



EVERGREEN[®] Pro

CONDENSING GAS BOILER
220/299/300/399

Vent Category II Addendum Boiler Manual

KEEP THIS ADDENDUM WITH BOILER MANUAL

**This Addendum adds to and supercedes items in the “Evergreen Boiler Manual”
(Part Number 550-100-131) and previously released Addenda’s.**

Evergreen Boilers (EVG 220, EVG 299/300, and EVG 399) can now be vented in a Category II configuration.

In addition to the Evergreen boiler’s Category IV rating (positive pressure, likely to condense), Evergreen boilers are approved for Category II (negative pressure, likely to condense) as well.

This new venting option includes / requires:

- The Vent system for a Category II **Evergreen** boiler is considered a Designed / Engineered vent system and should be designed by a professional using accepted engineering practices in accordance to local authority having jurisdiction.
- Vertical Vent only.
- Must not be installed into an existing common vent system with other appliances.
- Combustion air must come from the boiler room. See Boiler Room Air opening requirements in this Addendum.
- Must increase venting to 6” using a 6” to 4” bell reducer at boiler vent adapter for Category II Vent Connection.
- The Vent System should be designed so that the pressure in the 6” vent pipe immediately following the bell reducer is between the ranges provided in the Table 1, page 2, during all running (burner lit) conditions (i.e., High Fire through Low Fire).
- Flue gas temperature should not exceed 210°F; the boiler will shut down and recycle if it does. The flue gas temperature should typically be within 20°F of the return water temperature of the boiler. If there is the potential for a wide variation in return water temperatures, the lowest possible temperature should be used for any calculations.

- continued on next page

Hazard definitions

The following defined terms are used throughout these Instructions to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.



WARNING Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.



NOTICE Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.



- continued

- Stack / Vent Flow Rate for each individual boiler model is listed in the table below. This flow rate is based on the unit running at 9.25% CO₂ and the maximum flue gas temperature of 210°F. The values can vary depending on the location of the installation and operating conditions.
- A carbon monoxide detector(s) is required in the boiler room for **Evergreen** boilers installed in a Category II configuration. The carbon monoxide detector must be wired on the same electrical circuit as the boiler. Check your local codes for any additional requirements of carbon monoxide detectors.

TABLE 1 Rating & Vent Data

Boiler Model	Input Btuh	Stack / Vent flow rate scfm	Negative Pressure to be maintained at Vent Connection of the boiler Inches w.c.	Evergreen Vent Adapter required for Category II
EVG 220	220,000	61	-0.001 to -0.100	6"
EVG 299	299,000	83	-0.001 to -0.100	6"
EVG 300	300,000	83	-0.001 to -0.100	6"
EVG 399	399,000	111	-0.001 to -0.100	6"

WARNING Improper Installation of a Category II vent system resulting in positive pressure in the vent system can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

NOTICE Weil-McLain recommends the use of a Variable Speed Chimney Fan/ Power venter to ensure that the appropriate negative pressure is maintained for Category II venting. This is recommended because, as a result of the boiler's efficiency, the exhaust gas temperatures can be quite low resulting in less natural draft. A flow proving switch should be wired into the Proof of Closure jumper circuit on the boiler control. See the boiler manual for additional information. The use of this device should be considered in any Engineered Vent system.

NOTICE Weil-McLain recommends the use of a Double Acting Barometric Damper or Modulating Damper to ensure the appropriate negative pressure range is kept for Category II venting. The use of this device should be considered in any Engineered Vent system.

NOTICE When using a damper of any kind, it is recommended to use a thermal spill switch to detect any exhaust flow into the boiler room. Verify the temperature range on the thermal spill switch is adequate for the Flue gas temperature from the **Evergreen** boiler. The use and set-point of this shall be determined by the system designer. The Auto reset input on the Boiler's control can be used to wire in the thermal spill switch.

NOTICE Increasing the negative pressure in the vent pipe will slightly increase the firing rate at low fire, thus reducing the boiler's true modulation range. Consider this factor during system design.

Code Compliance

WARNING Venting / Combustion air piping – Installations must provide provisions for combustion and ventilation air in accordance with the section "Venting of Equipment", of the National Fuel Gas Code, ANSI Z223.1 / NFPA 54, or "Venting Systems and Air Supply for appliances" of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

See **Evergreen** boiler manual for approved vent material.



