



## **Mechanical Systems Submittal Guide**

### Residential Code of Ohio (RCO)

An applicant is free to submit any mechanical systems description meeting the requirements of RCO 106.1 along with the other required drawings under RCO 106.1; However, the attached forms and this guide are provided as a convenience and the applicant is encouraged to use them to insure that the information submitted is complete and in compliance with the requirements of the RCO so that plan approval can be granted.

This packet contains the following, which can be completed and submitted for plan review:

1. Mechanical Systems Description Form.
2. Residential Standard Electrical Load Calculation Form if required, see below.
3. Referenced Code Text Attachment (provided in this guide).

Accompanying or attached to these forms, provide:

1. Plan(s) to scale showing all of the information noted below. This information may be shown on the required floor plans.
2. Heat gain/ loss calculations for any new house or house addition. Calculations for a house addition must include the existing house if the existing or new HVAC system is to serve both. Only calculations for the addition are required if it is to have its own separate HVAC system. HRIA format is recommended.

An electrical load calculation in compliance with NEC 220 is required for:

- Any addition.
- Any new house.
- Any renovation greater than 25% of the existing residence area or that replaces the electrical panel or service.
- Any alteration adding a significant load to an existing panel such as a swimming pool, central air conditioning, accessory structure or electrical heating/cooking devices greater than 30A.

The load calculation should be completed by a certified electrician and must be complete. The spreadsheet for the attached example is available on-line at the Building Department website.

See next page for further plan requirements.

The following must be located on the plans submitted for plan review:

Electrical:

- Panels, subpanels
- Overhead or underground service

Mechanical:

- Furnaces
- Boilers
- Condensers
- HVAC equipment, exhaust fans
- Flues
- Exhaust discharge locations including clothes dryers and toilet room fans
- Gas fired appliances
- Gas meter

Plumbing:

- Water closets
- Lavatories/sinks/service sinks
- Bath tubs/showers
- Hose bibs
- Floor drains
- Dishwashers
- Garbage disposals
- Bidets
- Interceptors
- Sewage grinders
- Water heaters
- Backflow devices
- Sump pumps
- Any other plumbing fixtures not listed above

**MECHANICAL SYSTEMS DESCRIPTION FORM  
RESIDENTIAL CODE OF OHIO**

**PROJECT/BUILDING LOCATION**

Homeowner: \_\_\_\_\_

Street Address: \_\_\_\_\_

**APPLICANT/CONTRACTOR INFORMATION**

Applicant: \_\_\_\_\_

Street Address: \_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_

Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

**ELECTRICAL SYSTEM DESCRIPTION**

Service Size:  100 Amp  200 Amp  Over 200 Amp

Size of Service Entrance Conductors: \_\_\_\_\_

Service Conductor Type:  Aluminum  Copper

Grounding Electrode Size: \_\_\_\_\_

Grounding Electrode Type:  Aluminum  Copper

Phase:  Single  Three

Number of 120 Volt Circuits: \_\_\_\_\_ Number of 240/208 Volt Circuits: \_\_\_\_\_

Provide:

- A detailed electrical diagram for services over 200 amps for review and approval.
- A detailed electrical and gas piping diagram for generator installations.
- Load calculations per NEC 220.

**HVAC SYSTEM DESCRIPTION**

Heating Equipment Type, Size and AFUE Rating	<input type="checkbox"/> Forced Air _____ Btu/h AFUE Rating: _____ <input type="checkbox"/> Boiler _____ Btu/h AFUE Rating: _____ <input type="checkbox"/> Heat Pump _____ Btu/h AFUE Rating: _____ <input type="checkbox"/> Electric _____ kW AFUE Rating: _____ <input type="checkbox"/> Geothermal _____ kW (Btu/h) AFUE Rating: _____	Design Heat Loss: _____ Btu/h Type of Fuel: <input type="checkbox"/> Natural Gas <input type="checkbox"/> LP <input type="checkbox"/> Oil <input type="checkbox"/> Electric <input type="checkbox"/> Other _____ Duct Size: Supply _____ Return _____
Cooling Equipment Type, Size and SEER Rating	<input type="checkbox"/> AC _____ Btu/h, SEER Rating _____ <input type="checkbox"/> Heat Pump _____ Btu/h, SEER Rating _____ <input type="checkbox"/> Geothermal _____ kW (Btu/h), SEER Rating _____	Design Heat Gain: _____ (Btu/h) Area of Conditioned Space: _____ sf Duct Size: Supply _____ Return _____

