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# Carbon Monoxide Dangers and the Duty to Warn

Carbon monoxide, an odorless, colorless, combustion gas byproduct, is a popular subject in Minnesota this year, not only due to the heating season where the use of furnaces and sealed houses increases the risk of carbon monoxide poisoning, but also due to a 2006 Minnesota statute that, as of August 2008, will require every existing single-family dwelling to have carbon monoxide detectors installed.

Reports of carbon monoxide accidents and deaths occur every year as we change into the heating season. Many times, incidents occur in residences where defective equipment, after sitting unused during the summer, is restarted for the first seasonal use. Also, in Minnesota, we routinely read reports of carbon monoxide injuries occurring in “deer shacks” and ice fishing “shanties,” usually as a result of do-it-yourself heating systems put together at the last minute by untrained personnel, and installed in a situation where people unfamiliar with the equipment are sleeping.

Lethal levels of carbon monoxide can result due to defective equipment, improper installation, or poor maintenance. A portion of carbon monoxide incidents are related to propane-fueled appliances and equipment, due to the fact that it is the only feasible fuel source in many areas. The dangers of carbon monoxide, however, are not limited to the use of propane-fueled equipment. Natural gas-fired appliances have the same potential hazards as their propane counterparts. Likewise, small gasoline engines, particularly on portable generators, can create a potential carbon monoxide hazard.

This article will examine the dangers of carbon monoxide, the history of Minnesota law regarding the duty to warn of carbon monoxide, and the new Minnesota law requiring mandatory carbon monoxide detectors in homes.

## THE LETHAL NATURE OF CARBON MONOXIDE

Once carbon monoxide has entered the body through the lungs, it binds to the hemoglobin, the principal oxygen-carrying compound in the blood. This attachment adversely affects the blood’s oxygen-carrying capacity. Carbon monoxide binds to hemoglobin more readily than oxygen binds to hemoglobin. The “binding” creates carboxyhemoglobin, which decreases the blood oxygen content, resulting in personal injury or death. Carbon monoxide also produces tissue toxicity, adversely affecting the ability of the heart to take up oxygen. Finally, carbon monoxide can cause cellular disruption, leading to cell and tissue death in certain areas of the brain.<sup>1</sup>

The injurious effects of carbon monoxide are more pronounced in infants, the elderly, and those with respiratory or heart disease. The carbon monoxide death rate is highest for those victims over 75. Pregnant women are also more susceptible. It is believed that carbon monoxide moves slowly across the placenta, increasing exposure and thus the risk of miscarriage.<sup>2</sup>

Carbon monoxide poisoning can also produce long-term ill effects even after the victim has “recovered.” One study estimates that 43 percent of carbon mon-



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oxide poisoning victims exhibited causal problems one year after the poisoning event. A victim who sustains a carbon monoxide-related cardiac injury has an increased risk of mortality over the following 10 years. For others, there can be lasting signs of brain damage, including cognitive or personality changes.<sup>3</sup>

The toxic threshold of carbon monoxide is dependent upon the amount of carbon monoxide and the duration of exposure. Exposure to 50 parts per million (ppm) of carbon monoxide over an eight-hour period is the toxicity baseline. Carbon monoxide exposure of 70 to 100 ppm for four to six hours results in flu-like symptoms such as nausea, runny nose, sore eyes, and headache. Exposure to 150 to 300 ppm causes dizziness, drowsiness, and vomiting. Exposure equal to or greater than 400 ppm results in unconsciousness, brain damage, and even death.<sup>4</sup> Infants, the elderly, and those with respiratory or heart disease will suffer adverse effects at far lower

exposure levels than the average human being.<sup>5</sup>

## PREVALENCE OF CARBON MONOXIDE POISONING

The hazard of carbon monoxide is inherent in the use of any product that causes combustion. Manufacturers cannot design these combustion-producing products to eliminate the hazard. Further, the presence of a hazardous accumulation of carbon monoxide is dependent upon a predicate event, a defect in the product (a cracked heat exchanger), negligent installation or maintenance (improper venting), or consumer abuse (using a gas generator inside a home). According to the Centers for Disease Control, there are approximately 500 unintentional carbon monoxide deaths in the United States each year.<sup>6</sup> As one would expect, many carbon monoxide deaths occur during the heating season. Frequent furnace use, a greater source of carbon monoxide than a water heater or cook stove, along with closed windows, contribute to this increase.

