An Investigation Into Evaluation of Health Product Declarations (HPD's) for UBC Campus Building Projects

Dipankar Tewari, Faiza Yahya, Mateus Leite, Tathan Liu

University of British Columbia

APSC 262

April 10, 2014

Date: April 10, 2014
Instructor: Naoko Ellis
Course: APSC 262

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Faiza Yahya
Dipankar Tewari
Tathan Liu
Mateus Leite

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Abstract

This report investigates into the Health Product Declaration in order to analyze its benefits, its usefulness over other eco-labels like Declare Label and Manufacturer Inventory. This is vital information to providing recommendations for UBC building project submission requirements and optimization. In order to assess HPD, the triple bottom line assessment is conducted based on environmental, social, and economic impact of HPD. To promote the transparency of HPD all the ingredients harmful to human body should be listed on HPD indicating its level of harm; "Red" indicates the most harm. This disclosure is necessary to create the transparency so that customers can make right decisions by obtaining products that are not as harmful to the human health.

In the economic analysis conducted, it is found that HPD Collaborative is the most comprehensive and eco friendly label compared to other eco-labels like Manufacturers Inventory and Declare Label. The most common material that is found to be carcinogenic is PVC which is prevalent in flooring, paints, carpeting, and furnishings. It is recommended that PVC flooring be replaced by Linoleum flooring or Bamboo flooring because of fewer adhesives.

Glossary

Sustainability	The quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance.
Tectum Panels	Interior Wall panels used for very commonly in building structures
Transparency	In Health Product Declaration context, this pertains to disclosure of all the harmful materials in the product. Health Product Declaration forces for greater transparency.
Red List	In Health Product Declaration red listed materials in the building products are most harmful to humans and have potential of causing cancer

List of Abbreviations

Term	Abbreviations
HPD	Health Product Declaration
PVC	Polyvinyl chloride
VOC	Volatile organic compound
IARC	International Agency for Research on Cancer
PVA	Polyvinyl acetate
VAM	Vinyl acetate monomer
LEED	Leadership in Energy and Environmental Design
EPD	Environmental Product Declaration

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Triple Bottom Line Assessment of Health Product Declaration

1.0 Economic Assessment

1.1 Introduction

The scope of economic assessment considers key issues pertaining financial implications on UBC campus building projects by adopting HPD evaluation as a directive for future. This assessment will also look at the availability of HPD's of commonly used building products on UBC campus, and issue a comparative analysis on possible substitutes to HPD. Additionally, it will attempt to outline differences between HPD versus non-HPD manufacturers from an economic standpoint, and suggest recommendations as to which one is better for UBC campus building projects.

1.2 Investigation

A dominant feature which should provide an impetus to UBC's efforts in making HPD a standard practice for all new building projects; it is free of cost. According to Health Product Declaration Standard, HPD is licensed under a Creative Commons and can be accessed free of charge. Organizations or manufacturers utilizing are also not liable to any copyright infringement further decreasing the financial risk associated with HPD. HPD collaborative is a non-profit customer led organization which thrives to develop, maintain and evolve the HPD as a format that meets the needs of customers for reporting of product content and associated health information related to individual building products and materials. The HPD logo is shown in figure 2 below. Additionally, manufacturers or the suppliers are encouraged to make a HPD of their product available online to customers and other suppliers alike.

Figure 1: HPD Collaborative Products Logo.

Alternatively, HPD's provide transparency in classifying chemical contents and associated health risks of various building materials. The access to this information can have economic benefits in the foreseeable future. For instance, acrylic wall emulsions, both exterior and interior, a commonly used building material in UBC are predominantly water based. In comparison to solvent based paints water based paints have negligent health hazards, they are odorless and provide better longevity. Nevertheless, a document detailing a comprehensive list of chemical contents and their implications to human health, used in acrylic emulsions is not provided by the manufacturer as communicated by the stakeholder in our meeting. Furthermore, a few studies indicate suspected use of vinyl or PVA resin used to increase adhesion and lower costs of water based acrylic emulsions. According to a report, IARC in 1995 designated PVA (Polyvinyl acetate) or VAM (Vinyl acetate monomer) as Group 2B carcinogen, meaning possibly carcinogenic to humans. Even though acrylic emulsions are commonly used as building material in all UBC campus projects, no manufacturer provides a detailed list of contents and their associated health risks. Therefore, it is necessary to incorporate HPD in sanctioning of building materials in new UBC building projects will assist in making better and informed choices that do not endanger human health. An example of HPD is shown in the appendix.