Direct Exhaust (Category II Only) Venting – general

⚠ DANGER

Evergreen Boilers must be vented and supplied with combustion and ventilation air using piping and methods described in this addendum.

Inspect finished vent and air piping thoroughly to ensure all are water-tight and comply with the instructions provided and with all requirements of applicable codes.

Failure to provide a properly-installed vent and air system will cause severe personal injury or death.

NOTICE

If the vent/air piping configurations covered in the Evergreen boiler manual and this addendum cannot be applied for a particular installation, contact Weil-McLain for assistance. Other configurations may be available.

⚠ WARNING

Installations must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 or B149.2 for Canadian installations.

⚠ WARNING

Use only the materials listed in the Boiler manual for vent and air pipe and fittings. Failure to comply could result in severe personal injury, death or substantial property damage.

⚠ WARNING

If used, a masonry chimney can ONLY be used as a PIPE CHASE for vent pipe — The vent piping must be installed as instructed in this manual and all joints must be sealed. The chimney must be used only for boilers. NO OTHER appliance or fireplace can be connected to the chimney.

The chimney must be straight, with no offsets, and the vent and air piping materials must comply with this instruction manual. The chimney must be fitted with a sealed access opening, through which the interior of the chimney can be inspected. The chimney (and liner, if installed) must be inspected at least once annually to verify condition.

Failure to comply could result in severe personal injury, death or substantial property damage.

Vent piping

Boiler flue gases must be piped from the boiler to outside, following the instructions in the Boiler manual and this addendum, and compliant with all applicable codes.

Combustion and ventilation air openings (direct exhaust installations)

Combustion and ventilation air are provided from the boiler room on direct exhaust installations. Follow all instructions in the Boiler manual and this addendum, plus all applicable codes, to provide required air openings.

Vent termination options

Vent piping must terminate out through the roof of the building, using only one of the methods described in the Boiler manual and this addendum.

Vent pipe diameter

A 6" vent pipe diameter must be used.

Vent pipe minimum length

Direct exhaust — no minimum.

Vent and air piping materials

See the Evergreen Boiler Manual for approved vent and air piping materials, for **direct exhaust**.

⚠ WARNING

Use the same vent or air piping material throughout. — Do not connect different types of piping together.

Install a bird screen in each vent pipe termination (coupling or elbow). Bird screens are not supplied with the Evergreen boiler. Purchase separately from Weil-McLain.



Direct Exhaust (Category II Only) Boiler room air opening

Combustion air openings for direct exhaust

▲WARNING Provide combustion air openings to boiler room and building. Combustion and ventilation air for direct exhaust boilers is provided from the boiler room. Follow all instructions in the Boiler manual and this addendum plus all applicable codes, providing combustion air openings as specified. Failure to comply could result in severe personal injury, death or substantial property damage.

1. Combustion air must be supplied through openings into the boiler room, following the instructions in this addendum and compliant with all applicable codes. Read the warning in Figure 1, page 5, and ensure the air and boiler room will not contain contaminated air.
2. Where the boiler shares a space with other appliances, the combustion air openings must be sized to handle the combined requirements of all appliances in the space.

Sizing combustion air openings

Air openings provide for ventilation (as well as combustion air) to prevent overheating of the boiler controls and boiler space. Air is also needed for other appliances located in the same space.

Use Figure 2, page 6, selecting the appropriate installation conditions.

▲WARNING Air openings must be sized to handle all appliances and air movers (exhaust fans, etc.) using the air supply.

The sizing given in Figure 2, page 6, is based on the National Fuel Gas Code, ANSI Z223.1, allowing adequate air openings for gravity-vented gas appliances (Category I) in addition to that needed for the Evergreen boiler.

The air openings recommended in Figure 2, page 6, will allow adequate ventilation and combustion air provided the boiler room is not subjected to negative pressure due to exhaust fans or other mechanical ventilation devices.

Refer to the National Fuel Gas Code for dealing with other conditions.

Free area — louver allowance

The free area of openings means the area after reduction for any installed louvers or grilles. Be sure to consider this reduction when sizing the air openings.

Special considerations

Tight construction

ANSI Z223.1 defines unusually tight construction where:

1. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed, and . . .
2. Weather-stripping has been added on openable windows and doors, and . . .

