



**Sustainable
Furniture
Purchasing
Guidance**

A Review of Sustainability Characteristics

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1. INTRODUCTION

This guide aims to support Penn staff in employing more sustainable purchasing practices for furniture. It provides an overview of sustainability attributes of furniture products and how they relate to health and environmental impacts, specifically focused on addressing the goals of Penn's *Climate and Sustainability Action Plan 3.0*.

The guide is intended to be a straightforward, easy-to-use document that provides those that purchase furniture for the University of Pennsylvania with:

- Recommended sustainability attributes for furniture
- A general understanding of the concepts and benefits of sustainability attributes for furniture
- Recommended optional furniture characteristics
- An overview of the furniture purchasing process at Penn

Released in October 2019, Penn's *Climate and Sustainability Action Plan (CSAP) 3.0* represents a vision for the University's sustainable future. In accordance with this vision and to improve Penn's impact on human health and the environment, CSAP 3.0 aims to encourage the purchase of more sustainable furniture by establishing sustainable furniture guidance for healthy interiors.

Sustainability attributes and certifications provide an independently verified report of how well a product performs according to different sustainability criteria such as what the pieces are made of, how they are made, and where these materials came from. By understanding these traits, different furniture pieces can be compared and selected based on prioritizing criteria, as appropriate. This ensures that Penn's campus is furnished by durable products that reflect sustainable practices.



2. RECOMMENDED ATTRIBUTES

This section addresses nine categories of furniture:

- Sofas
- Benches
- Chairs (*task chairs, lounge chairs, guest chairs*)
- Desks
- Workstations
- Tables (*conference tables, occasional tables*)
- Storage (*credenzas, cabinets, case goods, pedestals*)
- Electrical Office Equipment (*monitors, electrical components, lights*)
- Other Furniture Types (*such as privacy screens, dividers, and other accessories*)

a. Attributes and Certifications

For more information on the different types of certifications available, please see the [Glossary: Attributes](#). When looking for **furniture options that address sustainable best practices**, prioritize products with:

- Declare label indicating that the product is Red List Free (or another form of Material Health Transparency documentation, including a Declare label, Health Product Declarations (HPD), or Manufacturer's Inventory.)
- Environmental Product Declaration (EPD)
- BIFMA Level certification
- Indoor air quality certification, such as SCS Indoor Advantage Gold, UL GREENGUARD, and Intertek's Clean Air certification
- High percentage of recycled and/or biobased content
- FSC certification (for wood products)
- Corporate sustainability goals

For each furniture type, recommendations for certifications and sustainability attributes are listed. At a minimum, **all furniture pieces should be PVC free, which the EPA classifies as a known human carcinogen**. Furniture that has an **Environmental Product Declaration (EPD) should be preferred**. This is because EPDs require rigorous documentation of the lifecycle impacts of the product and allow greater transparency of factors that contribute to sustainability and human health.

Because different certifications and attributes cover different aspects of the product's health and environmental impacts, it's best to **look for a mixture of**

different types of attributes. For example, SCS Indoor Advantage Gold, UL GREENGUARD, and Intertek’s Clean Air certification all address indoor air quality, so it’s best to have just one of these certifications along with other certifications not related to air quality.

It is important to note that certification may not be obtainable for smaller organizations, while their products still meet certification standards. This should be considered when making furniture procurement decisions. In this situation, it is best practice to ask the dealer/ manufacturer representative for documentation that speaks to the standard.

Overall, what the piece is made of, where the materials come from, how the piece was produced, and how the manufacturer plans to address environmental sustainability are key aspects to consider when buying furniture.



Textile Components

For furniture pieces with textile components, such as sofas, benches, and chairs, it is important to consider the fabric's **composition and durability**, if it has any **chemical treatment**, and the supplier's **manufacturing process/management system**.

Look for Cradle to Cradle and Greenguard certified (or equivalent) textiles.

Cradle to Cradle certification evaluates textiles based on safety, circularity, and responsibility of materials and indicates that the textile is more sustainable than its uncertified counterparts. Greenguard certification indicates that the fabric has low chemical emissions, thus contributing to healthier interiors.

To address the sustainability of the fabric's manufacturing/management system, **look for fabrics that are ISO 14001 certified**. ISO 14001 certification evaluates the textile manufacturer's approaches to reducing pollution, minimizing waste, and managing the manufacturing process in an environmentally sustainable way.

Textiles should be **Red List free**. The Red List is a list of chemical classes that pose a serious threat to human health and environmental/ecological wellness. Common red list chemicals include: formaldehyde, per- and poly-fluorinated compounds (PFCs), polyvinyl chloride (PVC), antimicrobials, and flame retardants.

Additionally, in order to ensure durability of textiles and reduce frequency of replacement, look for products that are rated for 60,000 double rubs or higher and/or are abrasion resistant. When determining how durable the textile needs to be, also consider the location and use of the furniture piece; for example, if a piece will be in an outdoor setting, aspects such as weather resistance and colorfastness will be more important than if it is indoors.

