

Recommended Best Practices for Protecting the Reliability and Integrity of Electronic Products and Assemblies when Disinfecting for SARS-CoV-2 (COVID-19)

Rev 1.0 (July 22, 2020)

Purpose

To offer guidance and best practices for protecting the reliability and integrity of electronic products and assemblies when disinfecting equipment surfaces for SARS-CoV-2 virus which can cause the coronavirus disease (COVID-19).

Background and Approach

The COVID-19 crisis has prompted increasing inquiries to iNEMI and its membership for guidance on how to disinfect electronic equipment and assemblies without detrimental impact on the electronics. This is relevant since some SARS-CoV-2 (COVID-19) disinfecting substances and/or application methods can initiate intermittent or permanent failures due to potential intrusion into the equipment and corrosivity. These failures can occur immediately or within months after exposure.

In response, a team of experts from across iNEMI member organizations reviewed key industry, government and technical sources and assembled this Best Practices document. The team evaluated the chemicals published by the US EPA *List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19)*¹ and common application methods, highlighting any potential hazards to the reliability of the electronic products and assemblies.

The guidance presented here focuses solely on the impact to electronic products and assemblies. Please note that:

- This document does NOT provide guidance on disinfecting in general nor does it offer an opinion regarding the efficacy of the disinfectants against SARS-CoV-2; see EPA guidance^{2,3}.
- This document DOES offer suggestions regarding which of the EPA listed chemicals are suitable and which are unsuitable for use on electronic products and assemblies.
- The listed chemicals are only reported to be effective against SARS-CoV-2 when applied using the EPA and labeled instructions including surface type, application method, concentration and contact time for the specific pathogen on the List N.
- Member organizations have NOT empirically tested these chemicals. The categories of chemicals on the EPA List N have been considered and categorized

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and opinions rendered regarding suitability based on minimizing negative impact to the electronic products and assemblies.

Disinfecting Chemicals Assessment: Recommended Guidance

Products used as disinfectants against SARS-CoV-2 virus may contain chemicals that could cause harm to electronics. Knowing the risks associated with the chemicals used in these disinfectants should be understood prior to exposure. Table 1 summarizes the risk by List N Active Ingredient chemical family groupings.

Table 1. Assessment of Chemicals on EPA List N

| Active Ingredient / Chemical Family | Impact on Electronics | Rationale |
|--|---|--|
| Alcohols, e.g., isopropyl alcohol (IPA), ethanol | Low | Low risk for corrosion at recommended concentrations. |
| Phenolic & Hexanediol | Medium | Risk of corrosion – Is a weak organic acid that can chemically bond to metal surfaces that could lead to a lower surface resistivity and could weakly attack insulators. |
| Amine /Ammonia | High | Risk of corrosion - Compounds will react with copper and remove its protective oxide. |
| Halogen | High | Risk of corrosion - Will enhance copper, aluminum, and stainless-steel corrosion. Pitting corrosion will be the most prevalent but can also initiate atmospheric corrosion. |
| Acids, e.g., citric acid, carboxylic acid | High | Risk of corrosion - Can lead to accelerated electrolyte formation and create various types of corrosion. |
| Acetates | High | Risk of corrosion - Will act as a catalyst on any legacy lead based electronic forming Lead Carbonate from CO ₂ in air which then subsequently disintegrates. |
| Hydrogen Peroxide | Medium (Lower concentrations) High (Higher concentrations) | Risk of corrosion - Is an oxidizer and as concentrations increase and in the right environment may create an acid or electrolytes leading to various types of corrosion. Understanding concentration level and exposure time is important to risk assessment. If used, apply with appropriate caution. |

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Application Method Assessment: Recommended Guidance

1. Exterior surfaces of electronic products

Method: Absent a manufacturer or supplier recommendation, normal cleaning of product exterior surfaces and touchpoints can be performed by wiping with a non-abrasive, lint-free cloth, such as cotton or polyester microfiber that is slightly dampened and not dripping with a non-corrosive disinfectant (see Table 1). It is recommended that the cloth be lint-free to avoid foreign material contamination. Allow the surfaces to air dry.

