

Presentation

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Time 09:00 EDT

“Wildfire Smoke Particles and UVC Air Cleansing”

Development

By

The Canadian Association for the Club of Rome

“Our mission is to actively engage the public and decision-makers on key global and Canadian issues by encouraging you to share information; to inform and motivate citizens and decision-makers to take action to limit, stabilize and reverse demands on the global and local ecosystems.”

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OLD WAY

NEW WAY

Air Filter Design Requirements

1. The filter shall look like an end table suitable for any room in the home
2. The top surface of the “table” shall be removable but suitable for plants, light, and other items normally located on end tables.
 - The operation of the filter shall not be restricted if the top is either in its normal position or removed for greater airflow capacity
3. The filter must be mobile such that it can be moved from room to room. For example, in the sitting room during the day and in the bedroom at night. Pushing it around on its wheels shall not impact the structural stiffness.
4. The filter box shall be made from six MERV 13, nominal size 20x25x1 furnace filters
 - For capturing lint, dust mites, mold spores, pollen, pet dander, fine dust, smoke, viruses, and bacteria
5. The filter box shall include a high-powered Ultraviolet band C (UVC) LED light for dismantling molds, viruses, bacteria, and other RNA/DNA molecules
6. There shall be a portable PM2.5, PM1.0, and PM10 Air Quality Particle Detector to measure performance at removal of PM2.5 particles of smoke
7. There shall be a removable fan to move the contaminated air at low, medium, and high rates
8. The high-pressure air must be reasonably sealed within the main filter box

[Air quality guideline - Wikipedia](#)

The guidelines stipulate that [PM_{2.5}](#) should not exceed 5 $\mu\text{g}/\text{m}^3$ annual mean, or 15 $\mu\text{g}/\text{m}^3$ 24-hour mean; and that [PM₁₀](#) should not exceed 15 $\mu\text{g}/\text{m}^3$ annual mean, or 45 $\mu\text{g}/\text{m}^3$ 24-hour mean.^[2]

[Choosing a portable air purifier - Canada.ca](#)

These guidelines can be used to work up detailed operating procedures using the Air Quality Particle Detector described below.

What use is UVC Light

- UVC is a type of ultraviolet light that has a wavelength of 200 to 280 nanometers. It is also known as germicidal UV because it can kill or inactivate microorganisms like bacteria and viruses by damaging their DNA or RNA. UVC light can be used to disinfect surfaces, air, and water by exposing them to a certain dose of radiation for a certain amount of time.
- UVC light works by breaking the bonds between the nucleotides that make up the genetic material of the microorganisms. This causes mutations, errors, or gaps in their DNA or RNA, which prevent them from replicating or performing vital functions. As a result, the microorganisms are neutralized and cannot cause infection or disease.
- UVC light technology is used in various settings and applications, such as hospitals, schools, businesses, and aircrafts. It can be applied through lamps, devices, or systems that emit UVC light over a specific area or volume. [For example, Honeywell Aerospace has developed a UV Treatment System that can disinfect an aircraft cabin by using UVC lamps mounted on wings and carts¹. UV Angel has created a UV-C Surface Treatment system that can automatically sanitize keyboards, workstations, and other frequently touched surfaces².](#)
- UVC light technology is proven to be effective against many types of pathogens, including the coronavirus that causes COVID-19. However, it is also harmful to human skin and eyes, so it should be used with caution and proper protection. [UVC light should not be confused with other types of UV light, such as UVA and UVB, which have longer wavelengths and different effects on living organisms³.](#)
- Learn more:
- [1. aerospace.honeywell.com](https://aerospace.honeywell.com)[2. uvangel.com](https://uvangel.com)[3. healthline.com](https://www.healthline.com)

Filter Base

Notes:

- Four wheels
- Material is red cedar
- Fan Guides and support
- Open to the floor for airflow



Fan is 20"
x 20"
nominal

Notes:

- Three-speed control knob
- 120 VAC
- Airflow is from the bottom to the top



Air seal

- Recycled foam to take the loads and seal the fan to the rest of the structure
- Not visible when fully assembled
- Numbering on parts to maintain proper orientation



Mid Frame

Notes:

- Not assembled on the base.
- Screws for final leveling of the top



Frame and Base Integration

Notes:

- 4 screws to secure the two parts



Filter Box

Notes:

- Six sides held together with 1" duct tape
- Top filter is removed for viewing
- Box is 20" x 20" x 25"



Filter Integration

Notes:

- Snug but with clearances for filter box replacement



The business end
of the 12 UVC
LED lamps

Included link to
describe how
UVC
decontamination
works

[Ultraviolet Decontamination Chamber - Canadian Association for the Club of Rome \(canadiancor.com\)](http://canadiancor.com)