Ideal textile options have the following qualities:

- ISO 14001 certified (or equivalent)
- Cradle to Cradle certified (or equivalent)
- Greenguard certified (or equivalent)
- Contains high percentages of natural or recycled content
- Red list chemical free, including PVC, antimicrobials, and fire retardants
- 60,000+ double rubs
- Abrasion resistant

b. Recommended Attributes by Furniture Type

The following recommendations are meant to serve as a guide for sustainability attributes and/or certifications to look for when purchasing different types of furniture. When possible, **purchase reused and refurbished furniture** from other Penn community members on [Ben's Attic](#) to reduce carbon emissions.

For each type of furniture, there are two categories of aspects and certifications: "Should be" and "Look for." The traits listed under "Should be" are common amongst the specified type of furniture and should act as a baseline for sustainable attributes. Traits listed under "Look for" are less common and should be prioritized. Some products might not be officially certified but still possess the same qualities required for certification. In these cases, ask the representative for documentation of the equivalent qualities. It should be noted that when looking at recycled content, it is more common to see high amounts of pre-consumer recycled content, but post-consumer recycled content is preferred.



Should be:

- PVC Free
- FSC Certified (for wood benches)

Look for:

- BIFMA Level Certification (Level 1+)
- Indoor Air Quality Certification (such as Clean Air)
- Recycled Content

Benches



Should be:

- PVC Free
- BIFMA Level Certification (Level 1+)

Look for:

- Healthier Hospital Compliant
- Environmental Product Declaration
- Declare or other Material Health Transparency Documentation
- Indoor Air Quality Certification

Sofas



Should be:

- PVC Free
- BIFMA Level Certification (Level 2+)

Look for:

- Environmental Product Declaration (Product Specific)
- Indoor Air Quality Certification (such as SCS Indoor Air Advantage)
- Declare or other Material Health Transparency Documentation
- Made from Recycled Content

Chairs



Should be:

- PVC Free
- BIFMA Level Certification (Level 2+)
- Made from Recycled Content (Pre-Consumer)

Look for:

- Declare (Red List Free) or other Material Health Transparency Documentation
- Indoor Air Quality Certification (such as SCS Indoor Air Advantage and Clean Air)
- Environmental Product Declaration (Product Specific)
- Healthier Hospital Compliant
- FSC Certification

Desks

**Should be:**

- PVC Free
- BIFMA Level Certified (Level 3)

Look for:

- Declare (Red List Free) or other Material Health Transparency Documentation
- Environmental Product Declaration (Product Specific)
- Indoor Air Quality Certification (such as SCS Indoor Advantage)
- FSC Certification
- Recycled Content (Pre-Consumer)
- Healthier Hospital Compliant

Workstations**Should be:**

- PVC Free
- BIFMA Level Certified (Level 2+)

Look for:

- Declare or other Material Health Transparency Documentation
- Environmental Product Declaration (Product Specific)
- Indoor Air Quality Certification (such as Intertek's Clean Air)
- Made from Recycled Content (Pre-Consumer Content)
- FSC Certified

Tables



Should be:

- PVC Free
- BIFMA Level Certified (Level 2+)

Look for:

- Declare (Red List Approved/LBC Compliant) or other Material Health Transparency Documentation
- Environmental Product Declaration (Product Specific)
- Indoor Air Quality Certification (such as Intertek's Clean Air)
- FSC Certified
- Made from Recycled Content (Pre-Consumer Content)

Storage



Should be:

- PVC Free
- Declare or other Material Health Transparency Documentation
- BIFMA Level Certified (Level 2+)

Look for:

- Indoor Air Quality Certification (such as Intertek's Clean Air)
- Made from Recycled Content (Pre-Consumer)
- Environmental Product Declaration

Electrical Office



Should be:

- PVC Free
- BIFMA Level Certified (Level 2+)
- Declare or other Material Health Transparency Documentation

Look for:

- Made from Recycled Content (Pre-Consumer)
- Environmental Product Declaration

Other

c. Furniture Disposal

Oftentimes, furniture dealers and manufacturers will provide takeback programs on certain pieces. Before disposing of old furniture, **reach out to the dealer/manufacturer to see if there is a takeback program for your furniture piece.**

[Ben's Attic](#) can be used when your furniture piece has reached the end of its useful life for your department, school, or center as an alternative to the landfill.

Penn's Netter Center hosts the Penn VIPs program. Penn VIPs works on Excess Items Distribution, wherein furniture and office supplies that are no longer of use to the University are shared equitably with the community. Visit the [Netter Center's Staff, Faculty, and Alumni Volunteer Opportunities page](#) for additional details and contact information.

