

**MECHANICAL AND ELECTRICAL  
SCHEMATIC DESIGN NARRATIVE**

**Westwood Community Church**



**Karges-Falconbridge, Inc.**  
*Engineers*

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**KFI PROJECT NO. 08-430.00**

## **OVERVIEW**

This project consists of a new 51,081 square foot phase 2 addition to Westwood Community Church, located in Chaska Minnesota. The building will be attached the existing building, Phase 1, with a transitional link. Phase 2 will consist of a 5,600 square foot multi-purpose room, Classrooms, and office space. A small kitchen and two café areas will be part of the phase 2 building.

All mechanical systems shall be new, the existing phase 1 electrical service shall expanded to accommodate the new addition. The existing utility standby generator size shall be increased to maintain compliance for the Standby Generator program from Minnesota Valley Electric. New water service, sanitary sewer, gas utility, from the nearest campus mains will be required. No new storm sewer is anticipated within the new building.

Mechanical heating and cooling systems shall be independent form other campus buildings. An option to tie the phase 1 and phase 2 coolings systems together is being considered. Lighting and lighting controls by others, not part of this narrative.

The Scope of work is not all encompassing. This scope presents the intent of the project at this schematic design phase.

## **MECHANICAL DESIGN NARRATIVE**

### **DESIGN INTENT**

The mechanical systems are designed to match the same types of systems that are found in the existing facility. This allows for the building operators to be easily familiar with the new systems and helps to reduce maintenance costs. The variable air volume system is well suited varying heating and cooling requirements of a building of this nature.

### **HEATING PLANT**

The heating load will be satisfied by utilizing a high efficiency condensing boiler. The boiler will supply hot water to the heating coils in the air handlers, and the heating coils in all perimeter VAV boxes and internal shut-down VAV boxes. The boiler will also serve fin tube radiation in certain perimeter areas and hot water cabinet unit heaters at the perimeter entrances.

Redundant heating water pumps will distribute hot water to hydronic heating equipment. The pumps will be controlled by a new variable frequency drives (VFD) and differential pressure sensor in the piping.

At this time the anticipated heating capacity is 1,500 MBH.

### **COOLING PLANT**

A new air cooled chiller will be located on grade next to the existing air cooled chiller. Chilled water piping will be run below grade to the mechanical room. Redundant primary and secondary chilled water pumps will circulate the chilled water loops from the chiller to the chilled water coils in the air handling units. The pumps will be controlled by a new variable frequency drives (VFD) and differential pressure sensors in the piping.

The existing Phase 1 chiller loop is a primary pumping systems with bypass. The option to tie both chillers together to provide some degree of redundancy and improved part load capacity is being considered.

At this time the anticipated cooling capacity required is 125 tons cooling.

### **HVAC SYSTEMS**

The Mechanical system is a High Efficiency Variable-Air-Volume (VAV) system with two central indoor air handling units with chilled water cooling coils and hot water heating coils. This system will incorporate VAV units with hot water reheat for zone temperature control throughout the building as well as providing the required amount of outdoor ventilation air. Differential pressure sensors in the ductwork will control the fan speed supply fans; a return air plenum will be utilized for return.

The air handlers will have full airside economizer capability; a variable speed return/relief fan will used to control building pressurization. Ventilation air will be provided to meet ASHRAE 62.1-2004 standards for outdoor air per person during occupied modes.

A central exhaust system will provide exhaust capacity for the toilet rooms, service closets and mechanical spaces. Make up air will be provided through the main air handlers and VAV boxes.

### **ENERGY MANAGEMENT**

The building HVAC system will be controlled via a building automation system (BAS), with central computer connected to Phase 1 controls network. The BAS will be a direct digital control (DDC) system with a computer graphics interface. From the graphics interface, the temperature set points and schedules can be controlled.

The energy management system will include components to monitor energy input and output for the mechanical system to help ensure energy efficient operation at all times.