- Avoid using a saturated cloth.
- Avoid wiping near a vent/aperture in the product that may expose internal circuitry. Volatilized disinfectant may enter the vent/aperture.
- Do not apply disinfectant directly on exposed circuitry; even non-corrosive chemicals on exposed circuitry will cause reliability issues.
- Avoid creating pools of liquid disinfectant on the surface of the product.
- Avoid wiping the exterior of the electronic product with a corrosive chemical (Table 1). This can allow droplets and volatiles into the product and could corrode the electronic circuits.
- Spraying or fogging of disinfectant is not recommended⁴. Aerosolized disinfecting chemicals contacting the circuitry will affect performance or cause failure of the electronics.

2. Connectors & cable assemblies

Method: These should be cleaned according to manufacturers' instructions. Absent specific instructions, it is recommended that cleaning be performed according to the exterior surface guidelines, above. It is important to avoid having the chemical come into contact with the connector contacts. Wipe dry⁵.

Electrostatic Discharge (ESD) Hazards

Some disinfecting or distancing procedures include the use of plastics, which can generate electrostatic charges. Plastic containers and plastic shielding in the manufacturing environment can present electrostatic discharge (ESD) hazards for electronic assemblies. Follow your own ESD standard protocols to minimize the risk.

General Recommended Precautions

- Ensure adequate ventilation during use and storage of disinfectants.
- When using and storing any disinfectant, care must be exercised for flammability and compatibility with other materials.
- When possible, electronic equipment should be powered off for cleaning and disinfecting.

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- Use the disinfectant as directed on the label to ensure worker protection and the appropriate contact time with the surface.
- Workers should be trained on the safe use of disinfecting chemicals, including the use of appropriate personal protective equipment suitable for protection from the chemical and the physical hazards and equipment damage associated with ESD.
- Other chemicals, including hand sanitizers, pose risks to electronic assemblies⁶ and their use should be controlled.

Contributing Organizations

Amphenol, Celestica, Foresite Inc, IBM, Intel, IPC, Keysight Technologies and Nokia.

Other Useful Links

- CDC (2020) Chemical Disinfectants
<https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/chemical.html>
- NEMA (2020), COVID-19 Cleaning and Disinfecting Guidance for Electrical Equipment <https://www.nema.org/standards/view/covid-19-cleaning-and-disinfecting-guidance-for-electrical-equipment>
- CDC (2020) Cleaning and Disinfecting Your Home
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/disinfecting-your-home.html>

REFERENCES

- 1) US EPA (2020), List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19)
<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2-covid-19>
- 2) US EPA (2020), How does EPA know that the products on List N work on SARS-CoV-2? <https://www.epa.gov/coronavirus/how-does-epa-know-products-list-n-work-sars-cov-2>
- 3) US EPA (2020), Infographic: Guidance for Cleaning and Disinfecting Public Areas, Workplaces, Businesses, Schools, and Homes
https://www.epa.gov/sites/production/files/2020-04/documents/316485-b_reopeningamerica_combo_placard_infographic_4.19_6pm.pdf
- 4) WHO (2020), Cleaning and disinfection of environmental surfaces in the context of COVID-19 <https://www.who.int/publications/i/item/cleaning-and-disinfection-of-environmental-surfaces-inthe-context-of-covid-19>

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- 5) CDC (2020), Cleaning and Disinfection for Households
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cleaning-disinfection.html>
 - 6) An Investigation into Hand Sanitizers and Hand Lotions and Potential Risks to High Performance Electronics, IPC APEX-Expo 2010 Technical Paper S25_02. Available from the IPC Technical Resources Portal (IPC members only).
<http://www.ipc.org/MembersOnly/TechDocsSearch.aspx>

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