If your school or center has a large quantity of furniture in good condition (not broken, stained, or torn) and that is no longer needed, Revolution Recovery may be able to find a reuse for the pieces if given enough of a lead time. Please contact Revolution Recovery at info@revolutionrecovery.com a few weeks to a month prior to disposal for more information and provide furniture make, model, approximate quantities, and photos if available. Revolution Recovery may request to conduct a site visit and does not provide labor to transfer furniture to a loading dock for delivery.

If you have furniture that is not in good condition or other bulk and construction debris, Revolution Recovery can also support with recycling these items.

[Habitat for Humanity's ReStore](#) also accepts furniture pieces that are in good condition. Free pickup is offered for donations and has no minimum donation size, though bulk donations are preferred. Please note that if you schedule a pickup for a single, small item (or items that could be easily dropped off), your pickup may be cancelled. Information on what can be donated, how to schedule a pickup, and the ReStore's donation hours can be found on the [ReStore donation page](#). For further questions, please contact restore@habitatphiladelphia.org.

d. Additional Guidance

Your school or center may provide additional or more detailed guidelines on sustainable furniture purchasing. Work with your school/center's facilities group when purchasing furniture, as they may provide recommendations for

specific pieces and help to better guide your furniture buying decisions in conjunction with this guide.

Please note that in compliance with safety measurements set by EHRS, **only non-fabric, wipeable chairs and stools should be used in laboratory spaces**, including desk areas within the lab. Your school or department may already have a selection of chairs and stools approved for use in laboratory spaces. Additional guidance can be found on the [EHRS Chair/Stool Specification webpage](#).

The [Supplier Search webpage](#) can be used to look through Penn's preferred contract suppliers and search for ones that are local, women owned, LGBTQ+ owned, etc. In consideration of the ties between economic and environmental sustainability, this tool can also be used to search for WBE (Woman Business Enterprise) and MBE (Minority Business Enterprise) certified suppliers.

The Sustainable Furnishings Council offers a [Quick Buying Guide](#) that outlines major considerations when buying furniture. The Environmental Protection Agency also provides more in-depth recommendations for standards and certifications to look for when purchasing furniture. Details can be found on the EPA's website [Sustainable Marketplace: Greener Products and Services for Furniture](#).

It is also important to **consider ergonomics prior to purchasing furniture pieces**. The goal is to select furniture with an adjustability range that allows it to fit most users. This will help ensure that your chosen piece is able to function properly, avoiding returns and replacements of furniture pieces. Refer to the [Appendix: Ergonomics](#) section for more information.



3. LONG TERM GOALS

One of Penn's primary goals within *CSAP 3.0* is to reduce carbon emissions and achieve carbon neutrality by 2042. This guide contributes to this goal by increasing awareness of and providing guidelines for sustainable furniture procurement focused both on environmental and health impacts.

While guidelines are provided for each furniture category based on recent data from common furniture manufacturers, our future goals aim towards higher standards of furniture. As a leader in environmental sustainability, Penn looks to lead by example and push for higher availability of healthier, more environmentally friendly furniture.

One way that we can do this is by encouraging manufacturers to prioritize certain attributes and certifications. For example, currently Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) are relatively uncommon for furniture pieces. By showing that Penn is dedicated to purchasing pieces that have these standards, this can indicate to manufacturers that more products should have these attributes.

Based on this, we encourage buyers to have discussions with the vendors about our priorities for furniture. The following are ideal traits for sustainable furniture:

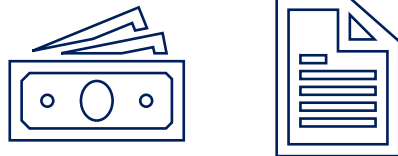
- Material Health Transparency documentation that prioritizes eliminating chemicals of concern
- Environmental Product Declaration (EDP) demonstrating a reduction in embodied carbon or other environmental impacts of products
- BIFMA Level certification
- Indoor air quality certification
- High percentage of recycled content, particularly post-consumer
- High percentage of biobased content
- FSC certification (for wood products)
- PVC free
- Purchasing from regional manufacturers
- Purchasing from minority owned dealers/manufacturers

4. PURCHASING PROCESS

When making new furniture purchases at Penn, establishing a Purchase Order is required. Approved methods of purchasing can be found on [Procurement Services' website Making Purchases](#).

When possible, **purchase reclaimed and refurbished furniture from [Ben's Attic](#)**. Ben's Attic is the University's surplus property exchange site for faculty and staff. By purchasing reused furniture from Ben's Attic, we **reduce carbon emissions associated with the production and transportation of new furniture**. Ben's Attic can also be used as an alternative to disposal when your furniture piece has reached the end of its useful life for your department, school, or center.

Questions regarding the purchasing process can be directed to sourcing@upenn.edu.



5. ERGONOMICS

When purchasing furniture pieces, consideration of **ergonomics will help you choose the right piece**. Ergonomics looks at comfort and functionality in relation to the movement of the human body. By correctly specifying furniture based on ergonomics, we can **reduce emissions associated with returning or repurchasing unfit furniture pieces**.