Temperature control of the zones will be accomplished by temperature sensors. Temperature set point control for the rooms themselves will be from the BAS. Setback temperatures will be established for unoccupied periods of time.

## **PLUMBING SYSTEMS**

### **DOMESTIC WATER**

A new gas fired water heater and circulating pump shall be installed to serve the hot water needs of the new addition. Water service piping shall be Type "L" copper. Indoor domestic piping shall be covered with fiberglass insulation with all-service jacket. Plumbing fixtures shall be low flow high efficiency fixtures to reduce water consumption. Battery operated sensors shall be provided on all flush valves and lavatory faucets. No additional water treatment is planned.

### **SANITARY**

New indoor waste and vent piping shall be provided to serve new plumbing fixtures. Extend a 6" sanitary line 5'-0" from the building.

### **STORM**

No Internal storm drains are required. Storm water will be controlled with exterior rain gutters by others.

### **FIRE PROTECTION**

The entire building will have a sprinkler system in accordance with NFPA 13.

The fire protection system shall be a wet-pipe system. A dry system shall be required for any unheated spaces including any unheated ceiling or attic spaces.

A fire pump, if needed, shall be sized in accordance with the latest flow test available for the area.

## **OUTSIDE UTILITIES**

### **DOMESTIC and FIRE PROTECTION WATER SERVICE**

A new combined domestic/fire water service from the 8" take off from existing campus water main provided for phase 2 is required to serve this addition.

### **SANITARY**

A new sanitary sewer shall be required. The new sanitary sewer will be run from the existing 6" sanitary main provided for phase 2 and extended to within 5'-0" of the new building.

### **STORM**

No Internal storm drains are required.

## **ELECTRICAL DESIGN NARRATIVE**

### **DESIGN INTENT**

Electrical wiring shall be in metallic conduit and metallic boxes. Wiring shall be concealed. PVC Schedule 80 conduit with ground wire shall be installed below grade. Conductors shall be copper. Wiring and equipment shall be in accordance with the National Electrical Code, local and state codes and ADA requirements.

System wiring installed exposed above accessible ceiling must be with plenum cable (locations only determined by owner/engineer). Cable shall be supported above suspended ceilings at a minimum of 4-foot intervals. Raceway shall be provided for vertical and horizontal runs on or within walls and cavities.

Raceway shall be installed above non-accessible ceilings, exposed structural areas, storage and mechanical/electrical rooms.

### **ELECTRICAL SERVICE**

The existing Electrical Service consists of a 277/480 volt, 3 phase, 4 wire 2000A system with (5) 277/480V Panels (1) 277/480V Distribution Panel (4) step down transformers to provide 120/208 volt electrical distribution. (3) 120/208V Distribution Panels and (14) 120/208 volt Panels for misc. power. Current Peak Demand is at 354 KW in June of 2007.

Provide a new 277/480V, 3P, 4W, 600A Distribution Panel located in the new addition for new mechanical and misc. power loads fed via existing space in the existing switchboard. Provide a new 277/480V, 3P, 4W, 225A, 30 CKT Panel for lighting and a new 277/480V, 3P, 4W 100A, 30 CKT Panel small mechanical loads. For each lower and first floor levels provide a new 75 KVA transformer to fed a 120/208V, 3P, 4W 225A, 60 CKT double tub panel for misc. loads .

Electrical distribution panels to be provided with bolt on breakers.

**Note:** The facility is on the Standby Generator program from Minnesota Valley Electric. Utilizing a 400KW standby generator to power the building based on previous peak demand.

In order to continue on the program the owner would be required to increase the size of the generator to a min. 600 KW Unit based on preliminary estimates.

Special power requirement provisions and devices to be installed for owner specific equipment.

### **CODES AND REFERENCES**

NEC, NFPA, ANSI, ASHREA, ADA, IEEE, NBFU, NEMA, ASTM, FM, IRI, OSHA, UL, State and Local Building Codes, State and Local Fire Codes, State and Local Electric Codes, and State Board of Health.

