



## **Clear Coats, Hardeners, Isocyanates and Skin**

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Primers, sealers, and clear coats contain isocyanates. They're an essential part of creating the hard protective coating needed for automotive paint. Isocyanates are a well-recognized health hazard. They're also, too often, a poorly-controlled health hazard.

Isocyanates can cause allergic skin reactions and, even more dangerous, allergic lung reactions. A painter or prepener could work with the substances for years, getting it on his hands when mixing or spraying, not wearing an effective respirator when shooting primer or clear, and never develop any problems. And then, for reasons we don't know, that person could become sensitized. After that, only a miniscule exposure could cause a severe asthma-like reaction.

If OSHA were to do air monitoring in your facility for isocyanates, we'd bet a lot of money that levels would be well below OSHA limits. But that doesn't mean your workers are adequately protected. The OSHA standard for isocyanates only regulates one type of isocyanate, a type now found only in very low amounts. And OSHA doesn't have a limit for skin exposure, even though skin contact could lead to respiratory sensitization.

Several studies have looked at how much isocyanate exposure painters actually have, by taking biological measurements (measuring the metabolites that workers excrete in urine or that show up in blood). Studies have also measured how much gets on the skin, with and without gloves.

The findings:

- Skin exposure occurs during
  - application of primers, sealers, and clear coats.
  - mixing those products.
  - nonspraying tasks that could have contact with paint that's not fully cured. Wet sanding and unaping, in particular, resulted in measurable exposure.
- Latex gloves offered little to no protection, but were the most often used type of glove. Isocyanates permeate through latex gloves, with no apparent damage to the glove.
- Nitrile gloves thicker than 8 mils seemed to offer good protection.

Based on these findings, nitrile gloves can protect hands. What about the rest of the body?

There's little good research on that. Some of the field studies have looked at isocyanate levels under coveralls, as part of evaluating skin exposure. But there don't seem to be enough results to report.

One safety consultant sprayed clear coats directly on spray suits mounted on test cards, and found that the isocyanate could go through five of six suits. That's not surprising. But it also may not be a realistic test. Three of the paint suits were nylon and one was polyester – all designed for comfort and to keep clothes clean, but not designed for chemical resistance. Another one, made from a "cloth-like fiber," is advertised as passing the ASTM F903 standard

for chemical *penetration*, which tests if a chemical can get through seams or pinholes. But the manufacturer made no claim of effectiveness against *permeation*, which measures if the chemical can move through the solid material. A Tyvek® suit was tested; we don't know if it, too, failed. DuPont has stated that Tyvek® will provide protection against isocyanate-based paints as long as the garment doesn't become soaked (so it probably passes the penetration test, but not the permeation test). If you expect a spray suit to be soaked with the primer or clear, a coverall made of a chemical-resistant fabric such as DuPont's Tychem QC, Tychem SL, Lakeland's ChemMax, or Kappler's Zytron is needed.

The gist: we don't know if the coveralls commonly in use provide adequate protection. You can do some evaluation on your own, though, by looking at how much overspray or back splatter ends up on the coveralls. If it's a substantial amount, it would probably be wise to switch to a chemical-resistant coverall. But keep in mind that those usually aren't as comfortable to wear, especially in hot weather, as the ordinary spray suits. A better idea: change work practices to try to minimize body contact with the spray. And even if spray suits don't provide 100% protection, they'll still provide a lot more than bare skin.

What about the face? One study found isocyanates on skin underneath half mask respirators. That may indicate that the inside of the respirator became contaminated (perhaps from handling it with contaminated hands, or from leaving it in the mixing room), or that the respirators didn't fit well enough to block the chemical. That's not the only concern with half mask respirators: they don't provide eye protection, needed because isocyanates are strong eye irritants.

In summary:

- Cover bare skin. Don't spray without gloves, arm, and body protection.
- Use nitrile gloves (never latex) for all mixing, spraying, and clean-up of primers, sealers, clears, or any other products that contain isocyanates.
- Use nitrile gloves for sanding freshly applied paint and for removing masking and tape.
- Wear coveralls, but make sure they don't become soaked with paint products.
- Airline respirators or powered air purifying respirators with loose-fitting helmets will provide the needed eye and face protection. If you stick with half-mask respirators, make sure they are carefully and correctly maintained. And remember that you still need eye protection with them.

If you have questions about working safely with isocyanates, spray painting, chemical exposures, OSHA inspections, OSHA grants, or other safety or environmental issues, contact CHESS at 651-481-9787; toll free at 877-482-4377, or [carkey@chess-safety.com](mailto:carkey@chess-safety.com). CHESS specializes in helping small to medium sized business with occupational health and safety issues. We have been providing services to the automotive industry for more than 20 years.

This article is intended to provide general information (not advice) about current safety topics. To discuss your specific concerns and how CHESS may help, please contact CHESS at 651-481-9787 or [chess@chess-safety.com](mailto:chess@chess-safety.com)

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