1.3 Comparative analysis of HPD with its substitutes

There are a few equivalent standards like HPD Collaborative, such as Manufacturer Inventory and Declare label. This section describes the key differences or similarities between them, and which one should be the preferred practice in relation to UBC campus building product labels.

1. Manufacturer Inventory

   The manufacturer inventory discloses all material composition by two methods:

   a. Name and CAS number or
   b. For trade secrets or IP, the role, and amount

The impediments with this approach are: it does not have a structured methodology, and creates inventories that are random in nature. It also varies from one manufacturer to the other, creating huge problems for project teams and LEED reviewers that are attempting to decipher LEED compliance for rating buildings. Also, this standard does not mandate the declaration of hazards chemical contents, and replaced with an ambiguous benchmark that will leave many chemicals listed with an unspecified benchmark. This further magnifies problems for project team leaving them unaware of the health hazards associated with building material in question. This by itself should be an incentive for UBC to not deal with manufacturers that follow Manufacturer Inventory standard, since this methodology only adds to the ambiguity of building material's chemical content, and provides no information on the potential health risks to human at level that HPD manages.

From an economic standpoint following the Manufacturer Inventory standard might result in heavy financial ramifications. For instance, if it is later discovered that a particular building

material like, sealant contains aerosol (a VOC) beyond admissible limit causing deterioration of air quality, and requires immediate replacement. Such a situation would aggravate the finances of UBC building projects and incur significant monetary loss.

2. Declare Label

This standard is quite similar to HPD, and follows a similar philosophy of declaring building contents, which it refers to as ‘nutrition label’. It serves a niche market of manufacturers that are constantly striving to make their product line more attractive to consumers, like UBC, that are demanding greater transparency in building material contents. This standard also gives information about the possible health impacts of the contents much like HPD. Its working can be detailed in the following three steps:

a. Form completion with details about the primary company and the product in questions. The guidelines to form are provided in the Manufacturer’s guide to Declare labels.

b. Next, is to have the form attested by a higher authority in company.

c. Then, finally receive product label/s and view listing/s in the online database. Use the labels to let customers know that the products of your organization and thereby ensuring transparency.

An example of a basic guideline to forming a declare label is shown below in figure 2.

