Minnesota Pollution Control Agency

AIR QUALITY
520 LAFAYETTE ROAD NO., ST. PAUL, MN 55155-4194

PERMIT APPLICATION FORM **CAP-GI-04**
STACK/VENT INFORMATION
3/7/06

1) AQ Facility ID No.: _____ **2)** Facility Name: _____

3a) SV ID No.	**3b)** Operator's Description	**3c)** Height of Opening From Ground (ft.)	**3d)** Inside Diameter in ft. (left column only) or Length x Width in ft. (both columns)		**3e)** Design Flow Rate at Exit (acfm)	**3f)** Exit Gas Temperature (° F)	**3g)** Rate/Temp Information Source	**3h)** Discharge Direction
001								

INSTRUCTIONS FOR FILLING OUT AQ FORM

CAP-GI-04 Stack/Vent Information

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.

If you have previously received an air emissions permit from the MPCA or have filed an annual emissions inventory, contact the MPCA Customer Assistance Center at (651) 297-2274 or (800) 646-6247 prior to filling out this form. The CAC can provide you with a printout of the MPCA's most recent information entered in the permitting and inventory database. Start with (and edit) this information when filling out the Capped application form.

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).

1) **AQ Facility ID No. --** Fill in your Air Quality Facility ID Number as indicated on the *Facility Information Form* (CAP-GI-01), item 1a.

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

3a) **S/V ID Number --** Number the stacks and vents at your facility sequentially (001, 002, 003, etc.). It is important to assign the same ID numbers on CAP-GI-03, CAP-GI-04 and the CAP-GI-05 forms and to use these ID's 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 are not required to 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.")**

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 × 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 use the 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 - gasses exit upwards (with no cap on stack/vent)
C - gasses exit upwards (with a cap on stack/vent)
D - gasses exit downward
H - gasses exit horizontally

Instructions for determining or estimating stack flowrate and exit temperature for CAP-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 following procedure:

For each fuel, obtain an analysis (ultimate analysis) for weight fraction carbon (C), hydrogen (H), sulfur (S), nitrogen (N), oxygen (O) and fuel moisture to two decimal places (e.g., 0.86C, 0.14H). For common commercial fuels such as fuel oils sold as Grades 1,2 4,5 or 6, typical analyses in engineering handbooks are acceptable. For other fuels, consult your supplier or have a laboratory perform an ultimate analysis.

Obtain the manufacturer's recommended excess air for that fuel or use the following:

Fuel	Excess Air
Fuel oil, distillate	25 (%)
Fuel oil, residual	35 (%)
Natural gas	10 (%)
Wood	50 (%)
Coal	50 (%)

Calculate the minimum amount of oxygen to burn a unit weight of fuel using the following equation:

Min O_2 = $2.66 \times C + 8.0 \times H + S - O$

where C, H, S and O are the weight fractions of carbon, hydrogen, sulfur and oxygen in the fuel.

Calculate total oxygen from:

Total O_2 = $(1 + E/100) \times$ Min O_2

where E is the percentage excess air.

Complete the following table.

Fuel analysis by weight	Combustion products, weight per unit fuel weight	
Fuel weight fraction carbon, C =	CO_2, $3.67 \times C$ =	
Fuel weight fraction hydrogen, H =	H_2O, $9.0 \times H$ + fuel moisture =	
Fuel weight fraction sulfur, S =	SO_2, $2.0 \times S$ =	
Fuel weight fraction nitrogen, N =	N_2, $3.25 \times$ total O_2 + N =	
	O_2, $(E/100) \times$ Min O_2 =	
Total weight of products per unit weight of fuel	Sum of the above =	

Calculate the volume of combustion products at standard conditions by multiplying the sum by 13.33; V, std. conditions = $13.33 \times$ sum

Correct this volume to actual stack temperature as follows:

V, actual = V, std. conditions $\times$ (stack temperature + 460)/528, temperature in degrees F

where: V, actual is volume ***in cubic feet*** per unit weight of fuel burned.

Calculate the stack flowrate for Form CAP-GI-04 by multiplying V, actual by the maximum fuel combustion rate in pounds per hour. Maximum fuel combustion rate can be obtained from the manufacturer or by dividing the rated nameplate heat input by the heat value of the fuel per pound.

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 EPA Method 1 and 2. Stack tests already performed be adequate if conducted at the design conditions. EPA test methods are found in the Appendices to 40 CFR 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.