



COMMUNITY DEVELOPMENT DEPARTMENT ELECTRICAL PLAN REVIEW SUBMITTAL GUIDE/CHECKLIST

Plans are required for:

- New commercial building
- New multi-family project (over 2 units)
- Installations or alterations over 2,500 sq. feet
- Existing commercial service alterations, subpanels, transformers, feeders, or hazardous locations as defined by NEC
- Increase in load of 100 amps or more
- Any installation or alteration in a space with Health Care, Educational & Institutional occupancy categories

Requirements for Electrical Plan Review

Submit electrical plans for the following installations:

- Multi-family: 4 units and larger
- All work on electrical systems operating at over 600 volts
- All educational, institutional, and health or personal care occupancies classified or defined in WAC 296-46B-010(14).
- All commercial generator installations.
- All work in areas determined to be a hazardous (classified) location by the NEC
- Existing tenant alterations 2,500 sq. feet and greater where the load is increased by 100 amperes or greater, or the service is altered. This will include sub panels, transformers, ups systems, and generators.
- Other installations under 2,500 sq. feet where there is a significant increase in load (100 amps or more) or the service is altered.
- If 60% or more of lighting fixtures change, contact the electrical plan reviewer.

Design, signature, and stamp requirements by a registered electrical engineer are required for the following electrical installations:

- All services or feeders rated 1,600 amperes or larger, or any special considerations to the service.
- Installations that require engineering supervision by the NEC.
- Per the requirements of the City of Marysville ordinances. Ord. 2708

- As required by the building official for installations which by their nature are complex or hazardous or pose unique design problems.

Checklist – Electrical Plan Review

The intent of this checklist is to provide a general guideline for electrical plan review. This checklist may not include all items to be verified for every plan review encountered. This checklist may include more items than a specific set of electrical plans may encompass. Please tailor this checklist for the electrical plans submitted and the scope of your particular job.

Submittal Items 2 copies of each of the following)

- ___ Electrical plans showing power and lighting for each floor & the location of all panelboards
- ___ Electrical plans that are stamped and bear the engineer's signature who is a Registered Professional Engineer by the State of Washington
- ___ Electrical panel schedules showing individual loads in VA or KVA and the A.I.C. rating
- ___ Riser diagram with wire and raceway size, type and grounding methods
- ___ Electrical load calculations, including a load summary showing connected loads and all demand/diversity factors.
- ___ Fault current calculations through the subpanelboard level.
- ___ Lighting budget calculations per the current adopted Washington State Energy Code.

On the 2 plan copies, provide the following information:

Electrical Load Calculations

- ___ Breakdown of connected loads into proper NEC categories (lighting, receptacles, motors, HVAC, kitchen equipment, appliances, etc.)
- ___ NEC demand factors applied to each category of load.
- ___ Total connected load in VA or KVA
- ___ Total calculated amps
- ___ Panelboard load calculation worksheet completed for all panelboards.

Fault Current Calculations on the Riser Diagram

- ___ Submitted on a City of Marysville form and providing enough information on the riser diagram to verify calculations. Very large projects will require a "Fault Current Summary."

Fault Current Summary must include the following:

- ___ The starting nodes for fault current as they relate to the one line diagram.
- ___ The starting fault current at the beginning of each conductor.
- ___ The ending fault current at the ending of the conductor.

- ___ The conductor's impedance, size and length.
- ___ The conduit type (metallic or non-metallic)
- ___ The A.I.C. rating of the service, panelboards, and overcurrent devices.

- ___ Utility transformer size in KVA, impedance (%Z), and available fault current.
- ___ Complete the fault current information through the subpanelboard level or provide calculations to below the minimum AIC rating of the electrical equipment and overcurrent devices.
- ___ Available fault current shown on the one line diagram for all nodes.
- ___ Series rated systems – indicate on the one line or the panel schedules the circuit breaker model numbers for every panel or switchboard involving a series rated by system. Also please provide corresponding series rating charts from the manufacturer (with arrows indicating the breaker types) so the series rated system can be verified. This information should be provided in a systematic way as it relates to the one line diagram, down to the point in the system that the fault current is less than the fully rated or series rated overcurrent protective device and gear.

Riser Diagram (one-line)

- ___ Clearly identify the service point.
- ___ Identify voltages.
- ___ Service conduit(s) size & type, number of parallel runs, conductor(s) size and type, insulation type and number of conductors.
- ___ Service equipment ampacity, A.I.C. rating and the A.I.C. ratings of the overcurrent protection.
- ___ Indicating points (nodes at line and load points along the one line diagram. The nodes should state the AID levels at key points of terminations of electrical equipment.
- ___ Indication of ground fault protection of equipment when required.
- ___ Size of the grounded service conductor for the maximum unbalanced load.
- ___ Grounding electrode system, including concrete encased electrode, the sizing of the grounding electrode conductor, and main bonding jumper for the service equipment.
- ___ Feeder(s) conduit size & type, conductor size & type, and number of conductors.
- ___ Type of equipment grounding conductor and equipment bonding jumper for feeder(s), size if applicable.
- ___ Panelboard(s) ampacity, A.I.C. rating and overcurrent protection.
- ___ Transformer(s) secondary tap conductor length to overcurrent protective device.
- ___ Grounding electrode system and grounding electrode conductor for transformer(s).
- ___ Size of equipment bonding jumper and system bonding jumper for the transformer(s).
- ___ Overcurrent protection of transformer(s) complies with NEC 450-3.

