

THE AIR DVD: Chapter 1 - Air Quality Basics

All living things need elements of air to survive. Humans need the oxygen from air to create energy.

We inhale and oxygen enters our lungs. We exhale carbon dioxide and other components.

Air pollution threatens the health of human beings and other living things on our planet.

Often not visible to the naked eye, pollutants in the air create smog and acid rain, cause cancer, diminish the protective ozone layer, and contribute to world climate change.

The average adult breathes over 3,000 gallons of air every day. Children have less body weight than adults so they breathe more air per pound, making them more susceptible to the harmful effects of air pollution.

We can be exposed to air pollutants in many ways.

We may breathe contaminated air.

We may eat contaminated food grown in contaminated conditions.

We might drink contaminated water.

We could also touch contaminated soil, dust, and water.

Once some toxic air pollutants enter our bodies they can accumulate.

Our goal in the Nebraska Department of Environmental Quality Air Division is to maintain good air quality in Nebraska.

By developing and enforcing air quality laws and regulations we have been able to keep air pollution at low levels

The federal government began passing legislation to protect air quality in the 1950s but it wasn't until the Clean Air Act amendments of 1970 that the federal government took a large role in developing national air quality standards.

In the same year, President Nixon created the environmental protection agency. It became the EPA's job to further develop and enforce The Clean Air Act's requirements.

The Clean Air Act gave the EPA authority to establish national ambient air quality standards, or NAAQS.

Ambient air is the air humans have access to outdoors.

NAAQS are based on each pollutant's effects on our health and environment.

The pollutants covered by NAAQS are termed criteria pollutants because their standards are based on criteria specific to each of them.

There are NAAQS for particulate matter less than 10 microns in diameter, particulate matter less than 2.5 microns in diameter, sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, and lead.

The EPA also has the authority to regulate toxic or hazardous air pollutants not covered by NAAQS.

To do this they create national emission standards for specific industries. Facilities then have to test, monitor and report their emissions to prove they aren't exceeding the limits. Facilities may also have to use emission control technology to make sure they are operating within the standards.

Before Nebraska can implement and enforce EPA's laws, air quality regulations must be developed for the state.

Our authority to develop regulations comes from the Clean Air Act and the Nebraska Environmental Protection Act, or NEPA.

The state must comply with all federal laws and regulations. The state may make rules that are more stringent than federal laws and regulations but cannot make rules that are less stringent.

The Nebraska legislature may either amend the NEPA or pass laws that necessitate the issuance of regulations by the NDEQ.

In turn, NDEQ can propose regulations to improve or administer federal or state laws.

Nebraska air quality regulations are found in Title 129 of the Nebraska Administrative Code.

All regulations must be adopted by the Nebraska Environmental Quality Council, or EQC, prior to the Attorney General review and Governor's approval. The EQC is comprised of 17 members representing various industries and interests within the state. Members are appointed by the Governor, with the consent of the Legislature, for four-year terms.

Let's take a closer look at the origins and effects of some pollutants.

Particulate matter, or PM, is comprised of solid matter or liquid droplets less than 100 microns in diameter. This includes dust, smoke, fly ash and condensing fugitive vapors that are carried in the outdoor air. PM can be emitted from burning wood, road disturbances, manufacturing operations, agricultural operations, and construction activities.

The smaller the particulate matter is, the deeper it can travel into the lungs. $PM_{2.5}$ and PM_{10} are small enough that they can bypasses the body's natural defenses and get trapped in the air sacs of the lungs, causing an inflammatory response and increasing the potential for a heart attack.

Children, the elderly, and people suffering from heart or lung disease are especially at risk.

Sulfur dioxide or SO_2 , is generated through the combustion of fuels like diesel and coal. It's emitted largely from industrial, institutional, and residential furnaces and boilers. Petroleum refineries, smelters, paper mills, and chemical plants can also emit SO_2 .

Sulfur dioxide can aggravate heart and lung disease symptoms and increase the incidence of acute respiratory diseases.

As a primary component of acid rain, it can destroy paint pigments, erode statues, corrode metals, and harm textiles. In high concentrations, it's toxic to plant life

Nitrogen oxide or NO_x is emitted from burning fuels in power plants, industrial boilers, and automobiles.

It can cause increased breathing difficulty for asthmatics and harm vegetation. It's also a primary component of ozone and acid rain.

Carbon monoxide or CO is emitted from automobiles, power plants, and some industrial facilities. Heavy construction and farming equipment, open burning, and residential heating equipment can also emit CO.

In high concentration, Carbon monoxide interferes with the body's ability to carry oxygen, impairing perception, slowing reflexes and causing drowsiness.

Prolonged exposure to high levels of carbon monoxide can cause unconsciousness and even death.

If inhaled by pregnant women it can threaten the growth and mental development of their unborn children.

Ozone is a colorless gas that, in the upper atmosphere, protects us from the sun's harmful rays. In the lower atmosphere ozone is a major component of smog.

Ozone is formed in the lower atmosphere when oxygen, volatile organic compounds and nitrogen oxide react with each other in the presence of sunlight.

Vehicles, engines, power plants, landfills, industrial solvents, gas stations and diesel-fueled farm equipment all create pollution that makeup ozone.

Ozone irritates mucous membranes in the respiratory system and can cause coughing, choking and impaired lung function. It can aggravate chronic heart and respiratory diseases and reduce resistance to colds and diseases.

It also corrodes materials like rubber and paint and can injure or kill vegetation

Lead is a toxic metal that can be transported as particulate matter.

