

# **Wooden Lab Casework: A Comparative Study**

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## **Introduction**

In building its new science center, St. Olaf College has specified a wish for wooden lab casework. As the builders are seeking a LEED gold rating for the building, any products or materials going into the building must be sustainable and environmentally friendly in ways conforming to the LEED rubric. The researchers of this report investigated two manufacturers, Fisher Hamilton and Diversified Woodcrafts, and their distributors, Haldeman-Homme and Lance Service, respectively. Using the Environmental Impact Questionnaire as a basis for questioning, this report evaluates these companies and their products in the categories of materials, production, transport, and operation/performance. Both wooden lab casework and steel-core casework with wood fronts have been considered in separate sections, with an overall recommendation at the end.

## **Wood Casework – Concerns and Profiles, Fisher Hamilton and Diversified Woodcrafts**

### Materials

In wood casework, materials to be considered include wood, glue/adhesive, finishing, and steel. (A discussion of steel is found in the next section, “Integration of Wood and Steel.”)

As for wood, getting the raw product is not as easy as harvesting a tree, nor is it even as simple as planting a new tree for every old one cut down. It takes a number of years for trees to achieve maturity, and different types of trees grow at different rates. Careful planning must be employed to ensure optimal growth for a forest. There are a number of different organizations that regulate sustainable forests, a major one being the Forest Stewardship Council (FSC).

Fisher Hamilton is a member of the FSC and uses its special Chain-of-Custody (COC) products. The company has also been certified by SmartWood, the Rainforest Alliance, and the

Leadership in Energy and Environmental Design (LEED), a program developed by the U.S. Green Building Council. Its wood is obtained from Northern Wisconsin and Southern Canada. The glues used by Fisher Hamilton in piecing together the wood contain no added urea formaldehyde and are well below HUD and OSHA formaldehyde glue level standards. No glue is used in installation; screws are used instead.

Diversified Woodcrafts' lumber comes from FSC certified forests North of Green Bay, within a 100-mile radius of their plant, and next month, the company will be certified for COC wood. No information was available about the glue used during assembly. For installation, the matter of glue is handled by the company's local distributor, Lance Service, who has decided to use no glue at all. Rather, all products are assembled with screws. This leads to an elimination of any possible off-gassing. Much of the company's plywood is obtained from Weyerhaeuser, who uses sustainable forest wood and environmentally efficient mills.

As for finishing, both companies use a special, environmentally friendly wood finish, though Fisher Hamilton was the first in the industry to do so. Once, an accepted norm was the use of harsh chemical solvents as finishing, a process with a high potential for hazardous waste, whether through byproducts during manufacturing and after eventual disposal or through off-gassing during use. In lieu of this, Fisher Hamilton invested in developing a water-based polyurethane finish, the first to do so. Such a finish eliminates hazardous chemical waste and gives off virtually no VOCs and no HAPs, meeting SEFA requirements.

Fisher Hamilton, since developing the finish, has used this process for over 10 years, and though it was once optional, it is now standard for all its wood products, as well as for the industry, which is moving away from solvent-based finishing. Though such water-based finishes are becoming more common, Fisher Hamilton's pioneering product demonstrates both

environmental concern and, more importantly, a foresight into future sustainable practices. In addition, Fisher Hamilton applies the finish in custom spray booths so that airborne emissions may be reduced and to minimize the amounts of finishing wasted. Finally, of special concern to LEED and the St. Olaf Science Center, Fisher Hamilton's finish was manufactured in Minnesota, well within LEED's specified 500-mile radius for materials.

Diversified Woodcrafts also uses a water-based finish that meets and exceeds SEFA's standards for a "quality casework" product. Diversified Woodcrafts' finish is similarly virtually emission-free, and the company is soon switching to a more efficient process of applying the finish. Instead of manually using paint sprayers to apply finishes waste will be reduced by directly rolling and/or spraying the wood before cabinet assembly. As specified in the hardcopy MSDS materials, the finish comes from Chemcraft International from Winston-Salem in North Carolina.

### Production

Green concerns in production include efforts to reduce waste, to recycle what waste *is* produced, to maximize the efficiency of energy use, and to utilize resources in an intelligent and quality-oriented manner.

One consideration when evaluating wood cabinets is the type(s) of wood used. Wood naturally takes in water, and different tree species have different rates of water retention. In one product, Fisher Hamilton uses all the same species of wood to ensure the same expansion rate throughout. However, Diversified Woodcrafts uses different types of wood for sides and fronts of their drawers, a potential hazard during humid or wet weather.

In production of wood products, waste material is to be expected. However, efforts should be made to minimize the amount of waste that occurs in the transition from raw material to final product. Also, any generated waste should be recycled in a number of different ways. At Fisher Hamilton, a computer program chooses what cuts to make in order to maximize the output of a piece of wood. The resulting wood trimmings are collected and later burned to heat the factory. Diversified Woodcrafts uses similar processes concerning maximizing the area used and minimized the waste produced. The company uses large sheets of plywood and advanced computer cutting design to get as many pieces from the sheet as possible. Any sawdust or “off-fall” from the cutting process is sold to a local company that makes burnable wood pellets.

