Nitrous Oxide Equipment
Nitrous Oxide Delivery Systems

• 2 common styles
  – Mobile systems
  – Central systems
Mobile Systems

• Less expensive to purchase
• No installation costs
• Good for infrequent use
• Expensive to operate (gas cost are much higher for small tanks)
Central System

• “Central” tank room uses larger tanks
• Multiple rooms plumbed
• May move flow meters around, or have one in each operatory
Advantages of Central System

- More than one person can use at the same time
- Large tanks keep cost of gas down
- Set up cost is more
- Better if you use frequently
Equipment – In General

- Cylinders
- Regulators
- Flow meters
- Rubber (?) goods
Cylinders

• Materials and design
• Handling safety
• Different sizes
• Capacities
Cylinders

- Made of 3/8 inch chrome-moly steel
  - Others
    - Aluminum
    - Lightweight fiberglass-wrapped cylinders
- Tested every 5 years
- Built to handle 1.66 x usual pressure
- Color coded
Cylinder Colors - USA

• Oxygen tanks are **GREEN**

• Nitrous Oxide tanks are **BLUE**

• **ALWAYS**
Cylinder Safety

• *Never use grease, oil, or lubricant of any type to lubricate valve, gages, regulators, or fittings that come in contact with the gases*

• Could result in a violent chemical reaction such as fire or explosion
What Happens ...

Compressed gas + oxidizing properties of the gases + increased temperature in the reducing valve = BOOM!
Cylinder Safety

- Always store full cylinders upright
- Avoid temperature extremes
- Handle carefully they are heavy!
- Always open valves slowly
- Always close valves when not in use
- Always “crack”valves before attaching to sedation machine
Nitrous Oxide

- In a full tank, nitrous oxide exists as both liquid and gas
- One ounce of liquid will expand to 3.88 gallons of gas
- The pressure gauge will continue to read ~750 psi until most of the nitrous oxide is gone
Getting Fooled

• Because the nitrous oxide liquid is vaporized as the gas is used, this reading is not proportional to the amount of gas available in the cylinder

• The gauge will show a pressure decrease when the tank contains approximately 20% nitrous oxide
Nitrous Oxide - Liquid & Gas

100% Full

50%

20%
Oxygen

- Found as a gas in the cylinder
- When full, the pressure is 2000psi
- The pressure gauge will accurately reflect the quantity of gas available in the cylinder for use
- Failsafe devices are dependent upon oxygen flow
Oxygen - Gas
Compare
Types of Cylinders

• Common sizes used in dentistry
  – E
  – G
  – H
Types of Cylinders - E

- Small and portable
- 4.25 inches in diameter
- 29.5 inches tall
- Weigh 21 pounds empty
Types of Cylinders – G & H

- G and H are larger
  - 8.5 and 9.0 inches in diameter
  - 55 inches tall
- Weigh 130 pounds empty
Pictured Schematically…
Function – E Cylinders

- Used for mobile systems
- Hold 625 liters of oxygen @2000psi
- Hold 1590 liters of nitrous oxide @750 psi
Function - G Cylinders

- Used for **nitrous oxide** in central systems
- Hold 13839 liters of **nitrous oxide** @ 750 psi
Function - H Cylinders

• Used for oxygen storage in central systems
• Hold 6909 liters @2000 psi
Trivia

You will use approximately 2.5 tanks of oxygen per tank of nitrous oxide used.
Cost Comparison for Different Size Cylinders

**Oxygen**
- E cylinder: 2.16 cents/liter
- H cylinder: 0.35 cents/liter

**Nitrous Oxide**
- E cylinder: 1.89 cents/liter
- G cylinder: 0.52 cents/liter
Regulators

• AKA Reducing valve
• Decreases gas pressure from the cylinder pressure to a constant pressure in the rest of the system, usually 50 psi
Regulators – Central Equipment

• Commonly found on the cylinder
Regulator – Portable Equipment

- Located between the cylinders of gas and flowmeters on the yoke
A Bit Complicated View
Yoke

- “Metal framework adjoining the stand to which the cylinders attach”
- Only used in portable systems
- Holds E cylinders in place, and directs gas into a common regulator
- Has a pin index system to prevent putting the wrong tank on the side
- The diameter of the connectors differs for each gas so they cannot be cross connected
Yoke
Pin System – Pin Index Safety System

- Metal pins specifically arranged
- Protrude for the yoke
- Perfect match to holes in cylinder
Manifold

- Used in central systems
- Connects multiple tanks together
- May be manual or automatic
- May have a low pressure alarm
Alarms

- Wall Mounted
- Desk Mounted
Flow Meters

- Permit operators to administer a precise volume of either gas to the patient
- Each one is calibrated to the specific gas that flows through them
- They measure the actual amount of gas flowing, no flow, no reading
- The flow meters are about +/- 2% accurate
Flow Meters
Flow Meters
Flow Meters
Per Cent Gas Delivered

Either in terms of Nitrous Oxide or Oxygen
Calculate Nitrous Oxide Mix

• Divide the nitrous oxide flow in liters per minute by the sum of both the
  – Oxygen flow in liters per minute
  – Nitrous Oxide flow in liters per minute
  – \( \frac{N_2O}{(O_2 + N_2O)} = \% \text{ oxygen} \)
Flow Meters - “In the Mix”

• Automatic
  – Initial flow in liters per minute
  – “Dial” your percent
Bag “T” Assembly

- Looks just like its name suggests
- Where the **reservoir bag**, the **flow meter**, and the **conducting tube** attach
Emergency Air Intake Valve

- Allows room air into the system if all gas flow suddenly ceases
- Is attached to the “T” piece
‘Rubber’ Goods

- Reservoir bag
- Conducting tubes
- Nasal hood
- Scavenger system
Reservoir Bag – think 3

1) Serves as reservoir from which additional gas may be taken should the patients demands momentarily exceed the flow being delivered

2) Serves as a monitor of depth of respiration

3) Positive pressure ventilation
Nasal Hood

• Many sizes and styles
• Some disposable
• Some scented
Nasal Hood
Conducting Tubing

- Connects the nasal hood to the bag “T”
- Corrugated so that it won’t kink or crimp
Scavenger System

- Removes waste gases from the operatory
- Many different styles
- All use suction, and should vent outdoors
- Usually requires about 40-45 lpm suction
Scavenger System
Scavenger System
Scavenger System
Scavenger System
Scavenger System
Scavenger System
Safety Features

All Safety Features Are Designed to Prevent the Inadvertent Administration of a Hypoxic Mixture of Gases
Automatic Shut Off

Machine shuts down if oxygen supply runs out
Pin Index System

- Used on E cylinders
- Prevents inadvertent connection of wrong gas to machine
Gas Specific Sized Attachments

- Prevents connecting lines to the wrong fixtures
Flow Restrictions

MINIMUM
• Prevents you from completely cutting off oxygen supply

MAXIMUM
• Prevents you from delivering a hypoxic concentration of nitrous oxide
Color Coding

- For all tubing, and controls, attachments etc..
- Helps you to know which gas you are dealing with