New York State Education Department

Guidance for Transporting Oxygen on School Buses

When transportation for a student with oxygen needs is required by the child's Individualized Education Program (IEP), the following items should be considered:

- Does the child require oxygen to be received during transport?
    - Do we have a medically qualified person to deliver such needs?
- What kind of oxygen will need to be transported with the child and what size and type of tank will be used?
    - Is this size and type of tank safe to transport on a school bus?
    - Are any additional safety precautions necessary?
- What kind of training and emergency planning will the bus staff require to transport this child with oxygen?
- What kind of specialized equipment should be on a bus that transports this child?

To answer these questions Transportation Professionals can be referred to NYSED's "*Reference Materials for Safely Transporting Oxygen on School Buses"*.

New York State Education Department

Reference Materials for Safely Transporting Oxygen on School Buses

Purpose:

To give school districts, board of cooperative education services, school bus contractors, school bus drivers, school bus monitors, and school bus attendants guidance on how to safety transport oxygen on school buses when deemed medically necessary, in accordance with a student's Individualized Education Program (IEP). This guidance will include best practices in securement, contingency planning in cases of emergencies such as collisions or vehicle breakdowns, and training guidelines.

OXYGEN MAY BE SAFELY TRANSPORTED ON A SCHOOL BUS WITH PROPER PLANNING AND SECUREMENT

Definitions:

1) **A school bus driver** shall mean any person who drives a school bus which is owned, leased or contracted for by a public school district, board of cooperative education services or nonpublic school for the purpose of transporting pupils.
2) **A school bus** shall mean every vehicle owned, leased or contracted for by a public school district, board of cooperative education services or a nonpublic school and operated for the transportation of pupils, children of pupils, teachers and other persons acting in a supervisory capacity to or from school or school activities.
3) **A school bus monitor** shall mean any person employed for the purpose of assisting children to safely embark and disembark from a school bus which is owned, leased or contracted for by a public school district, board of cooperative education services, and for the purpose of assisting the school bus driver with maintaining proper student behavior on such school bus.
4) **A school bus attendant** shall mean any person employed for the purpose of serving pupils with a disabling condition on a school bus which is owned, leased or contracted for by a public school district, board of cooperative education services.
5) **A nonpublic school** shall mean a private or parochial school offering instruction in any or all grades, pre-kindergarten through 12.
6) **Oxygen** is a non-flammable substance that is stored in liquid or gas form and is used by a student to aid in breathing, and in many cases, in treating an ongoing medical condition. It is always a prescribed medication and will be considered medical support/needed equipment for a student.
7) **Maximum Tank Size** should be no more than 38 cubic feet for compressed gas.
   a) **Gas Oxygen Tanks (GOX)** are cylinders that come in various sizes and are labeled "MEDICAL E" tanks. "MEDICAL E" tanks are not larger than 22 cubic feet capacity, are approximately 4 ½ inches in diameter, and weigh less than 12 pounds. They are usually not more than 31 inches tall.
   b) **Liquid Oxygen Units (LOX)** come in portable containers that are smaller than the gas tanks. Most such units are less than 10 pounds and are no more than 5 inches in diameter. Liquid oxygen units are not more than 13 inches tall. In order to transport these units they should not be larger than 38 cubic feet.
8) **Cryogenic Materials** pertain to the production or use of extremely low temperatures.
9) **Oxygen Delivery System (ODS)** is the device that delivers oxygen through the upper airways to the lungs at concentrations above that of ambient air. There are two general types:
   a) **High flow oxygen delivery system**, which can supply all of the needs of a patient for inspired gas at a given fractional inspired oxygen.
   b) **Low flow oxygen delivery system**, which cannot supply all of the patient's needs for oxygen and delivers fractional inspired oxygen that varies with ventilatory demand.

