Overview: Comparison of Oxygen Plant Delivery Methods

Date: 12 September 2025

This document was developed by Build Health International for the Global Fund's Project BOXER.

This document compares the two oxygen delivery methods options for medical oxygen plants: compressed oxygen cylinders or medical gas piping systems (MGPS).

Characteristics	Oxygen Cylinders	Medical Gas Piping Systems (MGPS)
Use	Individual cylinders (restrained for safety) at patient bedside **or** wall-mounted oxygen outlets supplied by cylinder manifolds. *See Figures 1 and 2.*	Wall-mounted oxygen outlets supplied by a medical gas pipeline directly from the oxygen plant to the patient bedside. *See Figure 3.*
Maintenance Complexity	**High** - High pressure booster compressors require frequent, specialized maintenance. Maintenance may be needed every 2000 hours of operation. Operator training to perform maintenance is required.	**Low** - Requires limited ongoing maintenance. Includes checking for leaks and infrequent outlet maintenance.
Construction Complexity	**Low** - High pressure booster compressors and filling manifolds may ship assembled in containers or require light installation support	**High** - Requires specialized construction techniques and materials
Initial Costs	**High** - High pressure booster compressor(s), cylinder inventory, cylinder hand carts, regulators, valves	**High** - Copper piping (often hundreds of meters), outlets, bed head units, valves, regulators, alarms, trenching, installation labor
Recurring Costs	**High** - High pressure booster compressor maintenance as well as cylinder inspections, cylinder, valve, and regulator replacement	**Low** - Inspection and repair of leaks. Inexpensive periodic maintenance for outlets, such as replacing o-rings.
Flexibility	**Yes** - Cylinders can be easily moved and used at other facilities. The booster can be turned on only when cylinder filling is needed.	**No** - Modifying pipelines is difficult and costly. Operationally, the plant is either on or off, with no flexibility to respond to demand. The plant can be turned off and MGPS can be supplied by a back-up manifold, if needed.
Staffing Requirements	**High** - Changing oxygen cylinders at the filling manifold, transporting cylinders to bedsides, transporting cylinders to other health facilities	**Low** - No staff required to manage oxygen delivery via MGPS; staff only needed to monitor the oxygen plant
Other Considerations	• Cylinders require a secure, safe storage space with cylinder racking and designated areas for empty and full cylinders. *See Figure 4.* • Cylinders require an inventory management and tracking system • Cylinder require adequate pathways (including ramps) from the plant to each manifold or ward to safely transport the cylinders	• MGPS runs above or below ground. Buried piping networks are more secure, but typically more costly to install and more difficult to repair or modify. *See Figure 5.* • Especially long piping networks must be designed to limit excessive pressure drops within the system

Figure 1a: Individual cylinders at patient bedside (restrained for safety)

Figure 1b: Individual cylinder at patient bedside (restrained for safety)

Figure 2a: Cylinder supply manifold and storage restrained with chains

Figure 2b: Cylinder supply manifold restrained with chains

Figure 3a: Wall-mounted oxygen outlet (supplied by cylinder manifold or MGPS direct from the oxygen plant)

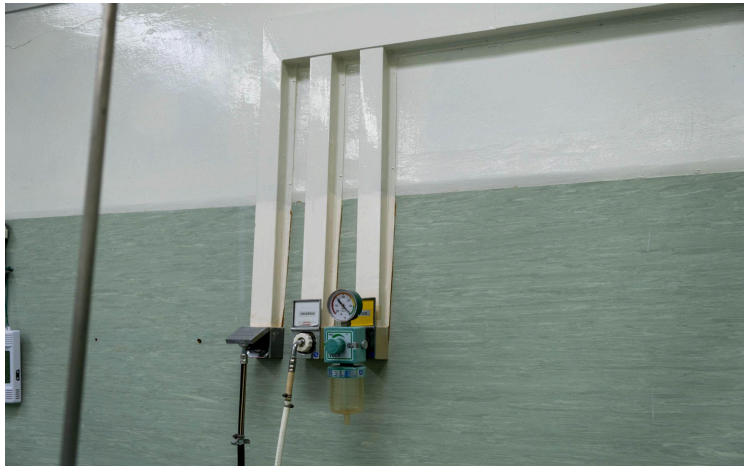

Figure 3b: Wall-mounted oxygen outlet (supplied by cylinder manifold or MGPS direct from the oxygen plant)

Figure 4a: Cylinder storage area, restrained with a chain (racking is preferred)

Figure 4b: Example of cylinder racking, the safest method of cylinder storage

*Figure 5a: MGPS running above ground**

Figure 5b: Digging trenching for underground MGPS

** Copper is corrosion resistant and does require extra protection from environmental degradation. Piping may be painted for aesthetic reasons or to mark the type of gas carried by the pipe. Conduit or trunking is typically added in areas where protection from physical damage is needed (for example, where a cart or vehicle may contact the pipe).*