3. Caulking or sealants are applied to areas such as joints around windows and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical, and gas lines, and in other openings. For buildings with such construction, provide air openings into the building from outside, sized per the appropriate case in Figure 2, page 6, if appliances are to use inside air for combustion and ventilation.

Exhaust fans and air movers

The appliance space must never be under a negative pressure unless all appliances are installed as direct vent. Always provide air openings sized not only to the dimensions required for the firing rate of all appliances, but also to handle the air movement rate of the exhaust fans or air movers using air from the building or space.

Motorized air dampers

If the air openings are fitted with motorized dampers, electrically interlock the damper to:

- Prevent the boiler from firing if the damper is not fully open.
- Shut the boiler down should the damper close during boiler operation.

The Evergreen control provides a Proof of Closure function which will prevent the boiler from firing if the damper is not fully open or closes during boiler operation. Please refer to the Boiler Manual for installation and wiring instructions.

▲WARNING Ensure that the combustion air will not contain



Every vent pipe requires a **bird screen at its termination**. Bird screens are not supplied with the Evergreen boiler. Purchase separately from Weil-McLain.

Direct Exhaust (Category II Only) Boiler room air opening

Figure 1 Corrosive contaminants and sources

any of the contaminants in Figure 1, page 5.

Do not pipe combustion air near a swimming pool, for example. Avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

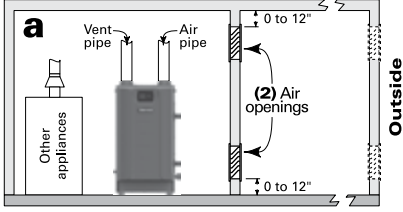
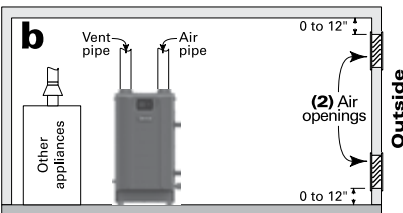
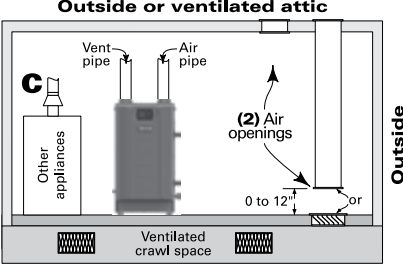
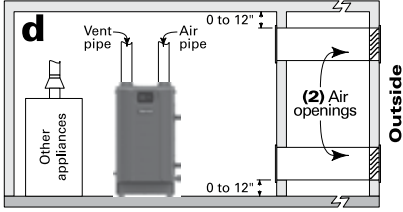
Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

Products to avoid
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
Excessive dust and dirt

Areas likely to have contaminants
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops

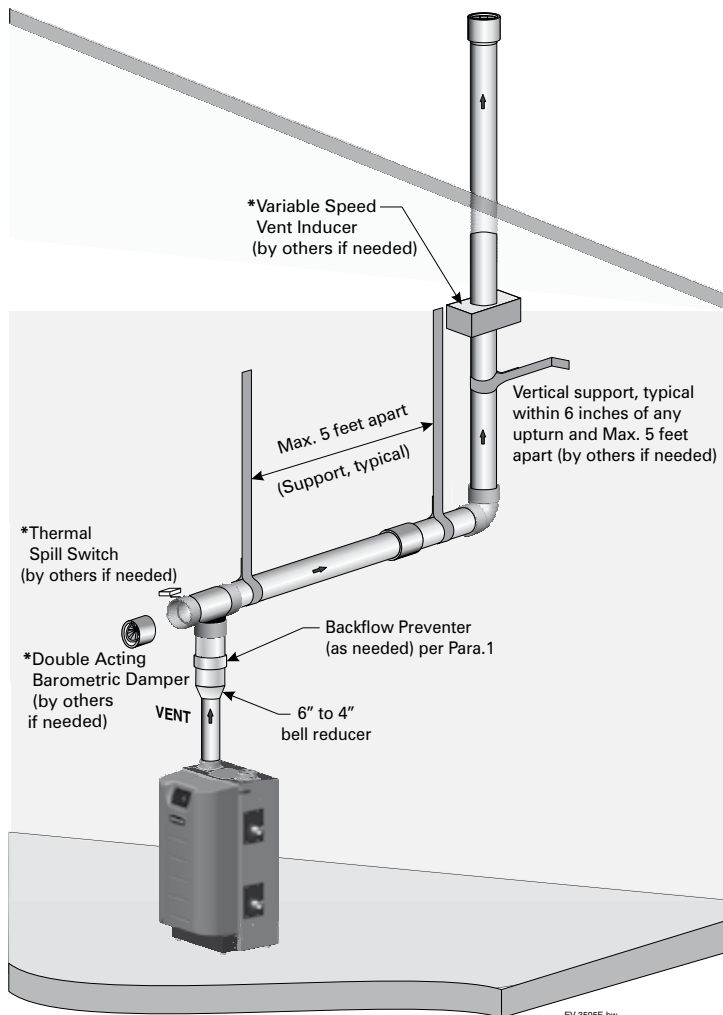
Direct Exhaust (Category II Only) Boiler room air opening