Note: *If a child's IEP dictates a larger tank is needed, the district is not relieved of its responsibility to transport the student. Arrangements should be made to transport the student in an alternative vehicle.*

Guidelines:

1) Oxygen may be transported on school buses only when it is medically necessary. The Individualized Education Program (IEP) for a student should document the oxygen use and transportation requirement.
2) Prior to initial transportation, and pursuant to a physician's order, school administration and transportation personnel should be informed as to the type and size of the oxygen tank that will be transported.
3) If Liquid Oxygen (LOX) is being transported, the vehicle should be equipped with a blanket and gloves to deal with potential frostbite incidents.
4) Prior to initial transportation, school administration and transportation personnel should contact the manufacturer of the oxygen tank for product specific information regarding transporting the tank on a school bus.
5) When it is determined through the Individualized Education Program (IEP) that a student shall be transported on a school bus accompanied by an oxygen tank and any other medical support equipment, it is strongly suggested that a school bus attendant or nurse also be assigned.
6) The determination as to what is considered to be "medically necessary" and "as needed" is the responsibility of trained medical personnel only. This decision is not the responsibility of the school district, the school bus driver, or the school bus attendant.
7) It is suggested that only one (1) tank per individual be transported on the school bus whenever possible or in cases of emergencies.
8) The school bus driver and the school bus attendant should be properly trained in the safe handling and securement of the oxygen tank. They should also be thoroughly familiar with the contingency plan established in the event of a collision or breakdown of the vehicle. However, under no circumstances should the school bus driver or the school bus attendant attempt to administer oxygen to a student.

Training

School bus drivers, bus attendants, and substitute drivers should receive the following training prior to transporting students traveling with oxygen:

- Tank Inspection, Handling, and Securement Procedures.
- Emergency Evacuation Procedures.
- How to secure the oxygen and how to handle the oxygen in case of a bus evacuation.
- Emergency Bus Procedures
    - Bus drivers, bus attendants, and substitutes should be familiar with the emergency plan developed by the school nurse in conjunction with the transportation office for each oxygen dependent student.
- Evacuation Procedures
    - It is essential to have a written emergency evacuation plan, which takes into consideration the individual needs of students who use oxygen equipment or other special equipment. Evacuation procedures should be well known and rehearsed by teachers, school staff, school bus drivers and attendants. The daily seating plan on the bus should always consider evacuation procedures**.** Oxygen dependent students should practice evacuation procedures to the same extent as their non-disabled peers. The manufacturer's guidelines should be followed for the use and evacuation of oxygen on the school bus. A description of the tank should be included in the emergency plan.
- Education of Other Students on the Bus
    - Consideration should be given to educating the other students on the bus where oxygen is being transported. The education should include the necessary precautions that should be used when traveling with oxygen on board

Safe transport of oxygen

The following information should be provided to the school bus driver and attendant before the student starts riding the bus:

- Whether the oxygen is continuous or on an as needed basis (included in emergency plan for emergency medical system-EMS).
- What constitutes an emergency for this student
- Appropriate emergency phone numbers to be called (usually 911).
- Basic safety procedures to follow until emergency personnel arrive.

The school bus should be equipped with two-way communications and a sign (or magnetic sticker) conspicuously posted on or near each door that states:

NO SMOKING
NO OPEN FLAMES
CAUTION - OXYGEN ON BOARD

- Seats should be assigned considering the student's proximity to heaters and other types of motors.
- The school bus attendant should be able to continuously observe the student.
- All storage, transportation and usage requirements specified by equipment manufacturers should be met.

Oxygen cylinders/containers should be secured as follows:

- All respiratory related equipment should be securely mounted or fastened to a wheel chair (with a permanently mounted bracket), bus sidewall, or bus floor during transit.
- Oxygen transport bags or pouches should not be used on school buses.
- Oxygen cylinders should be secured to prevent movement. Specific procedures should be developed by each school district with assistance from the oxygen supplier and manufacturer.
- Liquid oxygen containers should be secured in an upright position to prevent leakage.
- Liquid oxygen containers should be secured to prevent contact with cryogenic material.
- Liquid oxygen containers should be stored in a well-ventilated area; and
- All oxygen containers should be secured in a location that would allow all passengers free access to or egress from emergency exits.

