

A Guide to Nontoxic Residence Hall Furniture

*Improving Indoor
Air Quality for
Your Students.*

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INTRODUCTION

Is your furniture toxic? Can you answer that question definitively?

You may not know it, but this is a very real problem with a lot of residence hall furniture. And the implications are profound.

According to Harvard's School for Public Health, furniture with volatile organic compounds or VOCs (chemicals emitted as gases from certain solids or liquids) can adversely impact student cognition.

In this eBook, we're going to explore the different ways—the processes, products, and materials—that your residence hall furniture could be poisoning people and the planet.

We'll also highlight some of the best practices you need to look for to ensure that your furniture isn't toxic.

First, we explore the critical role of indoor air quality (IAQ) on student health and cognition and how your furniture impacts air quality.

Second, we'll look at some of the main sources of toxicity in furniture like plastic wood laminates and flame-retardants.

Finally, we'll highlight how, at DCI, we've eliminated toxins like formaldehyde and other VOCs from all of our furniture.

After reading this short book, you'll come away with a comprehensive context for understanding the major sources of VOCs in your furniture and how to mitigate them.





Chapter 1

HOW GREEN BUILDINGS AND CLEAN INDOOR AIR IMPROVE STUDENT COGNITION

College students spend a lot of time indoors.

Much of that time is in their residence hall studying, sleeping, and recreating. So providing students with the highest standard of indoor air quality is essential.

This issue takes on greater urgency in light of a 2015 [study](#) from Harvard's School for Public Health, which measured the impact of indoor air quality (IAC) on cognitive function. In short:

The findings suggest that the indoor environments in which many people work daily could be adversely affecting cognitive function—and that, conversely, improved air quality could greatly increase the cognitive function performance of workers.

EVOLVING INDOOR AIR QUALITY

Although our legal system and scientific institutions have made great strides to study and protect the outdoor environment over the last several decades, efforts to evaluate and improve the quality of our indoor environment are—ironically enough—relatively new.

Despite the fact that most of us spend the majority of our time indoors, we've paid comparably little attention to the effects of indoor air quality on human health and cognition.

This study is an important first step in changing the status quo.

Researchers wanted to look at the impact of ventilation, chemicals, and carbon dioxide on workers' cognitive function because, as buildings have become more energy efficient, they have also become more airtight, increasing the potential for poor indoor environmental quality.

WHAT IT MEANS FOR RESIDENCE HALL FURNITURE

The implications for the residence hall furniture business are huge. I can think of few other places where this is more important than a university residence hall. Ensuring that students study and work in green buildings that support learning and healthy cognition is more important than ever.

And because residence hall furniture is a major—if not primary—determinant of indoor air quality, it's important for student health and performance that objective third parties certify your furniture.

You'd think this is obvious, but it's not. There are still issues. For example, it's no secret that the furniture industry is [resistant and slow to evolve](#) when it comes to compliance with voluntary and mandated standards like reducing toxic volatile organic compounds (VOCs).

In fact, because VOCs are such a problem when it comes to IAQ, in the Harvard study, researchers tested the effects of VOC exposure on brain function. They exposed participants to high concentrations of VOCs, similar to those emitted from common office materials.

They found that cognitive performance scores for the participants who worked in the green+ environments were, on average, double those of participants who worked in conventional environments; scores for those working in green environments were 61% higher.



Formaldehyde is one of the most problematic VOCs in furniture and contributes to poor IAQ and reduced cognitive function. And yet many residence hall furniture companies import wood and furniture from Malaysia and China, which still use formaldehyde in their furniture.

We've already chronicled this issue with respect to [Rubberwood](#) and Wood [Laminate](#).

SAFEGUARDING STUDENT AND RESIDENT HEALTH

So how can you safeguard student health and make sure that your residence hall furniture isn't emitting harmful chemicals? That is to say, how can you make sure that it's safe?

One of the best certifications for guaranteeing residence hall furniture with the highest indoor air quality ratings is [MAS Certified Green](#). What is MAS?

MAS Certification is administered by Material Analytical Services, an independent, third-party laboratory that offers testing services that meet stringent ANSI (American National Standards Institute) furniture sustainability standards.

