to remain. Based on survey conducted on 5/2/2023, this building appears to have (3) or (4) electrical metered services. Each service was added and modified over the years. No major work to service equipment will be required. Childrens Ministry areas are powered from a 208/120V, 3-phase, 4-wire service. Gymnasium areas powered from a 480/277V, 3-phase, 4-wire service.

**POWER DISTRIBUTION:**

- Any new major HVAC loads will be fed from existing panelboards if there is available space. If no available space, new panelboard(s) shall be added to serve new HVAC loads.
- Lighting will be fed at either 120V or 277V as indicated on drawings.
- Small and general-use loads will be fed at 208/120-volts.
- Other new miscellaneous equipment will be fed at voltage/phase as noted on equipment nameplate.
- Power will be distributed in the Childrens Ministry areas at 208/120V, 3-phase from various existing panelboards throughout building areas. With new distribution panelboards as required for new loads if no space is available in existing panelboards.

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- Power will be distributed in the Gymnasium areas at 480/277V and 208/120V, 3-phase from various existing panelboards throughout building areas. With new distribution panelboards as required for new loads if no space is available in existing panelboards.

Feeders to distribution/branch panelboards will be sized in accordance with actual loads plus additional spare capacity.

### **VOLTAGE DROP:**

- Voltage drop for feeders will be limited to less than 3% of nominal voltage. Voltage drop for branch circuits will be limited to less than 2% of nominal voltage.

### **GROUNDING:**

- The power distribution system will be grounded throughout system, as required.
- The conduit and neutral conductors of the wiring systems and all electrical equipment will be grounded.
- The ground connection of the electrical system neutral and conduit system will be made at the main service panelboard.
- Each conductive, non-current carrying, part of the electrical system will be bonded to equipment grounding conductor sized in accordance with NEC.
- An insulated equipment-grounding conductor sized per NEC will be specified to be included in each raceway.

### **RACEWAYS:**

- All power conductors will be run in conduit or MC Cable. Raceway fill will not exceed 40%.
- Rigid steel or intermediate metal conduit will be used in all areas of the project except as otherwise noted.
- Schedule 40 (minimum) PVC conduit may be used for underground raceways. PVC conduit shall not be utilized above ground or any place where prone to damage.
- EMT will be used throughout for power circuits and signal circuits, and for telephone/CATV/data in the following applications:
  - Concealed above ceiling in dry locations.
  - Exposed in dry locations when not subject to physical damage.
- Flexible metallic conduit will be used for final connections to light fixtures, motors and appliances only.

### **Fittings will be as follows:**

- Rigid conduit – threaded type.
- EMT – steel, hexagonal set-screw or compression type, UL listed, insulated throat type.
- Flexible conduit, T&B nylon-insulated, “Tite-Bite”, or equivalent.

Conduit runs will be installed with no more than 360° of elbows/bends.

### **Fireproofing:**

- Raceway penetrations through floor slabs, equipment room walls, and fire rated walls will be sealed with impervious non-combustible materials sufficiently tight to prevent transfer of smoke, water, or combustible gases from one side of the wall or slab to the other in accordance with U.L. Listed assemblies.

### **POWER CONDUCTORS: 600 VOLTS CLASS:**

- All conductors will be copper. Conductors larger than #10 AWG will be stranded.

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- Conductors' insulation will be type THHN/THWN or higher grade, if required by N.E.C. or equipment.
- All conductors will be color-coded by voltage and phase.
- Feeder conductors will be provided with identifying nameplates/punch tape at each termination point and pull box.

**ELECTRICAL CONNECTIONS:**

- Power disconnect switch will be provided for each motor and appliance not in sight of equipment controller/ disconnect device.

**BOXES AND ENCLOSURES:**

Boxes:

- Exposed boxes, size 4' x 4' or smaller and within 15'-0" of floor level will be cast metal type.
- Outlet boxes in dry wall: 4" square type with 1-gang plaster ring.

Enclosures:

- Interior spaces: NEMA 1 type.
- Exterior spaces or spaces subject to moisture: NEMA 3R type.

**WIRING DEVICES:**

- Standard Receptacles: Heavy duty, specification grade, grounded, nylon body, minimum rating 20-amps.
- Coverplates: Matching existing building standards in material and color.
- Telephone, CATV and Data Outlets: Blank coverplates, matching existing building standards, on outlets not provided with a telephone/data coverplate by telephone/data installers.

**DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS:**

- Type: Distribution and Branch circuit type.
- Short circuit rating to be fully-rated, to match rating of circuit protective devices, as well as remainder of system.
- Ground Bus.
- Bolt-on circuit breakers.
- All buses will be copper.
- With hinged front trim (door-in-door feature).
- Spare capacity: 20% spare breakers, 20% space for future.

**MOTORS:**

- Motors  $\frac{3}{4}$  HP and larger will be rated 480-volts or 208-volts, 3-phase.
- Fractional horsepower motors  $\frac{1}{2}$  HP and smaller will be rated 120 volts, 1 phase.

Motors will be provided under: Division 23 – HVAC, Plumbing and Fire Protection equipment.

**MOTOR STARTERS:**

- Except for motors built-in with equipment, all motor starters will be provided under Division 23 – HVAC, Plumbing and Fire Protection equipment.

**DISCONNECT SWITCHES:**

- General: Provided a disconnect switch at each motor or appliance, which is not in sight of controller or circuit overcurrent protective device.



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- NEMA 1 enclosure for interior work.
- NEMA 3R enclosure for outdoor applications, or where subject to moisture.
- Heavy-Duty type
- Rejection-type fuse holders.

### **FUSES:**

- General: All fuses will be current limiting type.
- Small fuses: (600 amperes and smaller).
- Motor fuses: Class RK-5 dual element, time delay.
- Transformer fuses: Class RK-1 dual element, time delay.
- Large Fuses: Class "L" dual element, time delay type.

### **LIGHTING:**

- Lighting will be provided for all new and renovated building spaces.
- Lighting levels will comply with Illuminating Engineering Society of North America (IESNA) recommended standards.
- Standard fixtures will be 2'x4' recessed, LED direct/indirect light fixtures, along with recessed L.E.D. downlights at select locations.
- "House" and Theatrical lighting within the renovated fellowship areas located in gymnasium and Children's Ministry areas will be designed by the AVL Designer and powered by the electrical contractor.
- Lighting and Lighting Control Systems shall comply with state energy code.

### **FIRE ALARM AND DETECTION SYSTEM:**

The existing fire alarm system will be expanded/modified and installed throughout the renovated areas of the building. The fire alarm system will be a completely supervised fire alarm and smoke detection system. System is an existing microprocessor-based system with smoke detectors and multiplexing communication. Any new alarm-initiating devices in the system will match existing system.

The following equipment and functions may be provided in the renovated:

- Fire alarm controller with all the necessary modules and accessories for a complete system that will be connected to the existing system.
- Photoelectric type smoke detectors.
- Thermal sensors (if required).
- Manual alarm stations.
- Flashing alarm strobe lights. ADA compliant, synchronized
- Audible Horns with field-selectable tone pattern.
- All the necessary software to program system as intended.

System Alarm Operation: The actuation of any smoke detector, pull station, fire detector, tamper and flow switches will:

- Provide instant notification in control panel and remote annunciator.
- Sound alarm and flash lights throughout building.
- Summon the Fire Department via digital dialer.
- Automatic shutdown of HVAC fan system(s), as applicable.
- Perform any additional function as specified herein or as shown on the plans.

### **Devices:**

- Smoke Detectors: Photoelectric detectors will be specified for each equipment room, and any other space that may be left unoccupied for long periods of time.
- Pull Stations: Double-action device will be located at each exit door from the building.

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- Duct Smoke Detectors: Will be provided in each HVAC fan system larger than 2000 c.f.m., with interface module.

**TELEPHONE AND DATA WIRING SYSTEM PROVISIONS:**

- The existing telephone and data systems will be expanded/modified and installed throughout the renovated areas of the building.
- Install Telephone/CATV/Data Systems throughout renovated building spaces.
- Install Telephone/CATV/Data cable raceway and box systems for new devices.
- Telephone/CATV/Data cabling, devices and termination will be provided by Owner's telecom contractor.

**AVL, Telephone, Data, Lighting Controls, Security, Video Surveillance and Door Access Control Wiring Systems Provisions:**

- Owner-selected vendors shall be responsible for design of the AVL (within the renovated Gymnasium and Childrens Ministry Areas), telephone, data, lighting controls, security, video surveillance and door access control systems.
- All equipment and cabling for these systems shall be provided and installed by Owner-selected vendors/contractors.
- A system of conduits and boxes will be provided and installed by electrical contractor to be used by respective vendor to install AVL, telephone, data, lighting controls, security, video surveillance and door access control systems cabling and devices.

Please let us know if you have any questions or require further clarification.

Shultz Engineering Group, PC

A handwritten signature in black ink, appearing to read "George W. Austin, Jr.", is positioned above the printed name.

George W. (Billy) Austin, Jr., PE