In general, it is best to select workstations and chairs with an adjustability range that can fit most prospective users. This includes height adjustable workstations, and chairs with adjustable seat height, lumbar support, seat depth, and arm width and height.

Penn EHRS offers additional in-depth guidelines on ergonomic furniture selection through their [Computer Ergonomics webpage](#). Resources include:

- [Selecting Office Furniture](#) – includes standard work surface heights and recommended office furniture criteria
- [Humantech Office Ergonomics](#) – a training module on how to adjust your workstation for better ergonomics
- [Workstation Accessories](#) – outlines accessories aimed towards improving ergonomics successfully used throughout campus
- [Penn Chair Guidance document](#) – provides more details on how to choose the right chair
- [Contact the Ergonomics Staff](#) – fill out this form for direct assistance from ergonomics staff

When purchasing furniture for an office space, it's important to account for the **configuration of the workstation and how the occupant will use their workstation**.

Specifications for height adjustable desks are different than specifications for non-adjustable desks. For height adjustable standing desks, the range of motion should accommodate both petite and tall users. We recommend a range of 24 inches to 48 inches. A standing desk converter that sits on top of a fixed desk often needs a wide surface. Check the depth of the desktop it will sit on. Make sure to review overhead cabinet locations when determining if an adjustable desk will work.

When purchasing L-shaped desks with a side return, choose a curved or diagonal corner rather than 90-degree corner. If someone works at the corner, a 90-degree corner does not allow for use of a keyboard tray and

creates awkward postures. The curved or diagonal corner provides room for a chair to move closer to the desk.

For staff who use a laptop as their primary computer, workstations should be designed with a docking station and external monitor, mouse, and keyboard to provide appropriate alignment. If necessary, a laptop stand can be used to provide correct monitor height with an external keyboard and mouse.

The following images show guidance for best practices in designing both seated and standing workstations for proper ergonomics. Figure 1 shows the proper way to configure your workstation for seated work. Figure 2 shows proper configuration for standing work – [visit the EHRS website for more information on standing workstations.](#)

GUIDE TO ERGONOMIC SEATED POSTURE

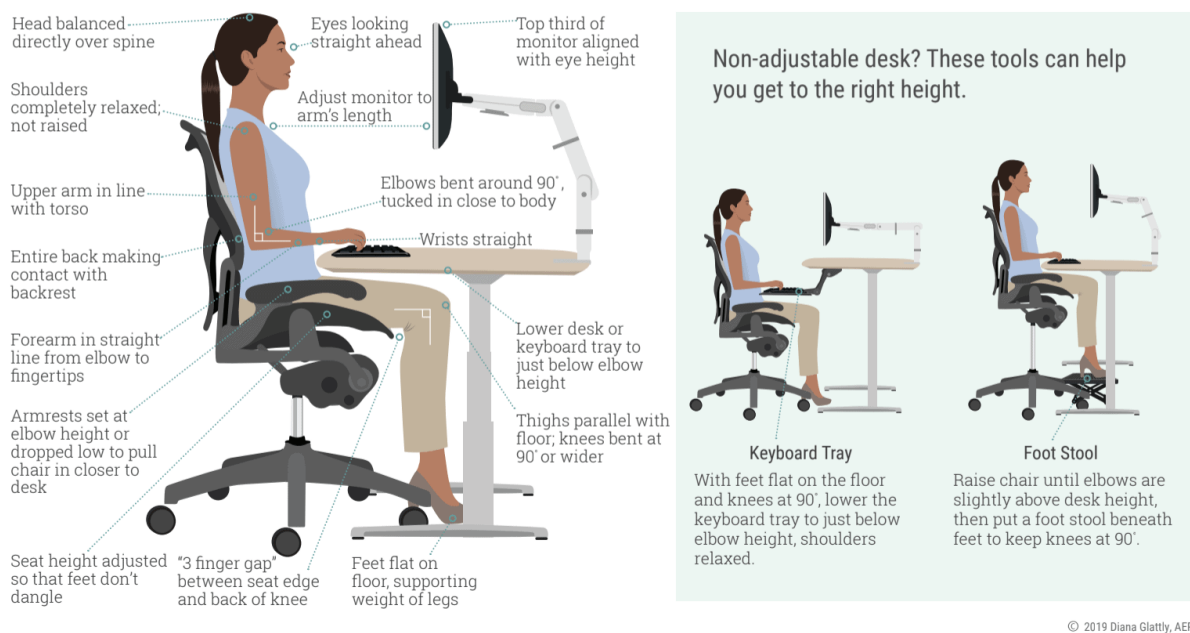
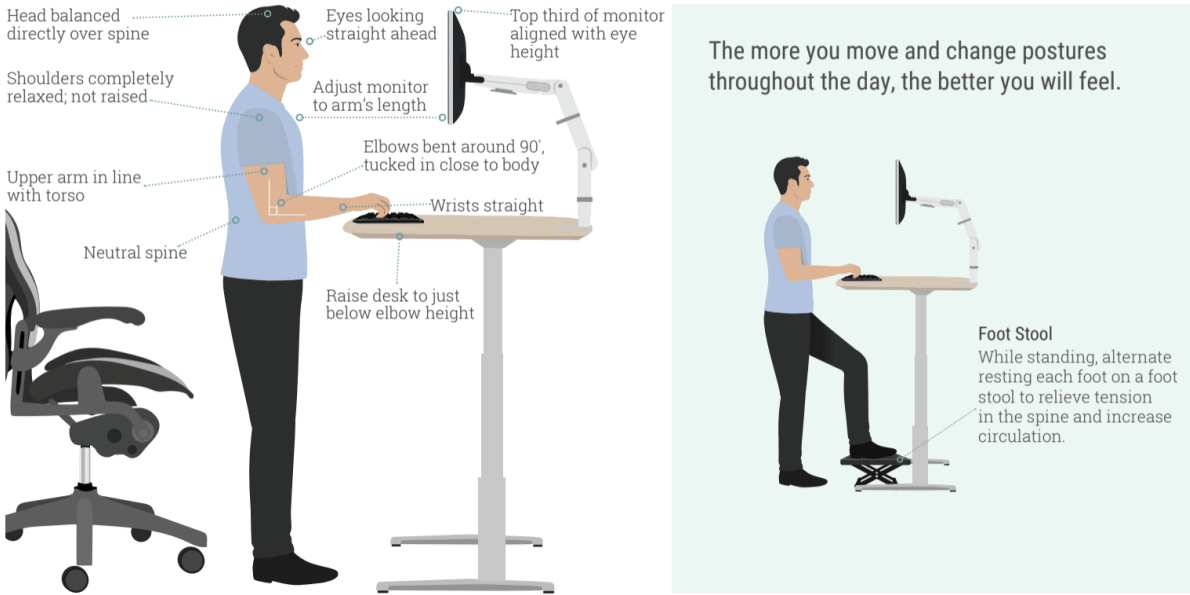