This is the same set of standards for GreenGuard certification. According to the MAS website, the MAS Green Certification is more stringent than GreenGuard. The truth is, they are both well-respected certifications, but you can compare the two [here](#). Here's what you need to know about MAS Certification.

What Is MAS Certified Green and Why Is It Important?

MAS is an independent environmental consulting firm that was founded in 1987 in response to growing concerns about indoor air quality.

It developed the MAS Green Certification so that:

...Consumers could readily identify interior construction products, furniture, and furnishings, which have been thoughtfully designed and manufactured to dramatically lower chemical emissions released into the indoor environment.

One of the most important things that MAS addresses with its certification is VOCs. Increased exposure to these chemical compounds inside buildings can be toxic and dangerous to human health.

Because of this, the US EPA and Consumer Product Safety Commission spurred regulators and industry groups to develop standards to diminish and stamp out hazardous chemical emissions from construction products and furniture. Why is this so important?

Why Indoor Air Quality Is Non-Negotiable

It's crucial to have Low or No VOC emitting furniture because many of today's energy-efficient buildings don't circulate much (if any) air from the outside environment.

In essence, it's a closed loop. When you combine low ventilation rates, high occupant densities, and the use of



chemicals in interior furnishings, you get a potentially toxic mix of air quality. This can translate into a number of issues including more reported allergen problems, odor complaints, and other health issues. As a furniture manufacturer, how do we deal with this?

First, with respect to all our hardwood furniture, we use a UV-cured finish that emits zero VOCs.

Second, DCI sources hardwood plywood, particleboard, and medium density fiberboard products that use either no-added formaldehyde (NAF) based resins or ultra-low-emitting formaldehyde (ULEF) resins.

1. **NAF** based resins are created with no added formaldehyde as part of the resin cross-linking structure and include resins made from soy, polyvinyl acetate, or methylene diisocyanate.
2. **ULEF** resins are formaldehyde-containing resins formulated such that the formaldehyde emissions from composite wood products are consistently below applicable CARB (California Air Resources Board) Phase 2 emission standards.
 1. ANSI/BIFMA e3-2012 Section 7.6.1, 7.6.2, and X7.1-2011 for private offices • California Dept. of Public Health (CDPH) Standard Method V1.1

These materials exceed requirements set forth by the California Air Resources Board (CARB) and satisfy the rigorous standards of MAS Green Certification.

That goes a long way to improving air quality conditions. And according to a [CDC report](#), high levels of exposure to formaldehyde can cause cancer and a variety of symptoms like a sore throat, scratchy eyes, nosebleeds, and coughing.

That's why it's crucial to have furniture that has the MAS Green Certification. It protects us from these harmful VOCs and ensures that chemicals used in production are at super safe levels.

You can learn more about the MAS Green Certification [here](#). This is how they describe their testing protocols.

The MAS Certified Green® program integrates the rigorous product testing requirements of the CDPH (California Dept of Public Health) Standard Method V1.1, the BIFMA M7.1 Test Method, and Formaldehyde emission testing requirements of the Cal EPA – ARB with the conservative chemical emission limits referenced by the USGBC LEED, CHPS and CARB organizations. There is not a more conservative or rigorous IAQ (indoor air quality) product testing program available. The MAS Certified Green® program is ISO/TEC 17025 and 17065 compliant and recognized by LEED, CDPH, BIFMA, and CHPS.

MAKE SURE YOUR FURNITURE PROVIDER IS MAS CERTIFIED

Ok. I know some of that is like reading Greek. But the important thing to know



is that the MAS certification adheres to standards set by the most progressive public health institutions in the United States.

And it uses a meticulous testing methodology.

In short, as someone who is responsible for the air quality of your residence hall, it's crucial that when you're choosing your furniture, you make sure that it's MAS or Greenguard certified.

If you don't, as this Harvard Study demonstrates, you're risking the health and the cognitive development of your students. It might be a tad dramatic to say so, but by choosing furniture that's not certified, you're undermining the very mission of higher education.





Chapter 2

HOW WOOD LAMINATE POISONS PEOPLE AND THE PLANET

When you're looking for residence hall furniture, you've got a few things in mind.

First, what's the most affordable option? What's the design spec? And then, what human health and environmental standards do you want it to meet?

In this chapter, we explore furniture that is made with high or low-pressure wood laminate. And specifically, we're going to zero in on wood laminate from the perspective of sustainability and toxicity.