Figure 2 MINIMUM combustion air openings for direct exhaust applications – **ALL OPENINGS ARE FREE AREA**
Provisions for combustion and ventilation air to be in accordance with the section “Air for Combustion and Ventilation,” of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or applicable provisions of the local building codes.

Air openings The required air opening sizes below are FREE AREA, after reduction for louver obstruction. Note the exception below for large spaces.	Evergreen[™] boiler WITH other appliances in room	Evergreen[™] boiler WITHOUT other appliances in room
	TWO openings, each at least: 1 square inch per 1,000 Btuh of all other appliances in the room	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room
	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room
	TWO openings, each at least: 1 square inch per 2,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room
	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room	TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room
** NOTICE: Requirements for using the SINGLE air opening option.	A single combustion air opening can be used for cases b , c , or d above, sized as listed, provided that: <ul style="list-style-type: none"> The single opening must communicate directly to the outdoors or to a space that communicates directly with outdoors (NOT to an interior space). The top of the opening must be within 12 inches of the ceiling. The free area of the opening must be at least equal to the sum of the areas of all equipment vent connectors in the space. 	
SPECIAL EXCEPTION FOR LARGE SPACES	NO combustion air openings are needed if the boiler (and other appliances) are installed in a space with a volume NO LESS than 50 cubic feet per 1,000 Btuh of all appliances in the space. That is, total the input of all appliances in MBH (1,000's of Btuh), then multiply this total times 50. The building MUST NOT be of tight construction. Example: For a total input of 500 MBH (500,000 Btuh), the minimum volume would be 50 x 500 = 25,000 cubic feet.	

Direct Exhaust (Category II Only) – Vertical

Figure 3 DIRECT EXHAUST vertical termination



DIRECT EXHAUST — Vertical termination — installation sequence overview

- Step 1** Install the boiler.
- Step 2** Determine the proper location for wall penetration for each termination.
- Prepare roof penetrations before installing vent piping.
 - Finish by attaching external pipe and fittings as shown in the termination instructions.
 - Install terminations as described in this manual.
 - Support vertical runs on the outside of the building with brackets as shown in the termination instructions.
- Step 3** Install vent piping from boiler to termination.
- Install a hanger support within 6 inches of any upturn in the piping.
 - Install pipe supports every 5 feet on both the horizontal and vertical runs.
 - Slope horizontal piping downward toward the boiler at least 1/4 inch per foot.
- Step 4** Connect the vent piping at the boiler per manual instructions.

Determine location for vertical termination

1. Locate the vent termination using the following guidelines:
2. The vent piping must terminate in a coupling as shown in Figure 4, page 8.
3. Consider the surroundings when terminating the vent:
 - a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
 - b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
 - d. Avoid possibility of accidental contact of flue products with people or pets.
 - e. Do not locate the termination where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards or other recessed areas.
 - f. Locate or guard vent to prevent condensate damage to exterior finishes.
4. Maintain clearances as shown in the illustrations in this manual section. Also maintain the following:
 - a. Vent must terminate:
 - At least 12 inches above roof or snow line as shown in Figure 4, page 8.
 - At least 6 feet from adjacent walls.
 - No closer than 5 feet below roof overhang.
 - At least 3 feet above any forced air intake within 10 feet.
 - No closer than 48 inches below or horizontally from any door or window or any other gravity air inlet.
 - b. Do not terminate closer than 4 feet horizontally from any electric meter, gas meter, regulator, relief valve or other equipment.
5. Where the vent penetrates the roof, the annular space around the penetration must be permanently sealed using approved materials to prevent entry of combustion products into the building.
6. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.
7. Do not connect any other appliance to the vent pipe.