Lead is emitted by motor vehicle battery plants, transportation sources using lead in their fuels, lead refining plants, coal combustors, smelters, and incinerators.

Lead can affect almost every part of the body, especially the central nervous system. It can damage the kidneys and the reproductive system, and it may cause anemia.

Children are particularly susceptible to ingesting lead from contaminated soil, dust and paint due to their normal hand-to-mouth activities. Eating and drinking are the principle means of entry into the body, but smaller lead particles can also be inhaled.

Nebraska developed their own ambient standards for a group of gasses called total reduced sulfur or TRS. TRS is made up of hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide.

Sources of TRS include packing plants, leather tanneries, sewage treatment plants, livestock waste control facilities, composting operations, animal rendering plants, sugar beet processing plants, and natural gas extraction sites.

Exposure to TRS can cause headaches, depression, fatigue, and nausea. At higher levels of exposure, it can cause eye and respiratory irritation, olfactory nerve fatigue, and pulmonary edema.

We also regulate Hazardous Air Pollutants, or HAPs. By 2008, EPA had identified 187 HAPs. On that list are arsenic, asbestos, benzene, and mercury. HAPs are emitted by solvents, paints, motor vehicles, and industrial processes. They can also come from natural sources like volcanoes and fires.

Hazardous air pollutants have the potential to cause serious health problems like cancer and birth defects.

All of us at the DEQ want Nebraskans to enjoy our clean air. That's why we take great pride in our efforts to monitor and regulate air quality.

Our objectives sound simple but our programs are complex. Let's take a closer look at some of them.

We have monitors that measure ambient air quality throughout the state. The majority of them are in densely populated areas.

When an area has pollution levels above ambient air quality standards then that area is considered a nonattainment area.

As of 2010, all areas in Nebraska are in attainment. As new science about the health effects from air pollution becomes available, the EPA evaluates and revises the standards. Therefore, Nebraska's attainment status may change in the future.

Nonattainment areas pose risks to our health. They also could impact economic growth. Businesses may decide against expanding or may decide to move if they can't afford the controls needed to return an area to attainment status.

New businesses may decide not to locate in these areas if they are unable to afford emission controls.

Our staff ensures that Title 129, the Nebraska Air Regulations, are current and proposed to the Environmental Quality Council, or EQC, in a timely manner.

The EQC meets quarterly and we propose regulations to the council at least once per year, but usually more often. The Title 129 regulations are updated regularly to keep up with ever changing federal regulations.

The Air Division develops state implementation plans that tell the EPA how we are implementing federal regulations and maintaining air quality standards.

We also develop work plans with our regional EPA office, Region VII, that specifically relate how our day-to-day activities will help us execute and comply with federal standards.

Once we have regulations in place, we are ready to implement them. Permits are the primary tool we use. They allow for economic development while preventing the degradation of our air quality.

Before a business can construct a unit that emits regulated pollutants, it has to determine if the potential emissions from that unit will exceed the thresholds in the Nebraska air quality regulations. If they do, they'll need a construction permit.

Construction permits may place emission limitations or control requirements on emission units.

Often, the construction permit process includes air quality dispersion modeling.

Air dispersion modeling uses computer models to simulate a source's emissions, operating at maximum capacity, combined with meteorological conditions, local topography, background emissions data, and physical characteristics of the source. The model will predict whether or not the source will contribute to a violation of the ambient air quality standards.

We also issue operating permits based on a source's level of emissions. An operating permit will incorporate all of a source's requirements into one permit, including all their construction permit limitations and federal regulations.

Operating permits usually require additional monitoring, stack testing, reporting, and recordkeeping.

Other parts of our division ensure compliance with air permits and regulations by conducting inspections, providing assistance and outreach, responding to complaints, verifying stack test data, gathering actual emissions data annually, and, when necessary, carrying out enforcement actions.

NDEQ is headquartered in Lincoln and has six regional field offices located throughout the state.

Our field office staff conduct compliance inspections, complaint investigations, sampling, monitoring, and outreach activities for almost all of our regulatory programs.

Three of the field office inspectors, located in Holdrege, Norfolk, & North Platte, have assignments to conduct work for the Air Quality Division. They participate in the same training, meetings, and other compliance program activities as the Lincoln-based Air Quality inspectors.

Just like the NDEQ has taken on delegation of the EPA's air programs, three local agencies -- the Lincoln/Lancaster County Health Department, the Omaha Air Quality Control, and the Douglas County Health Department, are responsible for various facets of the air program within their jurisdictions. The Lincoln/Lancaster County and Omaha agencies implement programs by planning, permitting, and enforcing regulations, much like the NDEQ. The Douglas County Health Department conducts the ambient air monitoring for the county and the Omaha area.

The NDEQ has oversight on the local programs, just as the EPA has oversight on us. We also develop work plan agreements with the local authorities to ensure their programs are protecting the air quality in their jurisdiction.

If you'd like more information about local air programs, you can visit their websites or contact them by phone.

LANCASTER COUNTY HEALTH DEPARTMENT
402-441-8040, www.lincoln.ne.gov/city/health/environ

CITY OF OMAHA

402-444-6015, www.ci.omaha.ne.us

EPA REGION 7 OFFICE

www.epa.gov/region7/programs/artd.air

Last but certainly not least, you can contact the air division with questions, comments, or complaints.

402-417-2189

877-253-2603

If you have questions about air permits you can call our permit hotline.

877-834-0474

And don't forget about our website, it has lots of useful information including fact sheets, reports, news bulletins, applications and forms.

www.deq.state.ne.us