Floor Plan (Lighting)

- ___ Electrical plans denote the type and location of all lighting fixtures.
- ___ Electrical plans denote all required switch locations.
- ___ Home-run conduit(s) showing size, type, and number of conductors.
- ___ Branch circuit(s) properly sized for the load.
- ___ Emergency lighting clearly denoted on plans.
- ___ Unit equipment used for egress lighting complies with NEC 700-12(e).
- ___ Photometric plans for egress lighting in parking garages. Please provide, for each level of building parking, photometric drawings of the emergency egress lighting per 2003 IBC section 1006.4, showing 1 foot candle average and .1 foot candle minimum, in a pathway down each drive isle leading to each exit.
- ___ Fill out a lighting summary form.

Energy Code Compliance

- ___ Electrical plans correspond to the lighting summary: including number and wattage of lighting fixtures, type of lighting fixture, the occupancy type, and the watts per square foot allowed.
- ___ Lighting control complies with 1513 of the current adopted Washington State Energy Code (when required). http://www.energy.wsu.edu/code/code_support.cfm. Chapter 15
- ___ Completed copies of a lighting summary form. <http://www.neec.net/resources/resources.html>

Floor Plan (Power)

- ___ Electrical plans denote the location of all switchboard(s), panelboard(s), and transformer(s)
- ___ All electrical equipment has working clearance shown as required by NEC Article 110.
- ___ Receptacle outlet locations. Receptacles required by local amendment, for rooftops, for show windows, etc and as required by NEC 210-52 and Marysville City Codes and Ordinances
- ___ Electrical equipment schedule.
- ___ Locations denoted on electrical plans for all motors, compressors, heaters, stationary appliances, etc.
- ___ Homerun conduit(s) showing size, type, and number of conductors.
- ___ Branch circuit(s) properly sized for the load.
- ___ Over 112.5 KVA transformers require 1 hour rated construction surrounding them.
- ___ Diagram of any transformer vaults including drain pipes and fire ratings.

Panel Schedules

- ___ Panelboard(s) are identified.
- ___ Panelboard busbar rating in amps shown.
- ___ Panelboard voltage rating is shown.

- ___ Main breaker size or main lug only is shown.
- ___ Panel schedule denotes double lugs or feed-through lugs.
- ___ The description or coding is provided for each branch circuit.
- ___ The connected load of each branch circuit is shown in VA or KVA
- ___ The total connected load is shown in VA or KVA.
- ___ The A.I.C. rating of the panelboard and overcurrent devices.
- ___ Time/current curves showing compliance with the selective coordination requirements for elevators and escalators. This shall be shown to the next common overcurrent device (common to more than one driving machine) above the elevator overcurrent device to the level of .01 time line.

Emergency, Legally Required Standby, or Optional Standby Systems

See also the section on Equipment System Designations, which follows this section.

- ___ Generator capacity and voltage.
- ___ UPS capacity and voltage.
- ___ System properly sized for the load.
- ___ Indicate that the room that houses the emergency generating system has a 2-hour fire rating (NFPA 20)
- ___ Emergency system is totally separate from all other systems.
- ___ Individual transfer switches required.
- ___ Grounding electrode conductor properly sized (when required for separately derived systems).
- ___ State the number of "poles" in the transfer switch.
- ___ Signage as required by NEC is denoted on plans.
- ___ Selective coordination of overcurrent protective devices for Emergency and Legally Required systems down to the .01 timeline – overlaid time/current curves for each branch from the service to each branch circuit overcurrent protective device on one sheet.
- ___ Provide 2 hour protection of the pressurization fan(s) circuit(s) from the emergency generator to the fan.

Peak Demand Records (NEC 220.35)

- ___ Starting and ending dates of the metering.
- ___ Highest reading of the metering period clearly shown.
- ___ Power factor adjustment shown, when necessary.
- ___ Explain the details of seasonal and occupancy adjustment factors.
- ___ Utility demand records or recordings of demand metering for the peak period must accompany the submittal.
- ___ Signature of the "administrator or engineer" who took the readings.

Healthcare Facilities

- ___ Clear definition of area use (I.e. dental, medical, chiropractic, etc.)
- ___ Indicate the ceiling height as it pertains to a Patient Care Area.
- ___ Clear definition of rooms uses (i.e. patient room, nurses station, critical care, general care, etc.)
- ___ One line showing separate transfer switches for equipment, life safety, and critical branches.
- ___ Ground Fault Protection where required and at the next level as required.
- ___ Wiring methods in patient care areas.
- ___ Selective coordination of overcurrent protective devices for the emergency system and subfeeds (where required).