Prepare roof penetration

1. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole at least 0.5" larger than the vent pipe diameter – use a 7" hole for 6" PVC.
 - b. Insert a galvanized metal thimble in the vent pipe hole.
2. Follow all local codes for isolation of vent pipe when passing through floors, ceilings and roofs.
3. Provide flashing and sealing boots sized for the vent pipe and air pipe.

Direct Exhaust (Category II Only) – Vertical *(continued)*

Termination and fittings

1. Prepare the vent termination coupling (Figure 4) by inserting a bird screen. Bird screens are not supplied with the Evergreen boiler. Purchase separately from Weil-McLain.
2. The vent piping must terminate in a coupling as shown in Figure 4.
3. Maintain the required dimensions of the finished termination piping as shown in Figure 4.
4. Do not extend exposed vent pipe outside of building more than shown in Figure 4. Condensate could freeze and block vent pipe.

Multiple vent terminations

When terminating multiple Evergreen boilers, terminate each vent connection as described in this section. Space terminations as required for best installation practices and required maintenance.

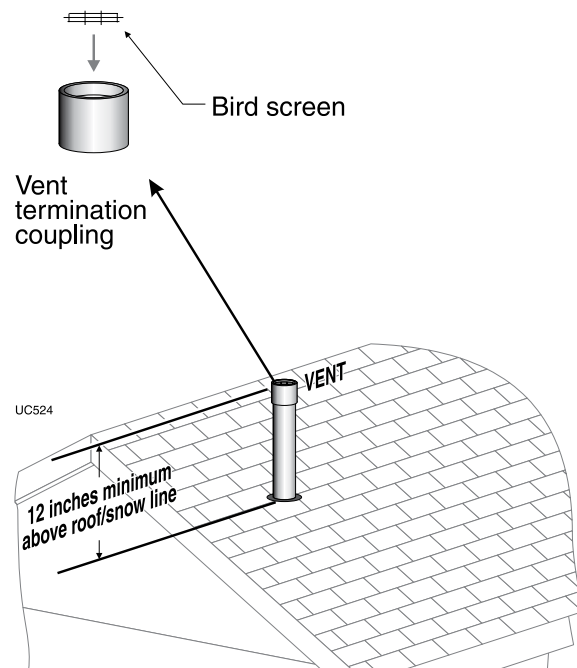
Complete termination preparation

Install vent terminations before proceeding. See previous pages for instructions.

Installing direct exhaust vent piping

1. For reference in the following see:
 - a. Vertical terminations: see Figure 3, page 7.
2. Work from the boiler to vent or air termination. Do not exceed the lengths given in the previous pages for either the air or vent piping.
 - a. You must install appropriate pipe reducers, where required, at the boiler vent connection.
3. See page 36 of Evergreen Boiler Manual for attaching vent and air pipes at the boiler.
4. Cut pipe to required lengths.
5. Deburr inside and outside of pipe ends.
6. Chamfer outside of each pipe end to ensure even cement distribution when joining.
7. Clean all pipe ends and fittings. Dry thoroughly.
8. Dry assemble entire vent or air piping to ensure proper fit before assembling any joint.
9. For each joint:
 - a. Handle fittings and pipes carefully to prevent contamination of surfaces.

Figure 4 DIRECT EXHAUST — Vertical termination



- b. Apply primer liberally to both joint surfaces — pipe end and fitting socket.
 - c. While primer is still damp, lightly apply approved cement to both surfaces in a uniform coating.
 - d. Apply a second coat to both surfaces. Avoid using too much cement on sockets to prevent cement buildup inside.
 - e. With cement still wet, insert pipe into fitting, twisting $\frac{1}{4}$ turn. Make sure pipe is fully inserted.
 - f. Wipe excess cement from joint. Check joint to be sure a smooth bead of cement shows around the entire joint.
10. Install pipe supports as shown on Figure 3, page 7.
 11. Slope vent and air piping continuously toward boiler, with at least $\frac{1}{4}$ inch drop per foot of run. Do not allow sags at any point.
 12. Maintain minimum clearance of $\frac{3}{16}$ inch between vent pipe and any combustible wall or material.
 13. Seal wall or floor penetration openings following local code requirements.