### **TELEPHONE SERVICE**

New phone service by owner.

### **LIGHTING**

Lighting layout and luminaire selection shall be by others. Fluorescent luminaires with electronic ballast and T-8 or compact fluorescent lamps shall be utilized where possible except for specialty fixtures.

Lighting distribution and branch circuitry shall be provided.

Provide temporary site poles and lighting for approximately 350 parking spaces.

Lighting levels shall be in accordance with the IES recommended standards for the various areas.

Egress lighting to provide an average of 1-footcandle at the floor for egress per NFPA. Egress lighting to be on battery backup.

Exit lighting to be LED type.

### **LIGHTING CONTROL**

Lighting control to be via multi-level switching throughout area. Occupancy sensors to be provided in utilitarian areas.

### **ELECTRICAL BRANCH CIRCUIT CRITERIA**

Provide a maximum of 1200 VA per 120 volt branch circuit or lighting branch circuit.

Provide a maximum of 3600 VA per 277 volt branch circuit or lighting branch circuit.

Provide a minimum wire size of #12 AWG for branch circuit wiring. Provide copper conductors for wiring. Install branch circuit wiring in EMT conduit, unless specifically noted otherwise. Each conduit run shall include a separate grounding conductor.

Install a maximum of three phase conductors in each homerun. Provide a minimum conduit size of ¾" for homerun conduits.

Location/Equipment	Criteria	Type	Notes
Storage Rooms	1 receptacle/1000 S.F.	Standard	
Restrooms	1 receptacle	GFI	
Corridors	1 receptacle within 45' of wall space	Standard	
Church / Assembly	1-receptacle per 20' of wall space Outlets as required for performance as requested by owner	Standard	
Rooftop mech. Equip	1 receptacle/25' from unit	WP/GFI	
Offices	3 receptacles/room	Standard	
CCTV Outlets	1-Receptacle/CCTV outlet	Standard	See below for CCTV outlet locations.

### EQUIPMENT CONNECTIONS

Provide connections to powered furniture and misc. and owner provided equipment.

### MECHANICAL EQUIPMENT

Provide equipment branch/feeder over current protective device, branch conductors, connections, disconnects, starters, etc for mechanical equipment as described in the mechanicals design intent narrative and drawings.

### COMMUNICATIONS

Telephone outlets: Provide telephone outlets as directed by owner. Stub one ¾" conduit with pullstring to accessible ceiling and terminate with a bushing.

Data/Telephone outlets: Provide data/telephone outlets as directed by owner. Stub one 1" conduit with pullstring to accessible ceiling and terminate with a bushing.

### ADDRESSABLE FIRE ALARM SYSTEM

Expand the existing addressable/intelligent fire alarm system as required. This system will interface with the sprinkler system and mechanical equipment building automations.

The design will specify smoke detectors or heat detectors to be installed in electrical/mechanical rooms, storage areas, etc. and other locations required by code and good engineering practices.

Duct smoke detectors for the HVAC units and smoke dampers with remote indicator status and test stations on walls or ceilings will be provided.

A combination of audible, visual and audible/visual devices with a minimum 15dba above ambient will be provided.

Visual devices/strobes to be synchronized.

Magnetic door hold open devices with required detectors per NFPA-72 will be provided.

**AUDIO/VISUAL SYSTEM**

Audio/visual systems by others. Provide rough-ins, conduit and power as required by sound system designer.

**MASTER CLOCK AND/OR BELL SYSTEM**

No master clock and/or bell systems.

**BUILDING PAGING SYSTEM**

No building paging system.

**SECURITY / CARD ACCESS / CCTV / DOOR CONTACTS SYSTEMS**

Provide additional card access/CCTV/door contact devices and expand existing system.

**MISCELLANEOUS ITEMS**

Provide wiring for ADA push plate systems at main entry doors. Interface operation of push plate system with security system.

**DEMOLITION**

Perform electrical demolition to surrounding area as required to accommodate the church addition.

*END OF DESIGN NARRATIVE*