Hazardous Locations

- ___ Clear definition of area use. Where the classified location starts and stops.
- ___ Wiring methods (type of conduit).
- ___ Location of sealing fittings where required, and identify the location (Class 1 Div. 1 etc.)
- ___ Depth of buried conduit.
- ___ Diagram of sump pump showing motors, drain pipes, and all chambers.

Smoke Control Systems (high-rises and places of assembly of 1,000 persons only)

- ___ Plans should be designated "Smoke Control System" to differentiate them from any other plans for that job or project.
- ___ Panel schedule (industry standard type) for the emergency panel with connected and demand loads.
- ___ Schedule of smoke control components showing equipment, its' load in amps or volt-amps, conduit type and size, conductor type and size and breaker type and size.
- ___ Floor plans showing the location of the smoke control components.
- ___ Wiring methods for the fire alarm system.
- ___ Show all emergency system wiring methods pertaining to the smoke control.
- ___ Schedule of individual smoke control components starting loads that will start at the same time.
- ___ Schedule of individual smoke control components running loads.
- ___ The total combined loads of smoke control components for start up and run (start up and run shown separately).
- ___ Identify the color marking, protection, and routing of the conduit from the generator to the pressurization fans.

Emergency and Legally Required Systems Equipment

(what equipment needs to be on which system)

TABLE 403(1)
Standby (Legally Required) and Emergency Power

<u>Type of equipment</u>	<u>Maximum Time to Energize Loads</u>	<u>Minimum Run Time (Duration)</u>	<u>IBC Section</u>	<u>IFC or NFPA Section</u>
Emergency PowerSystems'				
Exit signs	10 seconds	2 hours for generator power, or 90 minutes for battery backup	1011.5.3	604.2.15 high rises 604.2.16 Underground buildings 1011.5.3.2403.12.6.1 Temporary tents, canopy membrane structures
Exit Illumination	10 seconds	8 hours	1006.3	1006.3 604.2.15 high rises 604.2.16 Underground buildings
Any emergency voice/alarm communication including area of refuge communication systems (barrier-free & horizontal exits)	NFPA 72	24 hours	402.12 covered mall buildings 403.11 High rises 405.10 Underground buildings 907.2.1.2 Assembly occupancies	604.2.14 Covered mall buildings 604.2.15 High rises 604.2.16 Underground buildings 907.2.1.2 Assembly occupancies NFPA 72
Fire detection and fire alarms	NFPA 72	24 hours	403.11 High rises 405.10 Underground buildings 909.20.6.2 Smoke proof enclosures 907	604.2.15 High rises 604.2.16 Underground buildings 907.2.8.3 and 907.210.2 NFPA 72
Smoke control systems in high-rise buildings and covered mall building including energy management systems is used for smoke control or smoke removal.	60 seconds	2 hours	403.11 High rises 404.6 Atriums 405.10 Underground buildings 909.11 Smoke control	909.11
Fire pumps in high rise buildings & underground buildings	10 seconds	8 hours (NFPA 20)	403.11 High rises 405.10 Underground buildings	604.2.15 High rises and NFPA 20 604.2.16 Underground buildings 913.2 All Fire Pumps
Smoke proof enclosures and elevator shaft pressurization	60 seconds for ventilation	4 hours	403.11 High rises 909 and 909.20.6.2	
Any shaft exhaust fans required to run continuously in lfor ventilatioueu of dampers	60 seconds	4 hours	716	
Elevator car operation in high-rise & underground buildings (including control system, motor controller, operation control, signal equipment, machine room, cooling/heating, etc.)	60 seconds	4 hours	3003	604.2.15 High rises 604.2.16 Underground buildings 604.2.19 Elevators

Elevator car lighting and communications in high-rise & underground buildings	10 seconds	4 hours	3003	
Lights, heating, and cooling for building fire command center and mechanical equipment rooms serving the fire command center	60 seconds	24 hours		
Mechanical and electrical systems required by IFC 27 (hazardous materials including UPS rooms)	60 seconds	4 hours		
Legally Required Standby				
Pressurization equipment for low-rise buildings	60 seconds	4 hours	909 902.20	
Exhaust fans for any loading dock located interior to a building	60 seconds	4 hours	1007.4 & 5 3003	
Operation of elevators used as accessible means of egress in low-rise buildings (including car lighting, communications, control system, motor controller, operation control, signal equipment, machine room cooling/heating, etc.)	60 seconds	4 hours		604.2.19 elevators 1007.4 & 5
Fire pumps in low-rise buildings	10 seconds	4 hours		913.2 and NFPA 20
Transformer vault ventilation equipment	60 seconds	4 hours		
Heat tape for sprinkler lines & heating in sprinkler riser rooms	60 seconds	8 hours		
Fuel pump system for any legally required system	60 seconds	4 hours		
Sewage disposal pumps	60 seconds	4 hours		
Heat tape for sprinkler lines & heating in sprinkler riser rooms	60 seconds	24 hours		
Fuel pump system for any legally required system	60 seconds	4 hours		
Sewage disposal pumps	60 seconds	4 hours		

ⁱ The fuel pump and associated systems for the emergency or legally required generator shall be provided with power from the generator to maintain fuel supply.