Guidelines for safe handling of Oxygen Delivery Systems

These practices will help minimize the risk of fire and chemical or mechanical explosion, and will help protect the students, driver, bus attendant, and bystanders from serious injury or death.

- Only persons familiar with oxygen safety should handle the Oxygen Delivery System (ODS).
- Read the labels. They are the only sure indicator of contents. Only supplies labeled "Oxygen, U.S.P" should be transported.
- Do not transport unmarked cylinders or containers.
- Transport only labeled devices. Devices not labeled for oxygen could be contaminated or otherwise incompatible with oxygen.
- Protect containers, cylinders, and devices from impact and excessive heat. Both can cause explosions or the release of gas.
- Keep container or cylinder upright at all times. Tipped containers present a risk of frostbite and rapid oxygen release. Tipped cylinders present a risk of fire during use.
- Do not drop cylinders or allow them to fall over. Such actions present a risk of fires during transport and explosive release of gas.
- Have clean hands when working with oxygen devices.
- Do not apply oil or lubricants to any oxygen device.
- Do not allow the system to become part of an electrical circuit. Electric current flow through an ODS could cause fire or explosion.
- Do not use flammable aerosol sprays near an ODS or students. They can cause an explosive combustion; and
- Do not allow use of open flames, sparks, or heat sources within 5 ft (1.5 m) of an ODS or students.

Pre-Trip Inspection considerations for drivers

- Check to make sure all ODS securement systems are available and working properly.
- Check to make sure vehicle has signage stating “Oxygen on Board”.
- Check two-way communication system.
- Check to make sure ODS securement location is not within 5 feet of heaters, lift motors, or other electrical devices. ODS securement location should not be near emergency exits, and should not block aisles.

Loading procedures

- Inspect tank for cracks, leaks, and dents.
- Load student onto bus.
- Secure tank.
    - Make sure tank is upright and tightly secured.
- Recheck student securement and make any necessary adjustments.

During transport

- Bus Attendant should check securement of student and tank periodically during the ride.
- Driving defensively is expected of all school bus drivers, and is especially critical when transporting students with severe medical conditions.

Oxygen accidents during transport can be caused by exposure to heat sources, impacts, or movement. Traffic accidents involving vehicles with oxygen supplies can lead to fires. The following guidelines are designed to minimize the occurrence of such incidents:

- Do not allow smoking, open flames, or sparks in vehicles with an ODS.
- Ensure that the vehicle is well ventilated.
- Locate the ODS and student away from exits and heat sources.
- Secure the container or cylinder in an upright position so it cannot be knocked over or bumped; and
- Ensure that delivery tubing is free of kinks, pinch points, or easily snagged loops.

Unloading procedures

- When arriving at school, children should be unloaded first to avoid extended periods of time on the bus.
- Once student is safely unloaded remove tank.
- Excess or empty oxygen tanks should never be stored on the school bus.

Accident types and preventative measures

Accidents with oxygen use are rare but do occur and can cause significant injury and damage. Strictly following the above guidelines will minimize the risks associated with the transportation of oxygen and the ODS. Fires are often the result of not following safety practices. Reported incidents can be categorized by frequency as fires, cryogenic incidents, pressure incidents, and miscellaneous incidents.

Fires: Fires involving ODS occur in only a few ways; adiabatic compression ignition, particle impact ignition, and external ignition. Cylinders are subject to all of these, while containers, because of their low pressure, are mostly subject to the last.