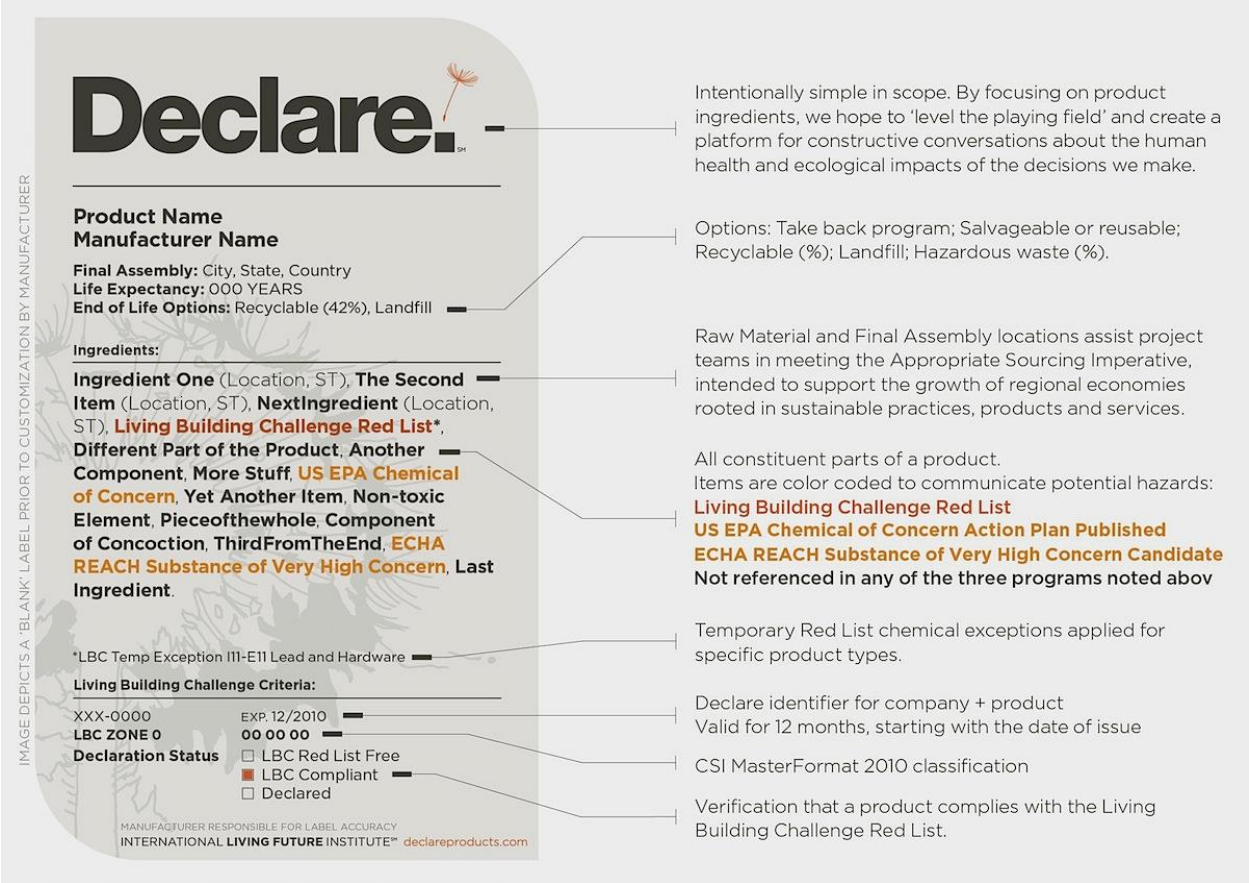


Figure 2: Simple Guidelines to forming a declare label.

The only major downside to Declare Label versus HPD collaborative is in terms of finances. The Declare label is valid for 12 month period, after which the manufacturers must renew by paying a renewal fee and confirming that the information in the label/s have not changed. The costs are outlined in the table below in Table 1.

Per Product or Product Line	1 Product	1 to 10	Over 10
Fees listed are introductory rates and subject to change	$850	$700	$600

Table 1: Declare Label Cost Table

It should be noted that renewal fees is 50% of the above fees if there are no changes to the product's content and will apply 100% if the contents of the material undergo a change, ie.; a new label needs to be made. Below is a declare label example of SunBeamer 100 (sun lighting product for buildings).

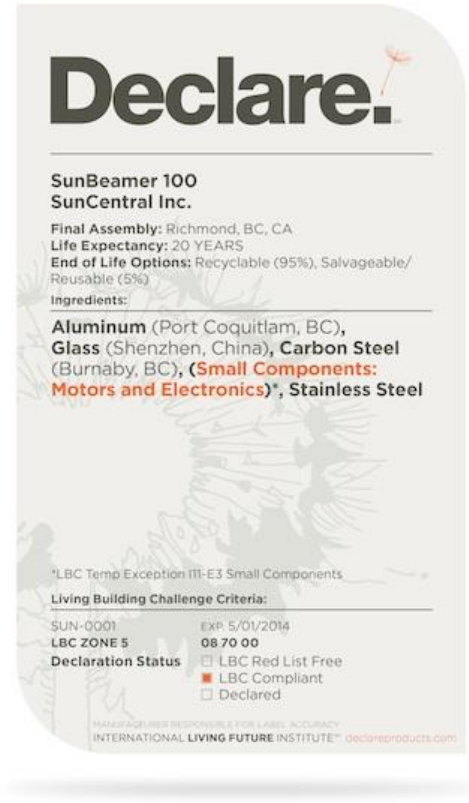


Figure 3: Declare Label for Sun Beamer

From a manufacturer's standpoint, the use of Declare Label would cause increase in costs which would be reflected in the selling price of the product. This would also mean that UBC will be spending more money in buying building materials that have been verified using Declare Label standard. So, from an economic purview HPD collaborative, which is free of cost is less likely to cause manufacturers to inflate product prices and therefore, is a better option for UBC campus building projects of future. Also, a recent article says that HPD Collaborative and

Declare Label are working in collaboration since their aims of bringing about transparency of building material content is similar. Thus, it is safe to assume that HPD collaborative shall uphold the same values and will offer its customers the same level of building content transparency but with no added costs.