### Transportation

Transportation of materials and products is also an important consideration. Distance, quality, and means of transportation all have environmental impact. Reduction of the distance a product has to be shipped means a reduction in emissions from trucks and energy used shipping that product. Quality of transportation is an environmental concern in that shoddy handling and shipping of products means more damaged products and thus more waste. Finally, the means of shipment, that is, protective measures and packaging, have an impact as well.

Fisher Hamilton and its distributor nearest to St. Olaf, Haldeman-Homme, use both materials and products well within LEED specifications. The previously mentioned sustainable forests are located in Northern Wisconsin and Southern Canada, with Haldeman-Homme located nearby in Minneapolis, Minnesota. To ensure the quality of their products’ transportation and the minimization of damaged products, Fisher Hamilton uses air ride trailers. As for packaging, Fisher Hamilton uses blankets for its shipments, one of the few companies employing such a

practice. The blankets are reusable, a major plus for reducing construction waste. (An image of the blankets is included to the right.) Overall, Fisher Hamilton proves again to employ a good deal of common sense and environmental concern and foresight.



Diversified Woodcrafts ships their products in stretching or foam wrap in order to protect products onsite. The rationale is that any blankets used to ship the cabinets would be taken back after delivery, leaving the cabinets exposed to possible damage. All packaging materials are recycled by the dealer (here,

Lance Service). A picture of this kind of wrapping is included to the left.

### Operation/Performance

Operation and performance are concerned with the durability and lifetime of a product. The longer lifetime a product has, the less it has to be replaced with a new product, meaning less use of materials. Both companies similarly manufacture their products for quality and provide warranties and service.

### Comparison

Both companies operate with environmental concerns. Both have nearby distributors and get most of their resources from similarly close distances (with the exception of Diversified

Woodcrafts' finish from a comparatively long distance). Both have similarly sustainable production practices. The main areas in which they differ are packaging, prestige, and mentality. Diversified Woodcrafts uses stretching or foam wrap, which, though it can be recycled, is not made for recycling and reuse. A construction site can easily have ways of storing materials to protect them from damage. The authors of this report find Fisher Hamilton's use of packing blankets a more environmentally sound means of transport. Also, prestige and mentality are important considerations. Fisher Hamilton is widely considered a leader in environmental solutions, having been a pioneer in water-based finishes and, in areas such as packaging, anticipating future environmental standards. Fisher Hamilton is also very experienced in LEED building projects and in working to minimize or eliminate waste. Also, mentality and spirit differ greatly between the two companies. Not only does Diversified Woodcrafts make little mention on their website of their environmental practices or certified wood, but also whenever the authors contacted the company, it showed a general unresponsiveness and lack of enthusiasm, with the noted exception of one professional. Fisher Hamilton and Haldeman-Homme, on the other hand, clearly display an environmental commitment on their websites. In addition, their responses were timely, enthusiastic, and informative. For these reasons of environmental foresight and commitment, the authors of this report recommend Fisher Hamilton's wood products.

## **Integration of Wood and Steel**

### Introduction

Even when narrowed down to the specification of wooden lab casework, two options still remain: namely, pure wood cabinets or steel-frame cabinets with wood fronts. Most people prefer the look and feel of wood to those of steel, and usually wood is selected for its warm, aesthetic look, not its durability or sustainable qualities. Steel, on the other hand, because of its cold and rather sterile appearance, is an often-overlooked option in considering laboratory casework. However, the two are not totally separable. In a meeting with Ronald Johnson and Farid Saed of Haldeman-Homme, Inc., they asserted that even pure wood casework will contain some small amount of steel, even if simply in the drawer slides and other smaller mechanical components.

Another option is a more integrated design of the two, using their various strengths. Namely, steel's durability and wood's traditional charm can be combined in a pleasing hybrid. Labs can be outfitted to make one feel surrounded by wood while most of the structure and core materials of the casework are actually made of steel. In some labs, the benches on the floor are made with wood and the cupboards with steel, or the benches and cupboards can be made with a steel frame and wood exterior. Fisher Hamilton offers such a product in a line called Accent. This product is highly recommended by the authors for a number of reasons. Most importantly, the environmental reasons for incorporating steel with wood are especially attractive.

What follows is an evaluation of the environmental practices of Fisher Hamilton in generating steel products, along with a comparison between pure wood products and wood-steel combinations. As Diversified Woodcrafts specializes in wood products, no product can be

analyzed in depth here. However, the small amount of steel that their wooden cabinets does contain comes from CompX, a company based in Dallas, Texas. This distance, well away from standards for sustainable distance, makes Diversified Woodcrafts hard to recommend in this respect. (On the same count, no information could be supplied as to the origin of Fisher Hamilton's steel. Both companies could very likely be equally "unsustainable" in this respect.)