Adiabatic compression ignition – is the result of high-pressure gas rapidly expanding and recompressing into a space, such as the high-pressure side of a regulator. This recompression can raise the gas temperature to a high temperature that can cause some materials to auto-ignite. Should combustible materials be present or introduced into the space, they can burn. This small fire can provide enough heat to cause other nearby materials to burn, including gaskets, aluminum, brasses, and steels. The resulting fire is explosive, and

usually self-extinguishes because the pressure is rapidly released through a breach in the device. However, this jet of fire can ignite nearby combustible materials and cause severe injury to bystanders. **Prevention Tip:** Preventing this type of fire requires that the ODS be kept clean and free of combustible materials such as oil, grease, metal filings, lubricant tapes, and gasket fragments, and slowly allowing pressurized oxygen into a device.

Particle impact ignition – is the result of a small fragment of material hitting another object at high speed under high-pressure oxygen. The energy of the impact causes the ignition of the particle, the target material, or both, which in turn cause a fire like the one described above. **Prevention Tip:** Preventing this type of fire involves keeping particles out of the high pressure gas stream. Good maintenance by the student's caregiver and the oxygen supplier will help in preventing this type of ignition.

External Ignition Sources: Regardless of the source of oxygen, cylinder or container, many fires occur because some heat source got into the oxygen-enriched atmosphere surrounding the oxygen outlet. If the student, school bus driver, bus attendant, or bystander is unaware of the fire risk associated with the use of oxygen, he or she may unknowingly do something that would result in a catastrophic fire. Oxygen risks are outside of most people's experience. For example, many people smoke without immediate problem, but smoking with oxygen in use can set delivery devices and clothing on fire. While grinding sparks from metalwork ordinarily does not cause fires, sparks hitting an oxygen student's clothing can cause them to burn. Even if the ODS has been removed from the student, his clothing will be oxygen-saturated and very easy to ignite for up to an hour afterwards. Similarly, oxygen use in a confined space or a poorly ventilated area can enrich the exposed materials and cause them to be easily ignited. **Prevention Tip:** Keeping oxygen in a well-ventilated area and away from heat sources can minimize the risk of these incidents.

Cryogenic Incidents: These incidents occur when liquid oxygen or cryogenic gas leak from a container. The leaks lead to risks of frozen connections, frostbite, and percussive ignition in addition to the fire risk of an oxygen-enriched atmosphere. In addition, skin can freeze to cold surfaces and splashes of cryogenic fluids can freeze eyes. As with oxygen risks, cryogenic risks are outside of most people's experience.

Frozen connections occur when moisture condenses from the air onto or into the ODS. For example, when the portable unit is being filled from the base station at home, the connection joining the two devices can become frozen in ice and inseparable until the ice thaws. Dirty connectors, ice in the system, or a piping or seal leak can cause this problem. Ice inside the system can prevent valves from working. **Prevention Tip:** Good filling practices by the supplier minimize this risk.

Frostbite is a risk from any exposed parts of the ODS whenever the device emits cryogenic fluids (i.e., when a relief valve opens or when the unit is tipped). If a container is exposed to high temperatures, loses its insulation, or simply sits unused, its relief valve will open and vent very cold gas to reduce the pressure inside the container. Normally this venting is inside the container's housing, and the student and bystanders are not exposed to the cold. If the device is near the student or under his clothing or a covering, the student may become frostbitten. Most containers, if tipped, will have LOX enter the delivery tubing and jet onto the student, causing frostbite if the delivery tubing is not quickly removed from the student and the unit set upright. **Prevention Tip:** Following the ODS instructions and keeping containers upright can minimize the risk of frostbite.

Pressure Incidents: These incidents occur when the pressure contained in an ODS is rapidly released, often propelling some object with great speed and force. Most pressure incidents are caused by problems with the device such as wear, abuse, and improper assembly. For example, if a worn gasket is used to seal a regulator to a cylinder, and the cylinder valve is opened, the pressure might blow the gasket out of the assembly. The gasket might then hit the bus driver or attendant. When pressurized, a poorly assembled regulator can blow apart and injure the bus driver or attendant. Worn or damaged hoses can blow open. Upon impact, a valve stem can eject from a cylinder causing the cylinder to shoot across the room. **Prevention Tip:** Proper maintenance and handling of the ODS can minimize these risks. Drivers and attendants should inspect the tank prior to transporting it. Inspect the tank for cracks, leaks, and dents. Do not transport damaged or unmarked tanks.