1.4 Conclusions and Recommendation

HPD is growing in popularity among manufactures around North America and is cementing its place as an unequivocal industry standard. Its core values of providing greater transparency and spreading awareness about possible hazards of building material contents to humans has promoted the practise of making informed and safe decisions with respect to purchase of building materials by customers. Even though there are many eco-labels in the market HPD collaborative is the most comprehensive and economically viable option for both manufacturers and consumers since it is free of any charge. Here are some recommendations for UBC to ensure further its HPD aspirations and carry forward its green building initiative.

a. Purchase from manufacturers or suppliers using HPD for their products. For instance, Yolo Colorhouse is a collection of premium interior paints with zero VOCs, no hidden carcinogens, phthalates, or ozone depleting materials. It is one of the thirty members to have been associated with the HPD collaborative pilot program which started in 2012. In fact, it sells in Northern Vancouver at Greenworks building supply. The table below shows a price comparison between other paint or emulsion manufacturers.

Company Name- Product Line	Cost per gallon
Yolo Colorhouse-Inspired	$35
Dunn-Edwards-Enso	$50
Sherwin-Williams- Harmony	$50
Benjamin Moore-Natura	$55

Table 2: Comparison of prices of paints with healthier ingredients

b. As a rule of thumb, UBC should do away with any building materials listed in the 'Red List' in all their future projects. For instance, PVC which used in flooring, wiring and even acrylic emulsions should be banned in view of the potential harm it can cause to humans. As mentioned before, IARC designated it to be Group 2-B carcinogen.

c. A possible replacement for PVC in flooring could be Linoleum. Linoleum is natural occurring and contains fewer toxins compared to PVC flooring which may contain heavy metals like cadmium used for stabilizing (Lowell Center for sustainable Production, 2011). Furthermore, operational and cost of maintaining Linoleum is 73% of PVC and it lasts 50 years compared to PVC which last about 15 to 30 years (Moussatche, Languell, 2001). Other possible replacement could be Bamboo flooring, which is a fast growing renewable timber, naturally occurring antibacterial, water resistant and extremely durable. Even though it is more expensive compared to PVC, it is free of toxins and harmful VOCs. Nevertheless, it should be noted that Bamboo flooring may contain

formaldehyde, a toxin rather than a naturally occurring adhesive. This is predominant in cheaper Bamboo flooring. The table below shows a comparison between Linoleum flooring manufacturers.

Company Name-Product Line	Material	HPD	Cost per square foot
Forbo- Marmoleum	Linoleum	Yes	$2.75 to $3.55
Armstrong-Bamboo Tan	Linoleum	No	$4.30 to $5.99
Tarkett- Compact Essenza	Linoleum	Yes	$5.00 to $8.00

Table 3: Linoleum Flooring Manufacturer

Figure 4: Linoleum flooring

2.0 Environmental Assessment

2.1 Introduction

The environmental assessment is crucial issue to be considered for UBC Building Projects. HPD should be adopted for future projects since environmental sustainability is such an important target to be achieved by UBC. In addition, this evaluation will also attempt to clarify and consider the differences between HPD and EPD. Also it will analyze the transparency of HPD and how this transparency could lead to environmentally friendly products.

2.2 Investigation

An environmental analysis of HPD needs to be considered to make UBC a sustainable campus. The materials used in the buildings and its hazards are usually not fully investigated because it is difficult to get full disclosure of all the products. The transparency listing of HPD provides the full disclosure of all the materials in the product and its possible hazards that would have harmful impact on human beings. EPD on the other hand is intended for impact of these harmful products on the environment.