Figure 1. Guide to ergonomics for seated work (graphic provided by Herman Miller)

GUIDE TO ERGONOMIC STANDING POSTURE



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Figure 2. Guide to ergonomics for standing work (graphic provided by Herman Miller)

6. CURRENT PURCHASING PATTERNS

The most common manufacturers and certifications were determined based on data collected from furniture manufacturers about furniture pieces purchased by Penn in 2019. This data was used as a baseline for generating recommendations for this guide. Recommendations were then adjusted in accordance with Penn's goals to reduce carbon emissions related to furniture on campus.

There are many options for furniture sustainability certifications. Overall, **BIFMA Level certification is most common** amongst the manufacturers from which Penn purchases. BIFMA Level certification looks at sustainability attributes broadly, including chemicals, manufacturing processes, worker and end user health, and organizational commitments. It comprises three tiers: Level 1, Level 2, and Level 3. **Level 2 is the most common** BIFMA Level certification, but Penn should **aim for Level 3** when purchasing furniture. This is because Level 3 certification indicates more rigorous reporting and performance, and BIFMA Level 3 products are generally more sustainable. More information on BIFMA Level certification can be found in the [Glossary: Certifications](#) section.

Certifications that show material health are key in specifying sustainable, healthy furniture. Declare: Red List Free, is the most common material health transparency document, indicating that the product is free of red list chemicals. A Declare Label focuses on the origin, materials, and end of life of the product. Health Product Declarations (HPDs), which report potentially hazardous chemicals used to create a product, are currently relatively uncommon. When looking at material health, **all furniture pieces purchased at Penn should be red list free** if possible, and at a minimum be PVC free. Despite limited options, furniture pieces with HPDs are preferred. More information can be found in the [Glossary: Certifications](#) section.

Environmental Product Declarations (EPDs) are also relatively uncommon and look at a product's life cycle assessment (LCA). Through the LCA, EPDs provide a general understanding of what a product's embodied carbon is. Although it can be difficult to compare products based on their embodied carbon due to inconsistent and infrequent reporting, those with EPDs generally have a more rigorous study and reporting of the product's qualities and are preferred.

The two most purchased furniture manufacturers at Penn are Knoll and Herman Miller. In 2021, the two companies merged into a single entity, MillerKnoll. At the time of data collection, Herman Miller and Knoll existed as

separate entities. It was found that Knoll had relatively high percentages of products with EPDs, HPDs, and Declare Labels (or other Material Health Transparency Documentation), while Herman Miller had a low percentage of products meeting these standards. Herman Miller reported both a corporate carbon reduction plan and annual corporate social responsibility reporting, while Knoll reported neither. Both Herman Miller and Knoll had take-back programs available for all purchases. For more information on [MillerKnoll](#) and the other manufacturers named in this guide, view their respective websites.

