



# Workplaces design & media supply for ad hoc treatment facilities

Recommendations for setting up emergency workplaces for ventilated patients.



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The current Covid-19 pandemic creates urgent demand for additional intensive care and ventilation facilities. Besides obvious requirements like ventilators and patient beds, the necessary medical infrastructure needs consideration as well. In this paper we would like to discuss different aspects of medical gas supply for short-term capacity enhancements for the treatment of Covid-19 patients.

**MEDICAL BACKGROUND**

The range of medical treatment requirements for patients suffering Covid-19 is broad and ranges from no or mild symptoms up to critically ill and fatal. In this paper we focus on areas for critically ill Covid-19 patients who require hospitalization.

Roughly three major treatment options should be differentiated when discussing medical gas requirements. From the lowest to the highest intensity these are:

1. Low flow oxygen therapy (e.g. oxygen nasal cannula)
2. High flow oxygen therapy
3. Mechanical ventilation (incl. NIV)

Table 1 gives an overview of technical details resulting from the different therapies.

Therapy	Gases required	Peak Flow / Minute Volume in l/min per patient	% of O <sub>2</sub> in gas supplied	Avr. daily demand
O <sub>2</sub> low flow	O <sub>2</sub>	Ø 6-10, max. ~15	100%	O <sub>2</sub> : ~14m <sup>3</sup>
O <sub>2</sub> high flow	O <sub>2</sub> and Air	Ø 40-60, max. ~85	0-100% Ø ~50%	O <sub>2</sub> : >40m <sup>3</sup> Air: >40m <sup>3</sup>
Mechanical Ventilation	O <sub>2</sub> and Air	Ø 10-12, max. ~20	0-100% Ø ~60-80%	O <sub>2</sub> : ~8m <sup>3</sup> Air: ~10m <sup>3</sup>

Table 1

## STANDARD ICU SETUP

In a normal ICU setting, all bed places are equipped with oxygen, medical air and vacuum, typically with a minimum of two outlets per gas type. Of course, this is also the preferred setup for the treatment of Covid-19. However, to quickly expand capacities, a focus on the provision of oxygen and medical air is advisable, as these two are mandatory for the required ventilation therapy.

If the ventilator used possesses an integrated compressor and thus provides its own medical air, all focus can be put on oxygen, medical air is less crucial. However, it is still advisable to have medical air available in case other types of ventilators are deployed. Furthermore, medical air can be used for driving ejectors for the provision of suction (vacuum) and for applying high-flow oxygen therapy for less critical patients to free up ventilation resources.



## 1. WHAT DO YOU HAVE TO CONSIDER?

The following information is intended to be a guideline for emergency situations where buildings are transformed to intensive care units such as hotels or school buildings.

With the novel coronavirus (SARS-CoV-2) many patients need to be supported by a ventilation device. As soon patients need to be treated by ventilators a gas supply has to be ensured. For each bed place you should also consider enough electrical connections.

A recommendation for media supply (per bed place):

Minimal media supply

Gas outlets:

- 1x O<sub>2</sub> – for ventilator
- 2x Air – for ventilator and pneumatic driven suction device

Electric sockets:

- 3x Electricity – 1x Ventilator, 1x Infusions, 1x Monitor or suction device.

Beside the media we recommend to have a rail or equal to mount small accessories such as examination lamps.

If possible the patient should have a bed light for reading and/ or examination.

**Daily news report constantly about a high demand for respirators to ventilate Corona-patients. Ventilators need a gas supply (Oxygen and compress air). So it is very important to consider the gas supply for the workplace as well!**



## 2. HOW TO ENSURE FLEXIBILITY AND FAST INSTALLATION?

Usually such media supply is guaranteed by wall outlets, ceiling supply units or bed head units.

In crisis situations where other buildings are used as intensive care units this type of supply is not possible as installation time would be too long.

### 2.1 MOBILE SOLUTIONS

We recommend to use mobile supply units at mobile stands. These units are installed and connected very fast. Our experience shows that it can be done a few minutes. Another advantage of mobile units is the flexibility.



Image 1: Emergency station built at corridor/ waiting area of central emergency room (Germany)

In this example a moveable bed head unit is used to be flexible. Additionally the integrated light can be used for the patient.

The media supply unit is connected to cylinders. Another way would be to connect these units to a central gas supply which is built next to the emergency station. The connection to a central gas supply is preferable due to high gas demand of artificially ventilated patients.

### 2.2 FLEXIBILITY

The shown example is the view onto a single bed place. To build a multi-bed area the single beds are separated by screens.



Image 2: Emergency station built at corridor/ waiting area of central emergency room (Germany)

Additionally the integrated light can be used for the patient. The single beds are separated by screens.

The media supply unit is connected to cylinders. Another way would be to connect these units to a central gas supply which is built next to the emergency station.

### 2.3 HOW TO SAVE SPACE?

The shown example represents the use of one supply unit for one bed. A separate unit for each bed offers advantages when it comes to lighting options. The clearly assigned workplaces can reduce cross infections.

There are other possibilities. The use of one supply unit for two bed places is also a suitable solution. The advantage is saving space at the emergency station and also the reducing the number

of media connections between supply unit and central gas supply, which reduces installation efforts for the medical gas supply.

This example shows how a mobile media column can be used. This is connected to a central gas supply and placed between to beds. The devices of both beds can be connected to this unit. A screen should be used to separate two patents to avoid cross-infections and keep privacy.



Image 3: Rendering of multi-bed solution with mobile supply column

## 3. SUMMING IT UP

Flexibility and fast installation secured by:

- Use of flexible supply units
- Supply unit shall have a fast connection interface
- Min. media supply per bed place

Gas outlets: 1x Oxygen, 2x Air

Electrical sockets: 3x sockets, (1x) potential equalization

- Accessory rail for equipment
- If possible: reading/ examination light for patient

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