**FUEL GAS SYSTEM DESCRIPTION**

Number of Outlets and Total Gas Load Input	_____ Heating _____ Btu/h _____ Water Heating _____ Btu/h _____ Cooking _____ Btu/h	_____ Laundry _____ Btu/h _____ Other _____ Btu/h _____ Total _____ Btu/h	Max Run and Main Size: _____ Piping Materials: <input type="checkbox"/> Steel Pipe Sch. 40 <input type="checkbox"/> CSST <input type="checkbox"/> Other _____
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**PLUMBING SYSTEM DESCRIPTION**

Building Main Drain: <input type="checkbox"/> 3 in. <input type="checkbox"/> 4 in. <input type="checkbox"/> 6 in. Building Water Service Size: <input type="checkbox"/> ¾ in. <input type="checkbox"/> 1 in. <input type="checkbox"/> 1 ¼ in. <input type="checkbox"/> 1 ½ in. <input type="checkbox"/> 2 in. Building Water Service Type: <input type="checkbox"/> Copper <input type="checkbox"/> PVC/Plastic <input type="checkbox"/> Other _____ Building DWV Type: <input type="checkbox"/> Copper <input type="checkbox"/> PVC/Plastic <input type="checkbox"/> Other _____	Water Heater: Capacity: _____ Gallons Input _____ Btu/h Fuel Type: <input type="checkbox"/> Gas <input type="checkbox"/> Electric
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# Residential Standard Calculation

9/25/1997

(Project Name)

by: John Sokolik

Version 2014

## STEP 1 Article 220.42 & 220.52

sq. ft	General Lighting load	VA
	Small Appliance	VA
	Laundry circuit	VA
	Gen.Lgt, Sm App.& Laun. Load	VA
	VA @ 100%=	VA
	VA @ 35% =	VA
	VA @ 25% =	VA

**Company Name**  
 Address  
 City, State, Zip Code  
 Telephone & Fax

4/3/2018 12:59

## STEP 2 Article 220.50 & 220.51

### A/C Condenser & Fixed Electric Space Heating

A/C #	VA	AHU	Select	QTY	VA
A/C #1	VA	AHU 1	Select	Qty	VA
A/C #2	VA	AHU 2	Select	Qty	VA
A/C #3	VA	AHU 3	Select	Qty	VA
A/C #4	VA	AHU 4	Select	Qty	VA
A/C #5	VA	AHU 5	Select	Qty	VA

Heating Load   
 CU Load

General Lighting Demand Load VA

Greater of Heat @ 100% vs.A/C @ 100% VA

## STEP 3 Article 220.53

<input type="checkbox"/> GAS	Water Heater	VA
<input type="checkbox"/> 1,400 VA	Refrigerator	VA
<input type="checkbox"/> 800 VA	Freezer	VA
<input type="checkbox"/> 1,200 VA	Dishwasher	VA
<input type="checkbox"/> 1,127 VA	Disposal	VA
<input type="checkbox"/> 540 VA	Range Hood	VA
<input type="checkbox"/> 1,400 VA	Microwave	VA
<input type="checkbox"/> 1,440 VA	Central Vac	VA
<input type="checkbox"/> 288 VA	Mini Refrig	VA
<input type="checkbox"/> 400 VA	Compactor	VA
<input type="checkbox"/> 12,000 VA	Tankless heater	VA
<input type="checkbox"/> 1,500 VA	Wine Cooler	VA
<input type="checkbox"/> select	Jacuzzi Tub	VA
<input type="checkbox"/> select	Sprinkler	VA
<input type="checkbox"/> select	Well Pump	VA
<input type="checkbox"/> select	Fountain Pump	VA
<input type="checkbox"/> select	Elevator	VA
<input type="checkbox"/>	Pool Equip. Panel	VA 100% Demand
<input type="checkbox"/>	Other load	VA No Demand
<input type="checkbox"/>	Other load	VA No Demand