Previously, we've [compared](#) different furniture materials based on their sustainable pedigree to help you identify and choose the most environmental option.

We've explored why popular furniture materials like [rubberwood](#) aren't sustainable.

We've also examined solid [hardwoods](#) and so-called "environmentally farmed [timber](#)."

Now let's take a closer look at laminated wood. (Spoiler alert: wood laminate ranks at the bottom when it comes to sustainability and poses real threats to human and environmental health.)

WHAT IS WOOD LAMINATE?

There are two kinds of wood laminates: high pressure and low pressure. And it's important to note that laminate furniture isn't real wood. It's man-made wood. What does that mean?

In simplest terms, you print a layer of wood-colored plastic and adhere it to a composite wood substrate like particle-board or MDF.

These substrates differ in quality and include a range of wood products, which are made by fixing strands, particles, fibers, or boards of wood together with adhesives to create composite materials.

According to [NovaDesk](#), the difference between high and low-pressure laminates comes down to the heat and pressure applied in the manufacturing process.

- **High-Pressure Laminate:** The layer of laminate is adhered to the substrate under pressures of 70 to 100 bars (that's between 1,000 and 1,500 psi) and temperatures of 280 to 320 degrees Fahrenheit using adhesives.
- **Low-Pressure Laminate:** The layer of laminate is adhered to the substrate under pressures of 20 to 30 bars (between 290 to 435 psi) at temperatures of 335 to 375 degrees Fahrenheit with no adhesives.

WOOD LAMINATE IS DURABLE AND CHEAP

Why is laminated wood so popular? For one thing, wood laminate is much easier and cheaper to make than solid wood furniture. You don't need to process all that wood or run it through a finishing process. It also boasts a durable surface that's hard to scratch.

According to the folks over at [Furnish Green](#):

Laminate is made with synthetic materials or very thinly sliced pieces of wood. In some cases, it is made to look like wood grain by using a method that is similar to printing. Laminate typically has a shiny finish and is known for being used in low-end furniture and pieces that need very durable surfaces. Of course, laminate is much cheaper than solid wood or veneer to produce and use.

In terms of overall durability beyond the laminate surface, it depends on the



substrate. Particleboard tends to be cheap. It can split and warp and fall apart quickly, and it has poor screw retention.

MDF or fiberboard is more stable. It's going to provide you with a more durable product.

So affordability and some measure of durability are the advantages of laminate furniture. But in terms of overall quality, there's consensus that laminate furniture just isn't as heavy-duty as a solid piece of wood.

Now let's look at a few of the reasons why wood laminate not only ranks last in terms of sustainability but also poses a threat to human health and the environment.

1. Wood Laminate Has A Large Carbon Footprint

When it comes to sustainability, one of the first issues with wood laminate is the large carbon footprint. It requires a lot of fossil fuel energy to power the pressure and heat used in the manufacturing process.

And more often than not, the plastic laminate used by furniture manufacturers is produced in China before it's shipped to the United States. That's problematic on a few levels.

First, China leads the world in carbon pollution by a large and growing margin. Second, it has notoriously [poor working conditions](#), and child labor laws are flaunted.

So it's important to consider not only the carbon footprint associated with producing and shipping the laminate but also the

social costs of producing furniture outside the United States.

2. Wood Laminate Is Not A Renewable Resource

Wood laminate is man-made. Because of advanced manufacturing processes, it's abundant and cheap. But it takes fabricated materials and lots of energy to create it.

Also, you can't reuse it.

By contrast, the resources required to make trees—the raw material for solid hardwood furniture—are all natural and require no added energy inputs: air, soil, water, sunlight.

3. Wood Laminate Has A Poor Life-Cycle Analysis.

So what happens when you can't use your wood laminate furniture any longer? According to the [Green Home Guide](#), you should consider the life cycle of this material.

On that count, it ranks low with an unfavorable impact on the environment. At Green Homes, they point out that:

1. Laminate is easy to maintain but ranks low on the durability quotient because it's not easily fixed or refinished if damaged.
2. At the end of its useful life, it gets pitched into a landfill, where its ability to decompose is minimal.
3. It's difficult to quantify what chemicals, if any, will leach from laminates once they hit the landfill or would be emitted into the air if placed in an incinerator.