Further, many carbon monoxide injuries occur during power outages, due primarily to the improper use of portable gas generators, grills, and liquid propane (LP) space heaters. The lack of electricity causes some individuals to operate the generators and grills inside their homes, allowing carbon monoxide to accumulate in the living space. Alabama, Louisiana, and Mississippi sustained 51 incidents of carbon monoxide poisoning due to the use of portable gas generators immediately after Hurricane Katrina.<sup>7</sup> The studies have also found that a disproportionate amount of carbon monoxide injuries occur in rental homes where the heating equipment is generally not well-maintained or is damaged due to tenant misuse.<sup>8</sup>

## CARBON MONOXIDE WARNING CASES IN MINNESOTA

Because manufacturers cannot design combustion-producing products to eliminate carbon monoxide's hazard,

the danger must be warned of, or guarded against, as enunciated in the Restatement (Second) of Torts § 402A. Minnesota case law regarding carbon monoxide generally addresses a defendant's duty to warn, and the effectiveness of any warning given.

A 1941 reported case, *Ruth v. Hutchinson Gas*,<sup>9</sup> involved a deer hunting shack and a propane heater. Five men from Hutchinson planned to go deer hunting near Big Falls. For living quarters, one of them mounted an old chicken coop on the back of a flatbed truck, creating a primitive RV. The local gas company provided and installed a propane space heater. The gas company did not charge for the use of the stove, but required that the stove be returned at the conclusion of the hunting trip. The stove venting consisted of a straight metal pipe from the stove to the roof of the chicken coop. The pipe had a ventilator/cover that was a simple metal lid hinged on top of the stack, to which a wire was connected that ran back into the shack and was tied around a nail. To open the cover during use, one would just pull on the string and wrap it around the nail.

The hunters took their "RV" to Big Falls. The next morning, two game wardens knocked on the door, and, after receiving no reply, entered and discovered one man unconscious and the other four dead.

One man's widow filed suit, alleging that the gas company had failed to warn the men about the dangers of carbon monoxide. The gas company's response was that it was ignorant of carbon monoxide as well, and thus was incapable of giving a warning. The jury returned a defense verdict, and plaintiff appealed, arguing that an instruction should have been submitted to the jury that the gas company was required to warn, not only about what it actually knew about carbon monoxide (which was nothing), but also what it should have known as a responsible propane seller. The Minnesota Supreme Court upheld the verdict, applying pre-Restatement (Second) 402A law by holding that the gas company had a

duty to warn only of the dangers it was actually aware of, not those that it should have known.<sup>10</sup>

A 1954 case, *Zuercher v. Northern Jobbing Co.*,<sup>11</sup> revisited the duty to warn about carbon monoxide. A warehouse owner in St. Paul had flooding in the basement of his building. The Little Canada Fire Department sold him a gasoline-powered centrifugal pump to install in the basement, and pump the water out. One of the firemen installed the pump. The company had already put in two other temporary gasoline-powered centrifugal pumps. While installing the new sump pump, the fireman became sick and nauseous, allegedly from the exhaust fumes of the two other pumps, and had to be taken outside by other workers. Once in the fresh air, he appeared to recover from the effects, and seemed no worse for wear. Unfortunately, the fireman had a history of heart ailments and, one week later, suffered a heart attack.

Suit was filed against the warehouse owner, alleging that he had a duty to warn the fireman about the dangers of carbon monoxide being emitted from the other gas-powered pumps. The warehouse owner responded that he had no knowledge regarding carbon monoxide and had no reason to be concerned because employees who worked in the area had never reported ill effects from the pumps.

On appeal, the Minnesota Supreme Court rejected the argument that the warehouse owner was only required to warn about the dangers he actually knew about. Framing the issue of a landowner's duty to a business invitee, the Court stated: "Where knowledge is necessary to careful conduct in the installation and operation of an appliance discharging carbon monoxide, voluntary ignorance is equivalent to negligence."<sup>12</sup> As a result, the Supreme Court found that the warehouse owner was charged with the knowledge that carbon monoxide was being emitted and had the duty to take affirmative steps to protect others in that building from its effects.

In a 1972 case, *Peterson v. Balach*,<sup>13</sup> an 11- and 13-year-old died from carbon monoxide poisoning at a lake cabin. The burner on an LP refrigerator had clogged, causing incomplete combustion that produced excessive amounts of carbon monoxide. The Minnesota Supreme Court ruled that a landowner had a duty of reasonable care, even to guests, to ensure that the appliances were in safe working order, and to warn of any dangers present, including carbon monoxide.<sup>14</sup>

In a recent case, *Yang v. Voyageur Houseboats, Inc.*, individuals sustained carbon monoxide poisoning while staying on a leased Rainy Lake houseboat. A carbon monoxide detector on the boat was found inoperable after the incident. The reason for the detector's malfunction was never determined, but it was suggested that plaintiff or his guests had disconnected it. There was also a dispute as to the source of the carbon monoxide. The plaintiffs maintained that it was a gasoline-powered generator. The defendant alleged that plaintiffs had tampered with the boat's cook stove.<sup>15</sup>

The trial court granted defendant summary judgment based specifically on exculpatory language in the rental agreement that relieved the defendants of any duty. The Court of Appeals affirmed. The Minnesota Supreme Court reversed, however, holding that, due to the defendant's status as an "innkeeper" and the unequal "bargaining power" of the parties, public policy barred the defendant from contractually releasing his duty to warn plaintiff regarding carbon monoxide.<sup>16</sup>

From these Minnesota cases it is apparent that the duty to warn of carbon monoxide's dangers has significantly evolved in the last 60-plus years, as its dangers have become known and as use of combustion-producing products has increased.