Appliance Demand Load VA

Dryer Demand Load VA

Range Demand Load VA

Service Demand VA

Demand Load  @ 208V, 1ph A

Neutral Demand A

Min.Service Req. A

Total Appliance Load VA

4 or more demand @ 75% plus 100% demand loads VA

## STEP 4 Article 220.54

Electric Clothes Dryers

## STEP 5 Article 220.55

Electric Ranges

or Number of appliances

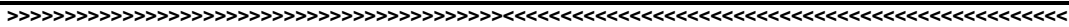
Col C demand 0

<input type="checkbox"/> Cooktop	Col B demand
<input type="checkbox"/> Cooktop	Col B demand
<input type="checkbox"/> Oven(s)	Col B demand
<input type="checkbox"/> Oven(s)	Col B demand

Number of appliances 0 Dem. Factor 0%  
 Cooktop & Oven Demand Load W

Use this area for your own notes

jmp1jds@comcast.net



Pool Panel Feeder Calculation (See Note)		A	B	N
Continuous Motors	0	0	0	0
Non-continuous	0	0	0	0
Spa heater 11 kVA		0	0	
Pool heater 3.5 ton		0	0	
Pool heater 5 ton		0	0	
Pool Light	0	0	0	0
Blower	0 <input type="checkbox"/> 240v	0	0	0
other load	0 <input type="checkbox"/> 240v	0	0	0
other load	0 <input type="checkbox"/> 240v	0	0	0
<input type="checkbox"/> Min.Copper Pool Feeder	<b>AWG</b>	<b>A</b>	<b>A</b>	<b>A</b>
Minimum Panel Rating		Phase Amperes		Neut. load

Continuous Motors		Non-continuous Motors	
select	<input type="checkbox"/> 240v	select	<input type="checkbox"/> 240v
select	<input type="checkbox"/> 240v	select	<input type="checkbox"/> 240v
select	<input type="checkbox"/> 240v	select	<input type="checkbox"/> 240v
select	<input type="checkbox"/> 240v	select	<input type="checkbox"/> 240v
select	<input type="checkbox"/> 240v	select	<input type="checkbox"/> 240v
<input type="text" value="0.0"/> Motor Neutral Load			
Max.Unbalanced Neutral Load			