What does this actually mean? From a sustainability perspective, it's the first 800-pound gorilla in the room when it comes to laminate wood.

To put it simply, this stuff doesn't decompose. Because of all the chemicals and glues, the material never breaks down organically.

Let's think about that for a second. If you're lucky, you'll get 10-15 years out of furniture made with wood laminate. After that, it's just going to sit in the landfill for a thousand years—literally. That's a disturbing thought and certainly doesn't reflect well on us in terms of being stewards of our own planet.

4. You Can't Recycle Wood Laminate

Unlike furniture made from hardwood trees, you can't recycle or upcycle wood laminate. Most of it ends up in the dump. And that's to say nothing of what happens to the waste products from the manufacturing process.

Using solid hardwood as the basis for residence hall furniture, we've created a zero waste system, and we recycle all our wood by-products to power our generators and fuel our kilns.

But we don't stop there. Wood is incredibly flexible, and so it lends itself to creative reuse.

To that end, we have [partnered with sustainability leaders](#) like the University of New Hampshire to furnish their residence halls with brand new solid wood furniture that is fortified with upcycled internal com-

ponents from furniture that we installed on their campus over 25 years ago.

In contrast, laminate waste is plastic, and it's rife with chemicals. You can't recycle, upcycle, or reclaim that waste. Most of the time, it ends up in the landfill.

5. Some Wood Laminate Furniture Is Toxic

As we alluded to above, another issue with using furniture made from wood laminate is that sometimes it's heavily processed and filled with chemicals.

[Wikipedia](#) flags this as well saying that:

The adhesives used in some products may be toxic. A concern with some resins is the release of formaldehyde in the finished product, often seen with urea-formaldehyde bonded products. Cutting and otherwise working with some products can expose workers to toxic compounds.

And that's just the beginning. Here we encounter the second 800-pound gorilla in the room.

As we reported in our recent article on [green manufacturing](#), a recent [study](#) of volatile organic compounds (VOC) like formaldehyde found that furniture made with MDF and laminated wood are dangerous potential sources of cancer-causing VOCs.

In short, because it contains toxic VOCs like [formaldehyde](#), laminated wood furniture is a serious potential human health liability if you don't take the right precautions. If you get wood laminate furniture, make sure that MAS or Greenguard certifies it.



WHY UNIVERSITIES LIKE UCLA AND UC IRVINE AVOID WOOD LAMINATE

Knowing all this, it's no surprise that some universities have phased out wood laminates completely based on the associated environmental, human health, and quality issues.

Thankfully, students are idealistic. They want furniture manufactured with an ethical basis that doesn't adversely impact or damage the biosphere.

For the most part, these universities choose solid hardwood furniture. Why? Because of wood's superior quality and sustainability.

For example, a lot of universities who have robust sustainability policies avoid laminates because wood laminate:

- Doesn't last as long
- Often comes from China
- Manufacturing has a large carbon footprint
- Is not recyclable or reclaimable
- Doesn't decompose well or burn
- Has a poor Life Cycle Analysis

What should you choose?

If you're concerned about VOCs, and if you want your residence hall furniture to have the highest ecological standards, choose wood. Solid wood furniture is the most sustainable on the market.

Before we move on and explore DCI's VOC-free approach to furniture manufacturing, let's explore another potential source of toxicity in your furniture. I'm talking about chemical flame retardants.

EVERYTHING YOU NEED TO KNOW ABOUT FLAME RETARDANT CHEMICALS

Maybe you've heard? In residence halls across the country, there's a debate over the furniture fire safety standards, which are designed to protect human health.

In a strange and unsettling twist, for the last several decades furniture manufacturers have used highly toxic flame retardant chemicals to meet the same fire standards that are meant to protect us.

According to a 2012 [study](#) examining the effects of these flame retardant chemicals on human health from Duke University:

Small doses of a flame retardant commonly added to furniture and baby products can trigger obesity, anxiety and developmental problems

As you might expect, that's caused concern at leading research institutions and universities like [Harvard](#) and [UC Berkeley](#). These schools now prohibit furniture on their campus that has flame retardant chemicals.

The saga related to banning toxic flame retardants—and it is a saga—is well chronicled by The Chicago Tribune in their award-winning series [Playing With Fire](#) and in an HBO documentary called [Toxic Hot Seat](#).