Other jurisdictions have also imposed a duty to warn of carbon monoxide in certain circumstances, such as a space heater manufacturer for providing inadequate instructions as to venting;<sup>17</sup>

a furnace manufacturer failing to warn that soot build up in a chimney flue could cause carbon monoxide;<sup>18</sup> a furnace manufacturer failing to warn that improper venting could cause carbon monoxide;<sup>19</sup> a wall heater manufacturer failing to warn that using the wrong-sized replacement burner could cause carbon monoxide;<sup>20</sup> and a water heater manufacturer failing to warn users of the hazards of carbon monoxide poisoning.<sup>21</sup> In unique situations, however, a court may find that a defendant did not have a duty to warn because the condition that caused the carbon monoxide poisoning was an "open and obvious" danger.<sup>22</sup>

## THE PRESENCE OF WARNINGS

Today, carbon monoxide warnings appear on various fuel-powered equipment. Admonitions regarding carbon monoxide poisoning are found in the owners' manuals and on the actual product itself, including gas generators, water heaters, furnaces, and barbecue grills.<sup>23</sup>

In addition to equipment manufacturers, gas utilities send warnings to their customers in monthly statements. The Propane Education & Research Council (PERC), an education arm of the propane industry, issued its own warning pamphlet to be distributed to propane consumers warning of the dangers of carbon monoxide and recommending the use of gas detectors.

## CARBON MONOXIDE DETECTORS

Carbon monoxide alarms provide a mechanical means for warning of carbon monoxide's presence. Many utilities recommend that consumers install carbon monoxide detectors in their homes. In 2007, PERC published a bulletin for LP users recommending the use of carbon monoxide detectors.

Underwriters Laboratories (UL) has issued standard 2034, governing the design and manufacture of carbon monoxide detectors. Likewise, the

National Fire Protection Association (NFPA) has promulgated pamphlet 720, governing the proper installation of carbon monoxide detectors. In many jurisdictions, UL and NFPA requirements are incorporated into the local building and fire codes.

## MINNESOTA STATUTE § 299F.51

In addition to the duties imposed on product manufacturers and others to warn of carbon monoxide, Minnesota recently added a new tool to its warnings arsenal. In 2006, the Minnesota Legislature passed the state's first mandatory residential carbon monoxide detector law. Authored by Sen. Pat Pariseau, the bill was in response to reports of carbon monoxide injuries and deaths nationwide.<sup>24</sup> In support of the bill, Sen. David Tomassoni relayed the tragic story of the carbon monoxide death of his son's best friend.

Since January 2007, all newly constructed single-family and multi-family dwellings issued building permits after that date must have a UL-approved and operational carbon monoxide alarm installed within 10 feet of each room used for sleeping purposes. Beginning August 2008, all existing single-family homes must comply with the statute. Existing multi-family dwellings must be in compliance by August 2009.<sup>25</sup>


In multi-family dwellings, the statute imposes specific duties on both the owner and occupant. Not only is the owner required to provide and install the carbon monoxide detectors, but he or she is also required to replace any alarm that is discovered to be damaged, stolen, or inoperable.<sup>26</sup> As a corollary, the occupant is charged with maintaining the device in good repair, and prohibited from removing the batteries, or in any way rendering the alarm inoperable.<sup>27</sup> An exception exists for those multi-family dwellings that have a centralized heating and alarm system.<sup>28</sup> Also, a multi-family dwelling that contains minimal or no sources of carbon monoxide (presumably an all-electric heated building) is exempt from the statute, provided that

the owner certifies to the commissioner of public safety that the building poses no foreseeable carbon monoxide risk to the inhabitants.<sup>29</sup>

Oddly, the statute does not contain an enforcement provision. In its initial version, both the House and Senate versions of the bill had Section 299F.52,<sup>30</sup> an enforcement provision similar to that contained in the smoke detector statute, providing the same penalty and enforcement provision as for the Uniform Fire Code.<sup>31</sup>

The "enforcement" provision, however, was removed prior to passage.<sup>32</sup> As a result, it appears that the drafters did not intend for the statute to have a penalty or enforcement provision, at least not one on the same par as the smoke detector statute or the Uniform Fire Code. It thus raises the issue of who is to enforce the law, and what are the consequences of a violation.