### Materials

As for steel, material considerations include the amount of recycled steel total in a piece of steel, percentages of different types of recycled steel, and type of finishing coat used in steel.

Steel can be recycled extensively without losing much quality. A minimum of 25% of Fisher Hamilton's steel is recycled (sometimes as high as 50%), and of this recycled steel, 25%-40% is post-industrial and 60%-75% post-consumer.

Finishing is another aspect to consider the sustainability of a steel product. The finishing process Fisher Hamilton uses on all their steel is environmentally friendly on a number of accounts. First, instead of a liquid coat, the company uses a special powder coat that is applied dry to the steel. (Two images of this process are included below.)



The coat is then electrically charged to adhere to the material, and the resulting finish baked onto the steel. One special feature of the process is that Fisher Hamilton reclaims all powder waste during the process by applying the coat in special, closed-off chambers that use an air and filters to collect all powder not used in the process. In addition, the nature of the dry powder process allows for a much thicker coat to be effectively applied to the steel, making it very resistant while being more efficient and environmentally friendly than typical liquid finishes.

### Production

Production concerns for steel include minimization and recycling of waste products. Just as with wood products, Fisher Hamilton uses a computer program to maximize available amount of steel in a single piece. Any scrap metal is sent back to the steel mill to be recycled.

### Transport

No specific information on the transport of steel materials and products was provided, but it can be safely assumed that Fisher Hamilton's methods of shipping steel are comparable to those of shipping wood.

### Operation/Performance

Most issues of operation and performance will be discussed in the subsequent comparison between wood and steel-wood combinations. However, one aspect of Fisher Hamilton's steel is notable here. To ensure quality performance, the company tests the strength of every piece of finished steel leaving its factory. In fact, it tests the steel for somewhere between 50-100 lbs. more than standard strength before the steel is approved.

## Comparison

Using steel as the core of a wood-fronted cabinet has definite environmental benefits. The first consideration in choosing between pure wood casework and the steel-wood hybrid is sheer raw material required for each. For example, except for certain components, wood casework requires mostly virgin timber, since recycled wood cannot yet meet quality standards to comprise most of a cabinet. On the other hand, as previously noted, steel can be recycled without losing much of its quality, leading to a higher possible percent of recycled material in steel. As virgin material requires extraction, shipping, and treatment, all of which require energy and produce emissions, a high amount of recycled content, along with high percentages of post-industrial and post-consumer content, is a key figure in gaining the LEED point concerning recycled content. High percentages of recycled content are hard to obtain in wood because although recycled wood can be used to make lower-grade particleboard and plywood, these form the core materials and not the structure of the casework, which requires harder wood.

Also, the comparative strength of steel means less of it has to be used for the same effect. Namely, processing properties of steel create these benefits. Because steel can be generated in larger volumes than wood, a small amount of high-volume steel cabinets can be made, whereas quality wood would require more low-volume cabinets. Steel can also be less wasteful than wood during the manufacturing process itself. In the case of wood, unless trimmings are chipped and made into plywood for the interior (only one of possible interiors), they cannot be used further in the product being made. The best possible scenario is that the wood trimmings can be used for heat.

Another environmental plus of steel is its strength, which leads to longevity. Steel both lasts longer than wood and is more durable. In these areas, steel is attractive with regard both to

the environment and to the hassle involved with maintenance. Steel is easier to replace than wood, especially since, being a welded material, small pieces of steel can be replaced without needing to replace the whole surrounding section as is often the case with wood. Welding, environmentally speaking, is preferable to gluing wood because of the potential for release of harmful glue,



not to mention what went into making the glue in the first place. In addition, steel can be welded, replaced and continually modified without compromising its structural integrity. Another consideration is adaptability. While both materials can be easily moved throughout a building, wood is much more delicate and can wear down—screw holes widen and tear, and

components are often too unwieldy to avoid resorting to full replacement. Furthermore, when the steel in casework outlasts the building it is in (as is often the case), modular parts make it easy to convert it to other uses. Wood cannot be so easily converted nor is used wood desirable to the builders of a new structure. Finally, steel lasts about twice as long as wood. Wood will generally last 20 to 25 years while steel will last 50. For better reference, pictures of a cabinet and the fume hoods from the Accent line are included above.

## **Final Recommendation**

Steel is outstanding in its amount of recycled content possible, its durability, and its longevity. Therefore, the authors of this report highly recommend a product combining wood and steel. Also, given their environmentally sound procedures, of this type of lab casework, the authors recommend Fisher Hamilton's Accent line. This choice, given steel's superior qualities and wood's pleasing look, preserves the look and feel of a wood-furnished lab while realizing the environmental benefits of steel and helping to accumulate one or more LEED points as well.

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