Simplifying The Fire Safety Story

So what's the story here and what impact should this have on what kind of residence hall furniture you choose to buy? The answer isn't as simple as you'd think. So let me break it down for you.

This story has a few chapters, and I'm going to briefly lead you through each one and distill it down to its essence.

Armed with this information, you can weigh the pros and cons and make your decision. Either way, I urge you to familiarize yourself with your local fire safety codes for furniture in public spaces.

And before we jump in, I should say that my own company, DCI, builds and designs furniture that is [free of chemical flame retardants](#). We adhere to the most up-to-date flammability code, TB117-2013 (not to be confused with TB-117 or CAL-133).

Furthermore, we strongly advise all residence halls to avoid buying furniture that adheres to Cal-133 (the flammability standard which requires flame retardant chemicals).

I'll explain why below.

A Brief History of Fire Safety

Some historical context. Let's back up to the beginning of our story. It all started way back in 1929 in Lowell, Massachusetts. To set the stage, I'm going to quote from [Wikipedia](#).

Congresswoman Edith Nourse Rogers (D-MA); she called for the National Bureau of Standards (NBS) to develop technology for "self-snubbing" cigarettes. The Boston Herald American covered

the story on 31 March 1932, noting that after three years of research the NBS had developed a "self-snubbing" cigarette and had suggested that cigarette manufacturers "take up the idea."

None did.

In 1973 the United States Congress established the Consumer Product Safety Commission (CPSC) to protect the public from hazardous products. Congress excluded tobacco products from its jurisdiction while assigning it responsibility for flammable fabrics. The CPSC regulated the flammability of mattresses and worked with furniture manufacturers to establish voluntary flammability standards for upholstered furniture, although more recently those standards have come to be considered mandatory.

Did you catch that slight of hand? Cigarettes were causing fires. Houses were going up in flames (Lowell was not an isolated incident). Cigarettes were the undisputed culprit.

Somebody had to take responsibility. After all, lots of people were dying.

Thanks to free-market advocates and powerful lobbyists, it wasn't going to be the most culpable party—the tobacco industry. Instead, someone got a brilliant idea and said, "Hey! Let's blame the couches instead!"

Makes sense, right? No.

But there you are. That's the ill-conceived beginning of this story and where everything goes off the tracks. Warning: things



don't really improve until about 2013.

And let's put these smoke and mirror shenanigans in context. The University of California at Davis came out with a [study](#) in August 2000 saying:

Based on a worldwide study of smoking-related fire and disaster data, UC Davis epidemiologists show smoking is a leading cause of fires and death from fires globally, resulting in an estimated cost of nearly \$7 billion in the United States and \$27.2 billion worldwide in 1998.

It took over seventy years for the first state to adopt fire-safe cigarette standards as law. And not coincidentally, that would help set the stage for the passage of legislation 13 years later that finally ended the mandatory application of toxic flame retardant chemicals to our furniture.

Part 1. So let's back up again. It's the early 1970s around the time that the CPSC was redirecting fire-safety responsibility away from big tobacco to the furniture industry. The California state government passed a law saying all upholstered furniture sold in the state had to be fire retardant.

If you're like me, it's hard to think about the '70s without also thinking about cigarettes. They were as ubiquitous as bell bottoms. In fact, [cigarette smoking](#) in the 20th Century peaked in 1965, when about 50% of men and 33% of women smoked.

At that time, our smoking habit was a real fire hazard and an urgent problem.

So someone had to determine what California's new fire retardant regulation actually meant. They had to create flammability standards.

Part 2. That responsibility fell to California's Bureau of Home Furnishings (CBHF). They published Technical Bulletin 117 ([TB-117](#)), which became law in California in 1975. By default, TB-117 served as the national minimum standard for flammability.

Part 3. By 1984, the CBHF had received numerous requests from fire departments and other public and commercial institutions asking for more guidance. To address the fire issues related to furnishings in public buildings, the CBHF published [TB-133](#) (also referred to as CAL-133, Cal TB 133, or just TB133).

This new document was used by local fire officials in buildings where they recognized the need to enforce a fire safety standard. And it's important to realize that this only applied to public spaces in public buildings like hospital waiting areas.