Its enforcement ambiguity aside, it is hoped that the carbon monoxide statute will save lives, and significantly reduce the number of carbon monoxide injuries. Yet, due to petroleum-fueled products' prevalent use in both business and recreational pursuits, there will, unfortunately, always be potentially hazardous scenarios involving carbon monoxide. As long as those

situations exist, there will always be a duty to warn. 

<sup>1</sup> "Carbon Monoxide Prevention Clinical Education," Centers for Disease Control and Prevention, [www.cdc.org](http://www.cdc.org), September 20, 2007.

<sup>2</sup> *Id.*

<sup>3</sup> *Id.*

<sup>4</sup> A Guide to Prevent Carbon Monoxide Poisoning, [www.carbon-monoxide-poisoning.com](http://www.carbon-monoxide-poisoning.com).

<sup>5</sup> "Carbon Monoxide Prevention Clinical Education," *supra*.

<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> "Use of Carbon Monoxide Alarms to Prevent Poisonings During a Power Outage—North Carolina, December 2002" *Journal of the American Medical Association*, Vol. 291 No. 14 (April 14, 2004) ("Of the 56 carbon monoxide exposure incidents reported, 30 [53.69%] occurred in rental homes.").

<sup>9</sup> 209 Minn. 248, 254, 296 N.W. 136, 139-40 (1941).

<sup>10</sup> 209 Minn. at 257, 296 N.W.2d at 141.

<sup>11</sup> 243 Minn. 166, 66 N.W.2d 892 (1954).

<sup>12</sup> 243 Minn. 172, 66 N.W.2d at 897.

<sup>13</sup> 243 Minn. at 172, 66 N.W.2d at 897.

<sup>14</sup> 294 Minn. 161, 199 N.W.2d 639 (1972).

<sup>15</sup> 701 N.W.2d 783 (Minn. 2005).

<sup>16</sup> 701 N.W.2d at 792.

<sup>17</sup> *Wallinger v. Martin Stamping & Stove Co.*, 93 Ill. App. 2d 437, 441, 236 N.E.2d 755 (1968).

<sup>18</sup> *Gajewski v. Pavelo*, 236 Conn. 27, 30, 670 A.2d 318 (1996).

<sup>19</sup> *Gines v. State Farm Fire & Cas. Co.*, 516 So.2d 1231, 1235 (La. App. 2 Cir. 1987).

<sup>20</sup> *Dover Corp. v. Perez*, 587 S.W.2d 761, 765 (Tex. Civ. App. 1979).

<sup>21</sup> *Sears Roebuck & Co. v. Harris*, 630 So.2d 1018, 1024, 1030 (Ala. 1993).

<sup>22</sup> *Hanlon v. Lane*, 98 Ohio App.3d 148, 648 N.E.2d 26

(Ohio App. 9 Dist. 1994) (danger of carbon monoxide poisoning from use of improperly vented gas furnace was open and obvious).

<sup>23</sup> *Bloom v. Hydrotherm, Inc.*, 499 N.W.2d 842, 895-6 (Minn. Ct. App. 1993) (jury found that furnace manufacturer's instructions on the product that boiler needed fresh combustion air for safe operation was adequate in carbon monoxide poisoning case).

<sup>24</sup> Minnesota Senate Committee Update, 2006 JEC (April 3, 2006).

<sup>25</sup> Minn. Stat. § 299F.51, subd. 1 (2007); Minn. Stat. § 299F.50, subd. 5 (2007).

<sup>26</sup> Minn. Stat. § 299F.51, subd. 2.

<sup>27</sup> *Id.*, subd. 3.

<sup>28</sup> *Id.*, subd. 5(a).

<sup>29</sup> *Id.*, subd. 5(b).

<sup>30</sup> "A violation of section 299F.50 or 299F.51 subjects the owner of the single family dwelling, multifamily dwelling or dwelling unit to the same penalty and enforcement mechanism provided for violations of the Uniform Fire Code provided in section 299F.011, subdivision 6." Minn. Senate Journal No. 99, (May 2).

<sup>31</sup> Minn. House Journal No. 89, 2006 Reg. Sess. (April 12); Minn. House Journal No. 90, 2006 Reg. Sess. (April 18); Minn. Senate Journal No. 99, 2006 Reg. Sess. (May 2); Minn. Senate Journal No. 102, 2006 Reg. Sess. (May 8).

<sup>32</sup> Minn. House Journal, No. 111, 2006 Reg. Sess. (May 20).



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