Example Manufacturers

To ensure that the recommended attributes for each product are achievable, information directly obtained from furniture companies frequently engaged by Penn schools and centers as well as other publicly available sources about their products were used. The list of furniture manufacturers below represents companies that self-report providing products that meet recommended characteristics to look for in each category. This list is not comprehensive, and other companies and products may meet similar recommended standards and certifications and be better suited for a school or center’s intended use.

Benches

| Manufacturer | Advantages |
|---------------------|------------------------------------------------------------------------------------------|
| Knoll | Intertek’s Clean Air Certification |
| Turnstone | Declare or other Material Health Transparency Documentation BIFMA Level Certification |
| Davis | BIFMA Level Certification Healthier Hospital Compliant |

Sofas

| Manufacturer | Advantages |
|---------------------|------------------------------------------------------------------------------------------|
| Turnstone | Declare or other Material Health Transparency Documentation BIFMA Level Certification |
| Davis | BIFMA Level Certification Healthier Hospital Compliant |
| Bernhardt Design | BIFMA Level Certification UL GREENGUARD Certification |

Chairs

| Manufacturer | Advantages |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Knoll | Declare (or other Material Health Transparency Documentation) BIFMA Level Certification Intertek’s Clean Air Certification |

| | |
|----------|------------------------------------------------------------------------------------------|
| Coalesse | Declare or other Material Health Transparency Documentation BIFMA Level Certification |
|----------|------------------------------------------------------------------------------------------|

Desks

| Manufacturer | Advantages |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kimball | Declare or other Material Health Transparency Documentation BIFMA Level Certification Healthier Hospital Compliant Indoor Air Quality Certification (such as SCS Indoor Advantage Gold) High Percentage of Recycled Content (Pre-Consumer) |
| Knoll | BIFMA Level Certification Indoor Air Quality Certification (such as Intertek’s Clean Air) FSC Certified High Percentage of Recycled Content (Pre-Consumer) |

Workstations

| Manufacturer | Advantages |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knoll | BIFMA Level Certification FSC Certification Environmental Product Declaration (Product Specific) |
| Allsteel | Declare or other Material Health Transparency Documentation BIFMA Level Certification Indoor Air Quality Certification (such as SCS Indoor Advantage Gold) Healthier Hospital Compliant |

Tables

| Manufacturer | Advantages |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knoll | Declare or other Material Health Transparency Documentation BIFMA Level Certification Indoor Air Quality Certification (such as Intertek’s Clean Air) High Percentage of Recycled Content (Pre-Consumer) |
| Steelcase | Declare or other Material Health Transparency Documentation BIFMA Level Certification High Percentage of Recycled Content |
| Coalesse | Declare or other Material Health Transparency Documentation BIFMA Level Certification |

Storage

| Manufacturer | Advantages |
|---------------------|-----------------------------------------------------------------------------------------------------------|
| Knoll | Declare or other Material Health Transparency Documentation BIFMA Level Certification FSC Certified |

| | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Indoor Air Quality Certification (such as SCS Indoor Advantage Gold) High Percentage of Recycled Content (Pre-Consumer) |
| National Office Furniture | Declare or other Material Health Transparency Documentation BIFMA Level Certification Indoor Air Quality Certification (such as SCS Indoor Advantage Gold) High Percentage of Recycled Content (Pre-Consumer) |

Electrical Office Equipment

| Manufacturer | Advantages |
|---------------------|---------------------------------------------------------------------------------------------------------------|
| Knoll | BIFMA Level Certification FSC Certified Indoor Air Quality Certification (such as Intertek’s Clean Air) |
| Steelcase | Declare or other Material Health Transparency Documentation BIFMA Level Certification |

Other

| Manufacturer | Advantages |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knoll | Declare or other Material Health Transparency Documentation BIFMA Level Certification FSC Certified Indoor Air Quality Certification (such as Intertek’s Clean Air) |
| Steelcase | Declare or other Material Health Transparency Documentation BIFMA Level Certification |
| Trendway | Declare or other Material Health Transparency Documentation BIFMA Level Certification Indoor Air Quality Certification (such as SCS Indoor Advantage Gold) High Percentage of Recycled Content (Pre-Consumer) |

Analysis By Furniture Type

Analysis of furniture products purchased is organized into nine furniture type categories:

- Sofas
- Benches
- Chairs (*task chairs, lounge chairs, guest chairs*)
- Desk
- Workstations
- Tables (*conference tables, occasional tables*)
- Storage (*credenzas, cabinets, case goods, pedestals*)
- Electrical Office Equipment (*monitors, electrical components, lights*)

- Other Furniture Types

Occurrences of certifications and attributes as self-reported by the manufacturers were analyzed by furniture type to assess which were most prevalent at the time of request and what goals might be achievable or were already being met. When assessing different certifications and attributes, focus was placed on the following key areas: material health transparency, environmental product declarations, indoor air quality, red list chemicals, and recycled content.