Unfortunately, many universities mistakenly interpreted this as a standard that also applied to their residence halls and students lounges.

But what's the big deal about TB-133 anyways?

Here's The Rub About TB-133

Here's the rub of this whole thing and the turning point in the story. To meet the standards of TB-133, a lot of manufacturers had to add toxic flame retardant chemicals to their upholstery and foam.

Now there are a few things of note about TB-133. It's basically the most stringent fire standard. And from a certain point of view, TB-133 is shaping up to look like the bad guy in this story.



Unlike the other standards, CAL-133 includes a flame test that furniture makers must pass for certification. According to this standard, each line of furniture has to pass the flame test to meet CAL-133 standards.

To our chagrin, many campuses still ask us to make TB-133 compliant furniture. For clarification, this is a mistake and endangers the health of students.

Furthermore, the TB-133 standard only applies to public spaces where there are 10 or more articles of seating. Most public spaces in university residence halls don't meet this definition of public space.

If at all possible, we encourage you to avoid TB-133 compliant furniture at all costs.

(As an aside, there is a caveat to all these standards. If you have a really smoking sprinkler system (couldn't resist!), these requirements become moot. Your local fire marshall will let you know. This exception applies almost everywhere except for the city of Boston.)

Part 4: Now back to our story. In 1986, California passed the now famous Prop-65, which banned the use of certain toxic chemicals and carcinogenic substances.

The law dealt with a lot of the toxic bad guys. And it gets even better.

Because California is the [6th largest economy](#) on the planet at \$2.46 trillion, Prop-65 had a hugely positive effect by forcing any manufacturer participating in that economy to comply.

Part 5: As it turns out, in 2011 some of the toxic chemical flame retardants spawned

by CAL-133 were added to the list of Prop 65 chemicals.

Part 6: Consequently, in 2013 California updated its original fire standards with TB-117-2013. This more appropriate fire standard accounted for the discrepancy with Prop 65.

Basically, the TB-117-2013 update ensures that you can still meet effective flammability standards without using the flame retardant chemicals required to meet CAL-133. This is how [Berkeley Analytical lab](#) describes it:

Instead of an open flame test, the new standard [CAL-117-2013] provides methods for smolder resistance to cigarettes of cover fabrics, barrier materials and resilient filling materials for use in upholstered furniture. As stated by the agency, these changes provide greater fire safety protection against smoldering materials, the major ignition source, while reducing or eliminating the need by manufacturers to rely on materials treated with flame retardant chemicals of concern. Additionally, 17 categories of infant and baby products with foam cushions became exempt from the flammability requirements.

Part 7: And finally, in the last act of this story, California passed a resolution called SB 1019 in 2015. It stipulates that details about flame retardant chemicals in upholstery materials must appear on the TB 117-2013 flammability label. This is how the label reads:

THE STATE OF CALIFORNIA HAS UPDATED THE FLAMMABILITY STANDARD AND DETERMINED THAT THE FIRE SAFETY



REQUIREMENTS FOR THIS PRODUCT CAN BE MET WITHOUT ADDING FLAME RETARDANT CHEMICALS. THE STATE HAS IDENTIFIED MANY FLAME RETARDANT CHEMICALS AS BEING KNOWN TO OR STRONGLY SUSPECTED OF, ADVERSELY IMPACTING HUMAN HEALTH OR DEVELOPMENT.

Why Should You Care?

Why should you care about all this? These details are confusing, no doubt about it. But here's what you need to know.

First, California sets the standards for most of these things and manufacturers abide by their laws. Therefore, it's likely that these policies apply in your own state and your district.

Second, getting furniture that meets CAL-133 standards costs about 10-15% more than furniture that meets TB-117-2013. Why? For a few reasons.

- Furniture makers have to add an additional fire barrier to the fabric and foam.
- Manufacturers have to send their furniture to a third party lab to run it through a flammability test. These costs are passed on to the consumer.

Third, a lot of people openly oppose CAL-133 for public health reasons. Boston, MA is one of the few cities which still uses the standard, and even this is [changing](#), albeit slowly.

According to Silent Spring Institute staff scientist [Kathryn Rodgers](#):

Boston Firefighters Local 718 wants to see the fire code updated to reduce fire-

fighters' exposure to these chemicals. The International Association of Firefighters and Professional Firefighters of Massachusetts have all expressed their concerns about exposure to carcinogenic flame retardant chemicals.