# Referenced Code Text (2014 National Electrical Code)

<b>ELECTRICAL</b>	<b>MECHANICAL</b>																																								
<p><b>NEC 110.3</b> All electrical equipment shall be installed and used in accordance with the listing requirements and manufacturer's instructions.</p>	<p><b>M1401.1</b> Heating and cooling equipment and appliances shall be installed in accordance with the manufacturer's installation instructions and the requirements of the Residential Code.</p>																																								
<b>Service</b>	<b>Sizing</b>																																								
<p><b>Size of Service in Amperes:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 20%;">Copper</th> <th style="width: 20%;">Aluminum</th> <th style="width: 15%;">Service Rating</th> <th rowspan="4" style="width: 40%;">NEC 310-15 Conductor Sizes 120/240 VOLT 3-Wire, Single-Phase, Dwelling Services/Feeders</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>4 AWG</td> <td>2 AWG</td> <td>100 Amps</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>1 AWG</td> <td>2/0 AWG</td> <td>150 Amps</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>2/0 AWG</td> <td>4/0 AWG</td> <td>200 Amps</td> </tr> </tbody> </table>		Copper	Aluminum	Service Rating	NEC 310-15 Conductor Sizes 120/240 VOLT 3-Wire, Single-Phase, Dwelling Services/Feeders	<input type="checkbox"/>	4 AWG	2 AWG	100 Amps	<input type="checkbox"/>	1 AWG	2/0 AWG	150 Amps	<input type="checkbox"/>	2/0 AWG	4/0 AWG	200 Amps	<p><b>M1401.3</b> Heating and cooling equipment shall be sized based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.</p> <p style="text-align: center;"><b>Gages of Metal Ducts &amp; Plenums Used for Htg/Cooling</b></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;">Types of Ducts</th> <th style="width: 10%;">Size (inches)</th> <th style="width: 10%;">Minimum Thickness (inch)</th> <th style="width: 10%;">Equiv. Galvanized Sheet Gage</th> <th style="width: 10%;">Approx. Aluminum B &amp; S Gage</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Round Ducts &amp; Enclosed Rectangular</td> <td>14 or less</td> <td>0.013</td> <td>30</td> <td>26</td> </tr> <tr> <td>over 14</td> <td>0.016</td> <td>28</td> <td>24</td> </tr> <tr> <td rowspan="2">Exposed Rectangular Ducts</td> <td>14 or less</td> <td>0.016</td> <td>28</td> <td>24</td> </tr> <tr> <td>over 14</td> <td>0.019</td> <td>26</td> <td>22</td> </tr> </tbody> </table>	Types of Ducts	Size (inches)	Minimum Thickness (inch)	Equiv. Galvanized Sheet Gage	Approx. Aluminum B & S Gage	Round Ducts & Enclosed Rectangular	14 or less	0.013	30	26	over 14	0.016	28	24	Exposed Rectangular Ducts	14 or less	0.016	28	24	over 14	0.019	26	22
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<p><b>NEC 250.50</b> All grounding electrodes that are present at each building or structure served shall be bonded together to form the grounding electrode system. Conductor size per NEC 250.66.</p> <p><b>NEC 250.52</b> Permitted Electrodes include:</p> <ol style="list-style-type: none"> <li>1. Metal underground water pipe in direct contact with earth for 10 feet or more</li> <li>2. Metal frame of the building</li> <li>3. Concrete-encased electrode</li> <li>4. Rod, pipe &amp; plate electrodes</li> </ol>	<p style="text-align: center;"><b>Access &amp; Installation</b></p> <p><b>M1401.2</b> Heating and cooling equipment shall be located with respect to building construction and other equipment to permit maintenance, servicing and replacement. Clearances shall be maintained to permit cleaning of heating and cooling surfaces; replacement of filters, blowers, motors, controls and vent connections; lubrication of moving parts; and adjustments</p>																																								
<b>General Circuitry</b>																																									
<p><b>NEC 210.11</b> and <b>422.12</b> In addition to the branch circuits installed to supply general illumination and receptacle outlets in dwelling units, the following minimum requirements apply: Two 20-amp circuits for the kitchen receptacles, One 20-amp circuit for the laundry receptacles, One 20-amp circuit for the bathroom receptacles and One separate, individual branch circuit for central heating equipment</p>	<p><b>M1601.4.3</b> Metal ducts shall be supported by 0.5-inch (12.7 mm) wide 18-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet (3048 mm) or other approved means. Nonmetallic ducts shall be supported in accordance with manufacturer's installation instructions.</p>																																								
<p><b>NEC 210.52</b> Receptacles installed in the kitchen to serve countertop surfaces shall be supplied by not less than two separate small appliance branch circuits.</p>	<p><b>M1401.4</b> Equipment installed outdoors shall be listed and labeled for outdoor installation.. Supports and foundations shall prevent excessive vibration, settlement or movement of equipment. Supports and foundations shall be level and conform to manufacturer's installation instructions.</p>																																								
<p><b>NEC 210.52</b> Generally, receptacle outlets in habitable rooms shall be installed so that no point measured horizontally along the floor line in any wall space is more than 6' from a receptacle outlet. A receptacle shall be installed in each wall space 2 feet or more in width.</p>	<b>Plumbing</b>																																								
<p><b>NEC 210.52</b> At kitchen countertops, receptacle outlets shall be installed so that no point along the wall line is more than 24 inch measured horizontally from a receptacle outlet in that space. Countertop spaces separated by range tops, sinks or refrigerators are separate spaces.</p>	<p>Provide layout of plumbing fixtures on floor plan. Plumbing shall conform to the Residential Code.</p>																																								
<p><b>NEC 210.52</b> At least one receptacle, accessible at grade level and no more than 6.5' above grade, shall be installed at the front and back of a dwelling</p>																																									
<p><b>NEC 210.12</b> Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A), (B), and (C). The arc-fault circuit-interrupter shall be installed in a readily accessible location.</p>																																									
<p><b>NEC 210.8</b> Ground-fault circuit-interrupter (GFCI) protection shall be provided for all 125-volt, 15 and 20 amp receptacle outlets installed outdoors, in boathouses, garages, unfinished accessory buildings, crawl spaces at or below grade level, unfinished basements, bathrooms, at kitchen countertops and within 6' of the outside edge of the sink in laundry rooms, utility rooms, and at wet-bars.</p>																																									