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| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | GI-04  Stack/Vent (SV) information  Air Quality Permit Program  *Doc Type: Permit Application* |

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| **1a)** AQ Facility ID number: | |  | **1b)** Agency Interest ID number: |  |
| **2)** Facility name: |  | | | |

**Form GI-05F *Emission Source Association* must also be completed and submitted whenever this form is required.**

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| **3a)** | **SV ID number** |  |  |  |  |
| **3b)** | **Stack/Vent operator’s description** |  |  |  |  |
| **3c)** | **Height of opening from ground (feet)** |  |  |  |  |
| **3d)** | **Inside diameter (feet)** |  |  |  |  |
|  | **length (feet)** |  |  |  |  |
|  | **width (feet)** |  |  |  |  |
| **3e)** | **Design flow rate (cubic feet/minute)** |  |  |  |  |
| **3f)** | **Exit gas temp. (°F)** |  |  |  |  |
| **3g)** | **Flow rate/temp. information source** |  |  |  |  |
| **3h)** | **Discharge direction** |  |  |  |  |
| **3i)** | **Status** |  |  |  |  |
| **3j)** | **Removal date (mm/dd/yyyy)** |  |  |  |  |
| **3k)** | **Reasons for changes/modifications** |  |  |  |  |

Instructions for adding stack/vents to the list

Complete the table on this form for all the stacks and vents at your facility. Do not include stacks and vents that vent only from insignificant activities or which do not vent any regulated pollutant. Regulated air pollutants include the criteria pollutants for which a national ambient air standard has been established, pollutants regulated under an NSPS, pollutants regulated under the National Emission Standards for Hazardous Air Pollutants program under Section 112 of the Clean Air Act (40 CFR pt. 61 and 40 CFR pt. 63), ozone depleting chemicals, and chemicals regulated under the accidental release program under section 112(r) of the Clean Air Act (40 CFR pt. 68).

All fields as directed by the form are **mandatory** except the Agency identification (ID) number. (if unknown). **If you submit your application with blank mandatory fields or without mandatory attachments, it will be deemed incomplete and returned.**

**1a) AQ Facility ID number –** Fill in your Air Quality Facility ID number (No.) as indicated on the *Facility Information Form*   
(GI-01), item 1a. This is the first eight digits of the permit number for all permits issued under the operating permit program.

**1b) Agency Interest ID number –** Fill in your Agency Interest ID No. This is an ID number assigned to your facility through the Tempo database. If you don’t know this number, leave this line blank.

**2) Facility name –** Enter your facility name as indicated on the *Facility Information Form* (GI-01), item 2.

**3a) S/V ID number –** Number the stacks and vents at your facility sequentially (001, 002, 003, etc.). This number will be used in other forms to identify the stack that is described in this form. Even if the stack replaces a previously removed stack, assign the next number; do not reuse numbers. This number will be used in other forms to identify the stack that is described in this form. This ID number is unique to this stack and must be used consistently throughout the application.

Stacks and vents from building and room ventilation systems which are designed only to provide fresh air for the occupants or to remove heat for comfort should not be listed, unless processes inside that building have emissions that could escape through these vents (e.g., are not vented directly to their own stack so their emissions leave through general building ventilation). All such stacks and vents for each building may be grouped under a single S/V ID number. Provide an estimate of the total air flow and temperature. In some cases, you may want to group these stacks or vents by rooms within a building. You may also list these stacks and vents individually if you wish.

Stacks or vents from buildings or room ventilation systems whose design basis is the removal of airborne contaminants must be listed individually with an estimate of air flowrate, temperature and emission rate of each contaminant which is a regulated air pollutant.

**3b) Operator’s description –** Please provide a short description that you would use to describe the function of the stack or vent. (For example, “boiler exhaust” or “dryer emissions.”) You may also include any identifying numbers that you use for the stacks or vents (this will be separate from the number prescribed in item a).

**3c) Height of opening from ground –** The height is from the top of the stack to nearest ground level.

**3d) Inside diameter in ft. or length and width in ft. –** Provide the inside dimension(s) of the stack at the exit.

**3e) Design flowrate at exit and 3f) exit gas temperature at exit (°F) –** You must usethe same source of data for both if these items, for instance, if you contact the manufacturer for the flowrate, have them provide the temperature also. Provide the design flowrate in actual cubic feet per minute and the temperature in degrees F corresponding to the flowrate from this stack. This data should be based on the stationary source(s) operating at its maximum design capacity. If this information is not known or documented, consult the following guidance (below).

Acceptable sources for this information are stack tests if there is no introduction of air or other process gases downstream of the test ports, manufacturer's estimates based on engineering calculations, or your own estimates based on engineering calculations***.***

**3g) Rate/temp information source –** Indicate the source of the flowrate and temperature entries separately, using the following code letters:

M - information provided by manufacturer

T - information obtained through testing

C - information obtained through continuous monitoring systems

E - estimated

**3h) Discharge direction –** Provide the direction of flow of the gases exiting the stack or vent using the following codes:

U - gases exit upwards (with no cap on stack/vent)

C - gases exit upwards (with a cap on stack/vent)

D - gases exit downward

H - gases exit horizontally

**3i) Status –** Provide the status of the emission unit as either active or inactive. If status is inactive, provide a removal date.