For each of the key areas, occurrences of relevant attributes were analyzed. For example, Figure 1 shows the average percentage of bio-based and recycled content for each furniture category. Desks have a relatively high average amount of pre-consumer recycled content, whereas sofas have a relatively low average amount of recycled content. This indicates that when purchasing desks, it is common to see a high percentage of recycled content in each piece.

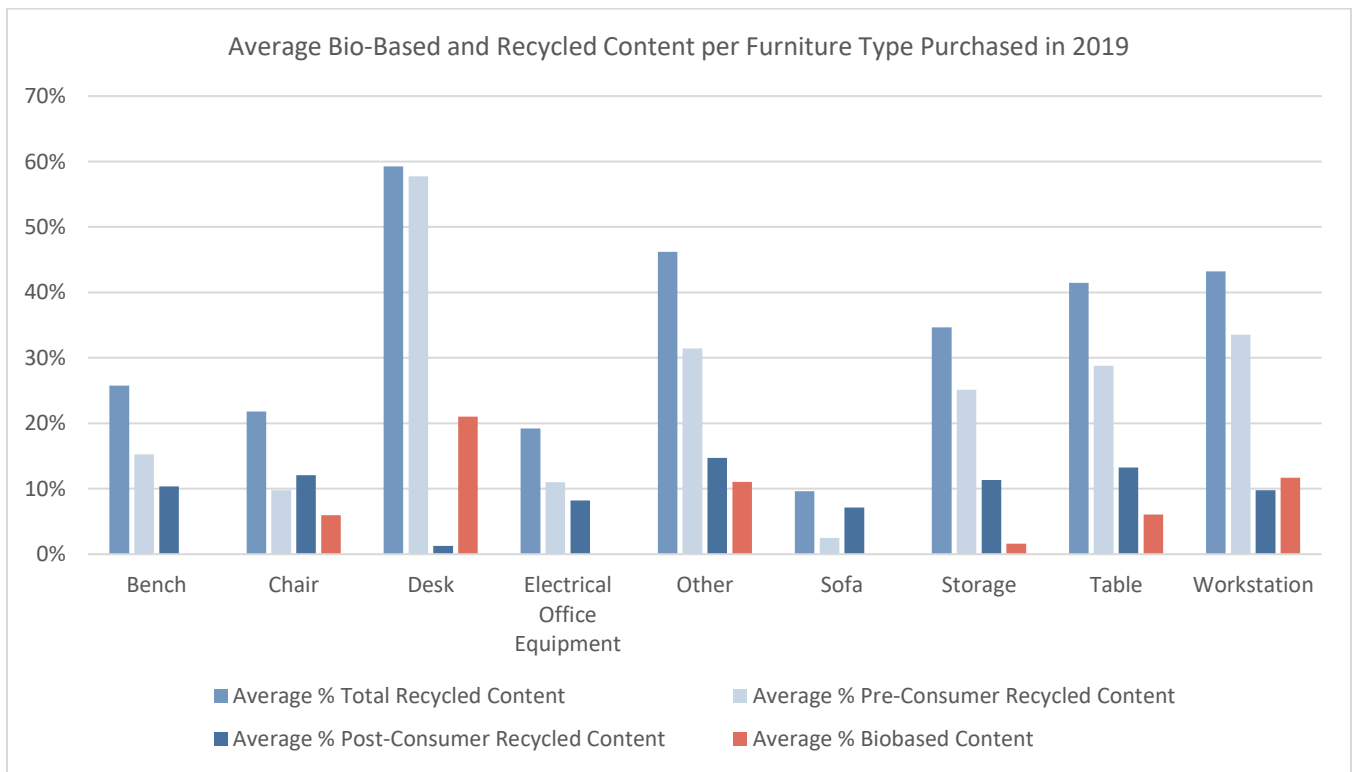


Figure 1. Average Bio-Based and Recycled Content per Furniture Type Purchased in 2019

Figure 2 shows the frequency of BIFMA Level certification per furniture type. Based on this information, sofas purchased by Penn should be BIFMA Level certified with at least Level 1 and aiming for Level 2.