Miscellaneous Incidents: These incidents do not clearly fall into the previous categories. For example, some fires occur in high-pressure oxygen systems and do not cause a large fire or explosion. However, the combustion gases mix with the oxygen and cause it to smell. Foul or acrid-smelling gas is contaminated and should not be used. Another possibility is that the delivery device becomes disconnected from the student or the supply due to poor assembly, movement of the student or supply, or something pulling the delivery device. Or, the ODS does not function as expected because of breakage, clogging, loss of insulation, or dead batteries. **Prevention Tip:** Knowledge of the ODS and its assembly, and awareness of the student and his surroundings can minimize these risks.

Guidelines for dealing with accidents

As discussed above, oxygen accidents, while rare, happen very quickly, and can cause severe injury or death. Quick reaction by the school bus driver or bus attendant can minimize an adverse outcome.

Fires

- Rescue student and all others directly involved. Remove them from the vicinity of the ODS and fire.
- Evacuate other students and personnel from the fire area per fire emergency protocol.
- Notify Dispatcher or call 911.

Cryogenic Incidents

- Remove student or involved personnel from area of the leak.
- Warm the affected body parts (e.g., warm water, blankets).
- Use gloves and clothing to prevent frostbite of exposed skin.
- Do not enter or walk in any vapor cloud near the leak.
- Notify Dispatcher or call 911.

Oxygen Leaks

Depending of the type of oxygen leak, different responses are needed.

Poor gasket seals usually cause Regulator/Cylinder leaks.

- Notify Dispatcher or call 911.

LOX container can leak from the delivery port, relief valve, connector, or loose fittings.

- Remove student or involved personnel from area of the leak.
- Warm the affected body parts (e.g., warm water, blankets).
- Use gloves to prevent frostbite.
- Do not enter or walk in any vapor cloud near the leak.
- Notify Dispatcher or call 911.

Cylinder can leak from the relief valve or the valve stem.

- Remove students from bus and away from cylinder.
- Notify Dispatcher or call 911.

TRANSPORTING OXYGEN ON SCHOOL BUSES

Administrative Tracking Form

Student Information

Name: _____ Age: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____

Emergency Contact Information

Name: _____ Phone: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Relation to Student: _____

Bus Route Information

Route Number: _____ Bus Number: _____

Driver Name: _____

Bus Attendant Required: YES NO Nurse Required: YES NO

Bus Attendant Name: _____

Nurse Name: _____ Phone: _____

Nearest Hospital on Route

Name: _____ Phone: _____

Address: _____

_____

Type of Oxygen Transported

- Gas Oxygen Tank
  - Size of Tank: _____
- Liquid Oxygen Tank
  - Size of Tank: _____
- Transported ONLY
- Administer During Transport
- Other Specialized Equipment or Mobility Devices: _____

_____

Record of Training

Transporting Oxygen on School Buses

Date: _____ Time: _____

Location of Training Facility: _____

City: _____ State: _____ Zip Code: _____

Name of Trainee: _____

Signature of Trainee: _____

The above named individual has completed the following areas of training pertaining to the safe transportation of oxygen on school buses:

- Tank Inspection, Handling, and Securement Procedures
- Pre-Trip and Post-Trip Inspection Procedures
- Proper Loading & Unloading Procedures
- Oxygen Tank Accident Types & Preventative Measures
- Emergency Evacuation Procedures
  - Development of an Emergency Evacuation Plan
  - How to handle the oxygen in case of a bus evacuation
- Emergency Bus Procedures
  - In cases of vehicle accidents or breakdowns

_____ _____

Instructor's Name Instructor's Signature