So firefighters are against it, and prestigious universities like Harvard and UC Berkeley won't allow CAL-133 furniture into their residence halls.

Dr. Joe Allen, Assistant Professor of Exposure Assessment Science at Harvard's T.H. Chan School of Public Health, had [this](#) to say on the issue.

When the science is this clear on the potential for harmful effects, and safe alternatives exist, it is time to take action to reduce exposure to flame retardant chemicals. This is an important, public health-promoting goal for our University.

According to Berkeley Analytical [lab](#):

Since the change in the California home furnishing flammability standard [in 2013], many office furniture customers also are requesting furniture items without flame retardant chemicals of concern that are compatible with TB 117-2013 and not with Cal-133.

In the end, the decision of what you need to do rests with your local fire marshall. He or she has the final say over what your university has to do with respect to meeting minimum fire safety requirements. And those requirements change from campus to campus.



Your Next Steps

Obviously, your concern here is twofold:

1. How do you make sure your furniture isn't flammable?
2. How can you prevent student exposure to toxic flame retardants?

Let me reiterate one key point here. Avoid CAL133 furniture if at all possible.

The [science](#) now shows that you run the risk of exposing your residents to toxic and potentially carcinogenic chemicals by adhering to Cal133.

Yes, it's true that Cal133 is the most rigorous fire safety standard. But the Cal117-2013 update shows that you can achieve a high level of fire safety without exposing residents to toxic chemicals.

I also recommend that you make sure you understand the policies we've discussed here. And more importantly, you need to make sure that your fire marshal also understands them.

And now that we've looked at two of the major sources of VOCs in your furniture—wood laminate and flame retardant chemicals—let's explore the final source of VOCs and how to mitigate it.





Chapter 3

HOW OUR UV FINISH IMPROVES YOUR AIR QUALITY

It turns out that subtle suspicion you were harboring in the back of your mind—It can't be good for me to be breathing this in!—was accurate.

VOLATILE ORGANIC COMPOUNDS ARE DANGEROUS

You see, part of what you're smelling is something called [volatile organic compounds](#) or VOCs. Those are the stinky and toxic chemicals that become vapors or gasses as the wood finish on your furniture or floor transforms from liquid to solid. And it turns out that inhaling those vapors can seriously compromise [human health](#).

For the last several years, in the wake of increased attention to the health impacts of [indoor air quality](#), the hardwood furnishings, and floorings industries have been working to free their finish from fume-spewing VOCs.

Interestingly enough, solutions have been around since the mid-1970s. Specifically, wood finishes that emit zero VOCs, which are instantly cured (hardened) by interacting with a harmless UV light.

We've used a nontoxic UV-cured finish like that here at DCI for over a decade. But the truth is, a lot of companies still use materials in their furniture that off-gas toxic VOCs.

WHY YOU DON'T WANT VOCs IN YOUR FURNITURE

So it's important for anyone who is buying residence hall furniture to gain clarity around VOCs before they commit to

buying any furniture. You may be surprised to learn just how important your choice of wood finish is for the health of your students and the quality of your furniture. Allow me to explain.

Furniture has a huge impact on indoor air quality. And historically, most wood finishes were filled with VOCs. According to the [Green Home Guide](#):

Volatile organic compounds, or VOCs, are carbon-containing substances that easily become vapors or gases. They can be present in paints, coatings such as varnishes and cleaning products.

For years, the federal government has prodded furniture companies to eliminate these toxic agents from their manufacturing processes.

VOCs Compromise Indoor Air Quality and Human Health

Why? Because VOCs can have all sorts of deleterious effects on human health. And in general, VOC concentrations are as much as 1000 times higher indoors than outdoors.

According to the [EPA](#), these compounds pose a spectrum of potential health risks including:

- Eye, nose, and throat irritation
- Headaches, loss of coordination, and nausea
- Damage to liver, kidney, and central nervous system
- Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans.

On the whole, the industry has been slow to respond to voluntary and mandated standards.



The Startling Effects of VOCs on Human Cognition

What are the implications of all this for student housing? For one thing, you definitely don't want to mess around with VOCs.