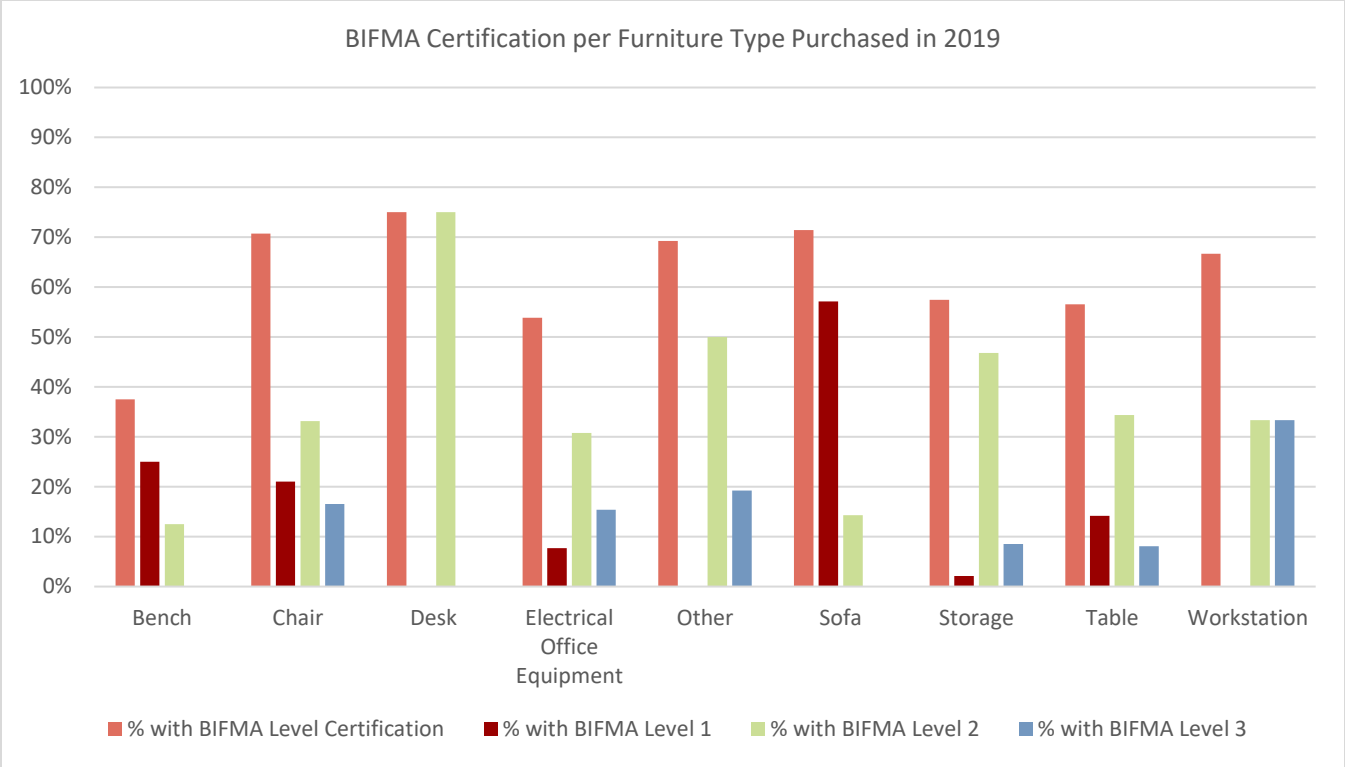


Figure 2. BIFMA Certification per Furniture Type Purchased in 2019

For each category, these analyses were used to generate a baseline for recommendations, which were then adjusted to better promote healthier, more environmentally sustainable purchasing in accordance with Penn’s *Climate and Sustainability Action Plan 3.0* goals. These recommendations can be viewed in the [Recommendations](#) section.

7. APPENDIX

a. Resources

- The American Institute of Architect's [Materials Pledge](#)
- California Government Proposition 65's [Formaldehyde in Furniture Products](#)
- Carbon Cure's [What is Embodied Carbon?](#)
- Carbon Leadership Forum's [Environmental Product Declaration Requirements in Procurement Policies](#)
- Ecolabel Index's [Alphabetical Index of Ecolabels for Furniture](#)
- EPA's [Polyvinyl Chloride and Copolymers Production: National Emission Standards for Hazardous Air Pollutants](#)
- EPA's [Recommendations of Standards/Ecolabels for Purchasing Furniture](#)
- EPA's [Recommendations of Specifications, Standards, and Ecolabels for Federal Purchasing](#)
- Health Product Declaration Collaborative's [Project Team user Guide: using Health Product Declaration \(HPD\)](#)
- International Living Future Institute's [The Red List](#)
- Sustainable Furnishings Council's [Furniture Quick Buying Guide](#)
- Sustainable Furnishings Council's [Glossary of Furniture Sustainability Terms](#)
- USDA's [Definition of Biobased Products](#)
- USGBC's [Recycled content \(post-consumer 1/2 pre-consumer\)](#)
- Muralikrishna & Manickam's [Environmental Management: Science and Engineering for Industry \(Chapter 5\)](#)
- Penn EHRS's [Computer Ergonomics page](#)
- Tanaka-Kagawa et al's [Volatile Organic Compounds \(VOCs\) Emitted from Large Furniture in *Bulletin of National Institute of Health Sciences*](#)