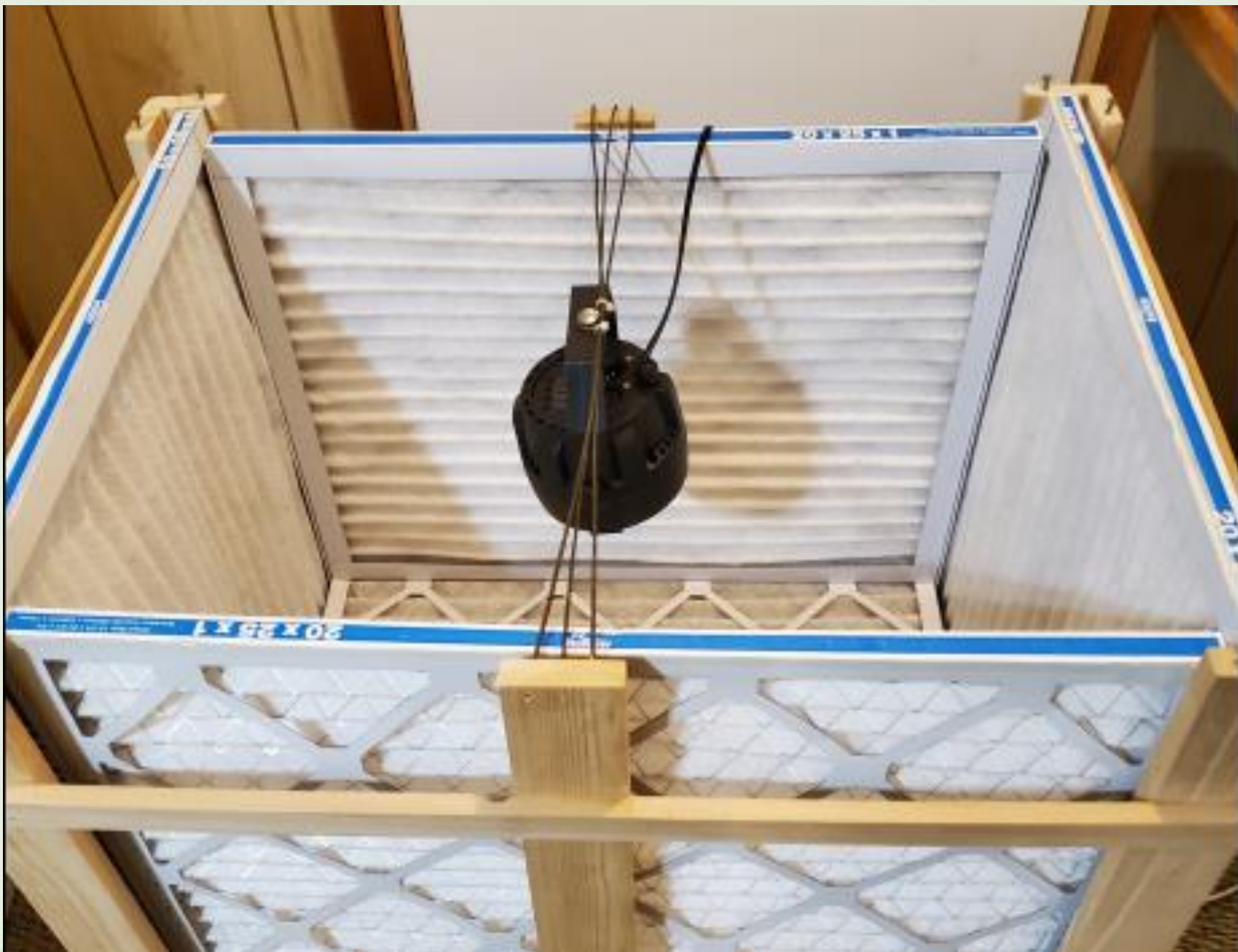
UVC LAMP in its Operational Position

1. Mounting of the Ultraviolet band C (UVC) lamp.
2. Looking downward directly into the airflow from the bottom.



UVC Lamp mounting details

1. Three wire coat hangers used
2. Bolted in the middle, three holes to support the wire
3. Protect the filters from distortion



UVC Lamp Secure

1. Coat hangers keep the load off the filter
2. Three screws hold the wires in place
3. Power cord has no special provisions



UVC Lamp fully integrated

Best view for the
construction details



Integration of the top filter to close the box

Notes:

- No loads directly on the fragile furnace filters



Tabletop structure

Notes:

- Removable top
- Sturdy to take loads



Fully Integrated Air filter

Notes:

- Final stain colour and polyurethane coatings are yet to be applied



Filter with Fan and UVC Lamp Energized

1. Note the slight blue colour of the normally white HEPA filter material
2. Wood stain and varathane coatings still to be applied



Dark Room with UVC Lamps Operational

1. The blue light is now very visible.



Finished Air Filter

1. Only remaining task is the design and build of the Controller
2. The top filter now essentially is a spare for the bottom when it needs replacement



Air Quality Particle Detector Meter

Notes:

- Handheld with memory
- Three measurements of PM2.5 microns
- PM1.0
- PM 10
- Micrograms/meter cubed



Cost to date

MERV 13 filters (pack of 6)	\$95
Particle detector	\$62
Fan	\$76
Wood stain and coating	\$44
Push button timer	\$24
	<hr/>
	\$301

Already had wood, glue, castor wheels, tools, fasteners, screws, electrical wiring, sockets, tools, etc.

THE END



Of the Old Way