As we highlighted in the beginning of this Ebook, a recent [study](#) from the Harvard School for Public Health analyzed the impact of VOCs and indoor air quality on student cognition.

Researchers exposed participants to high concentrations of VOCs, similar to those emitted from common office materials.

They found that cognitive performance scores for the participants who worked in the green+ environments were, on average, double those of participants who worked in conventional environments; scores for those working in green environments were 61% higher.

Let me reiterate that.

Students exposed to normal furniture that emits standard levels of VOCs performed half as well as students who were tested in an environment that was free of VOCs. In case it's not clear, that's a huge difference.

Long story short, you don't want VOCs in your residence hall furniture. Off-gassing furniture is one of the leading culprits contaminating indoor air quality. So no-VOC assurances for your residence hall furniture are a must.

The Benefits of UV Finish

This issue with toxicity is one of the main reasons why DCI uses a finishing process

that emits zero VOCs. Instead of using a solvent-based finish like nitrocellulose lacquer, we apply a UV-cured finish.

It's odorless, clean, and non-toxic.

How exactly does a UV finish work? According to [Wikipedia](#):

Certain inks, coatings, and adhesives are formulated with photo initiators and resins. When exposed to UV light, polymerization occurs, and so the adhesives harden or cure, usually within a few seconds.

In fact, our UV finish is one of the main reasons why our furniture was awarded the [MAS Green](#) certification. MAS is one of the most stringent third-party certifications for guaranteeing residence hall furniture with the highest indoor air quality ratings.

So why and how is this UV finish so effective at eliminating VOCs? This [article](#) from Yale's sustainability department does a great job of comparing a more common finish to a UV finish:

For every gallon of nitrocellulose lacquer, 25 percent is composed of solids. The other 75 percent is chemicals added to the solid resin so that the finish can be sprayed. The finish needs to be cured, and during this drying process, that other 75 percent of the material goes into the atmosphere as VOCs. Alternatively, for a gallon of the UV cured finish, 100 percent is composed of solids. This material stays on the furniture and is cured by ultraviolet (UV) lights, emitting zero VOCs and improving the health and safety of employees.



How UV Finish Is Better for Your Furniture and Your Budget

It's worth noting some related benefits of using a UV finish. First of all, unlike other finishes, UV Finish is completely re-useable. When you have excess coating or overspray, you can capture that for re-use. It's much less wasteful than other finishes.

Second, the UV finishing process is more efficient. UV-cured wood dries instantly whereas other coatings can take several days. That saves on labor costs, and we pass those savings on to our customers.

Third, according to the folks over at [American Ultraviolet](#):

...wood cured by UV is twice as hard as pre-finished floors, as well as most other available finishing options on the market. The hardness provided by UV curing hardwoods provides a better-looking product for longer periods of time as it is typically more scratch, scuff, and stain resistant!

Increasing Efficiency, Decreasing Carbon Pollution

And there are other benefits that make this the green finish of choice.

First, we use a roll-applied process to coat the wood. This approach features a 100% transfer efficiency. According to an application comparison in the [RadTech Report](#), spray applied finishes only have an 85% transfer efficiency.

A further advantage to our process is that it allows us to further minimize our carbon footprint because we finish the wood panels on both sides before we assemble the furniture.

What does that have to do with our carbon footprint?

It allows us to palletize components and ship them to North Carolina and California for assembly. In terms of raw efficiency, one truckload of parts equals roughly three truckloads of assembled furniture.

So when we ship by truck—compared to rail—our finishing process allows us to reduce our carbon footprint by approximately one third.

Don't Risk It

In the end, it shouldn't be much of a discussion. You don't want to risk exposing your students to furniture which is laden with VOCs and which might off-gas for months after installation. Instead, there are clean, non-toxic options available to you right now.

In conclusion, this Ebook has presented you with a clear case for why you don't want any VOCs in your furniture.

First, it's toxic to human health. And by compromising indoor air quality, it threatens the cognitive performance of your students. And of course, it's terrible for the environment.

It's also clear that you have compelling alternatives to furniture which still emits VOCs.

By choosing UV-cured solid hardwood furniture with no chemical flame-retardants, you can ensure the safety of your students while getting longer lasting sustainable furniture.

If you want to learn more, don't hesitate to reach out to me akofer@dcifurn.com.





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