**3j) Removal date –** If status is inactive, provide date stack/vent was removed. This includes dates for inactivating stacks that no longer have process emissions.

**3k) Reason for changes/modification –** Provide reason for changes or modification of emission unit.

Instructions for determining or estimating stack flowrate and exit temperature for GI-04

Under each type of equipment or emission unit, several methods of estimating flowrate and temperature may be given. The first method is the most preferred and should provide the most accurate data, but the other methods are also acceptable.

**1. Boilers and other equipment burning common fuels**

**1.1 Preferred method –** Determine the maximum rate at which each fuel can be burned based on the overall facility design, and contact the equipment manufacturer for the stack flowrate and temperature at that fuel-burning rate.

* **1.2 Alternate method –** Calculate the stack flowrate using the procedure below (steps 1-9). To aid in calculation, a spreadsheet is also available at <https://www.pca.state.mn.us/air-permit-application-forms>, the flue gas rate estimation for stack or vent flow rates template (aq-f1-gi04a).

Step 1: For a given fuel, obtain a wet basis (wb) analysis by percent mass for carbon (Cwb), hydrogen (Hwb), sulfur (Swb), oxygen (Owb), nitrogen (Nwb), ash (Awb), and moisture (Mwb). A wet basis analysis may be obtained from the manufacturer or through testing.

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| Analysis (wet basis) | | |
| Variable | Species | % Mass |
| Cwb | Carbon |  |
| Hwb | Hydrogen |  |
| Swb | Sulfur |  |
| Owb | Oxygen |  |
| Nwb | Nitrogen |  |
| Awb | Ash |  |
| Mwb | Moisture |  |

Step 2: Obtain the fuel higher heating value, with units Btu/lb fuel, on a wet basis (HHVwb).

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| Higher heating value (Btu/lb fuel): |  |

Step 3: Obtain the fuel heat input value (Hein) with units MMBtu/hr.

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| Fuel heat input (MMBtu/hr): |  |

Step 4: Obtain the percentage of excess air used in combustion (E).

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| Excess air (%): |  |

Step 5: Obtain the temperature of flue gas at stack exit (T) in degrees Fahrenheit.

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| Exit temperature (°F): |  |

Step 6: Calculate the percent oxygen in dry flue gas (Oxdf) using the following method:

Oxdf =20.9 \* E / (100 + E)

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| Oxygen in dry flue gas (%): |  |

Step 7: Calculate a whole flue gas factor (Fw), in units scf/MMBtu using the following method:

Fw = 1,000,000 \* [ (Cwb \*1.533) + (Hwb \* 5.525) + (Swb \* 0.574) + (Owb \* **-** 0.455) + (N \* 0.138) + (Mwb \* 0.214) ] / HHVwb

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| Flue gas factor (scf/MMBtu): |  |

Step 8: Calculate the flue gas flow rate in standard cubic feet per minute (Qscfm) using the following method:

Qscfm = [Hein \* Fw \* 20.9 / (20.9-Oxdf)] / 60

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| Standard flue gas flow rate (scfm): |  |

Step 9: Calculate the flue gas flow rate in actual cubic feet per minute (Qacfm) using the following method:

Qacfm = Qscfm \* (460 + T) / 528

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| Actual flue gas flow rate (acfm): |  |

**1.3 Alternate method –** performance test data

Performance test data may be used to provide flowrate and temperature. If the test is not conducted at the design fuel-burning rate, the measured flowrate may need to be extrapolated to the design condition.

**2. Fan-powered ventilation systems**

**2.1 Preferred method –** Consult purchase documents for the fan specifications which will usually specify the volumetric flowrate of air for which the fan is designed. If the air is cleaned by a baghouse, scrubber, cyclone or other air pollution control equipment, the purchase documents for that equipment will usually specify the design gas flowrate. If both are available, the smaller number should be reported.

**2.2 Alternate method –** Measure the air volume in a straight run of duct using a pitot tube and U.S. Environmental Protection Agency (EPA) Method 1 and 2. Stack tests already performed are adequate if conducted at the design conditions. EPA test methods are found in the Appendices to 40 CFR pt. 60.

**2.3 Alternate method –** Determine the fan model number from the manufacturer's nameplate and speed from the motor and drive, and measure the static pressure at the fan inlet. Consult the manufacturer's performance curve for the fan, or call the manufacturer to determine the fan performance.

**2.4 Last-resort-method for flowrate –** Multiply the cross-sectional area of the fan outlet or exhaust stack, in square feet, by 4000 feet per minute.

3. Natural draft ventilation systems

**3.1 Natural draft ventilation systems** usually consist of roof openings with a weather hood designed to facilitate exhaust of indoor air due to temperature difference (the indoor air is usually warmer) and may be assisted by wind. Obtain the manufacturer's model number from purchasing records if available or from nameplates if accessible and contact the manufacturer for estimated air flow. If the name of the architect or engineering company that designed the building is still available, they may have design calculations of the required ventilation flowrate.