It is important to consider the main materials that are prevalent in UBC buildings. These materials can be classified into pilot materials in HPD Collaborative for easier identification of the material. The pilot materials can be classified into three major categories: PVC, VOCs and, Heavy Metals. This categorization is helpful in determining the transparency of the building

materials. The PVC stands for Polyvinyl chloride are known to emit wide range of toxic chemical emissions through its life cycle such as VOCs and dioxins which are highly carcinogenic. The VOCs Volatile organic compounds which are produced by PVCs readily evaporate into the air causing dizziness, headaches, asthma or irritation. These are usually found in wet products like adhesives, paint, and other coatings. The VOCs are also found in building floorings, carpet, wall covering, ceiling tiles, and furniture. They are also common in composite wood products in the building, the insulation materials, sealants, concrete sealers, wall panels, composite wood floors, and resilient flooring including rubber. The second category of materials can be classified into Phthalates and heavy metals. The Phthalates are especially used in flexible building materials and heavy metals are used to for stabilizers or additives in building materials. Some of the examples are lead and mercury which are both very toxic. The heavy metals like lead are found in roofing products of the building, and wire insulation jacketing. Cadmium is an example of a heavy metal which is used in paints, and in some PVC products as stabilizers in the building. Some preserved wood floorings in the buildings contain heavy metals like chromium copper arsenic and creosote can be also highly toxic. Lastly, the PBT based materials could accumulate in human tissue leading to harmful results are found in building materials like foams and fabrics.

One of the questions raised about the transparency of pilot materials mentioned above was if this disclosure would lead to more environmentally friendly products. Although HPD is different from EPD, it does not give general analysis about the damage products can cause in the environment; however the disclosure of the products will lead to more environmentally friendly products. Because of the fact that HPD focuses on human health and protecting human health also helps protect the environment. For example, until 2004, pressure-treated wood was most common source for arsenic, however it implicated in groundwater leading to contaminated water. Thus, not using the arsenic, helps protect both the human health and the environment.

The transparency of the products in HPD lead to more environmentally friendly products however, the disclosure can lead to security issues. However, HPD comes with nondisclosure agreement where it is not necessary to disclose every material but all the hazards should be listed clearly and identified by stating if the error is high, medium or low according to HPD standards.

EPD's and HPD's are an attempts to make buildings more environmentally friendly and they are both part of the same transparency phenomenon. However, their focuses are different. EPD focuses on building's impact, hazards to the environment and ecosystem. Also, EPD lists every material used in the building that could be harmful to the environment. On the other hand, HPD focuses on human health. It can be said that the EPD is for more general analysis of building materials and its impact and HPD is a more specific. For example, there are chemicals that are harmful for the wildlife but have no harmful effect on humans and thus are not listed in the HPD and are considered in EPD.

2.3 Conclusions and Recommendation

HPD's are a great option for UBC to take one other big step toward sustainability by having a wide range of hazard concern and a detailed analysis of the materials with serious side effects for human health. HPD help improve the environment indirectly, however more detail environmental assessment EPD would cover more specific classification of materials. However, HPD is still a reliable option to UBC building projects because of the transparency of the products and focus on human health. EPD can provide further detail on environmental analysis as compared to EPD. EPD "nutrition label" is shown below.

EPD “Nutrition” Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO^2 eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H^+ eq)	0.93
Eutrophication Potential (kg N- eq)	6.43E-04
Photo-Oxidant Creation Potential (kg 03 eq)	0.121

Your Product's Ingredients: Listed Here

Figure 5: EPD Nutrition Label

3.0 Social Assessment

3.1 Introduction

The social assessment is another key issue for whether UBC needs to adopt HPD evaluation on campus building project in the future. It is important to look at HPD from the society's perspective. This assessment will focus on HPD's transparency for health hazards, its impact on the society and the requirement of HPD from a point of view of general public.

3.2 Investigation

To start with, HPD's transparency for the health hazards can be assessed in two ways: by health disclosure and by the health effect summary. The HPD categorizes the materials for building in categories according to the health hazards for example precautionary list, asthma triggers and asthmagens, and flame retardants list. However, throughout the manufacturing process, the disclosure of the entire contents of the product is sometimes limited due to the intellectual property concerns. To increase the knowledge of the contents, HPD Standard has three ways of disclosure in form of intentional ingredients, residuals, or hazards. The intentional ingredients disclosure includes all the ingredients that make the 99% of the product and has full disclosure. All the ingredients that fall under 1% make up the residual disclosure. The hazard disclosure lists all the hazards associated with the ingredients of the product whether the ingredients are fully disclosed or not. Then using the HPD priority list criteria these ingredients are sorted out according to their harmful effect. The HPD provides the transparency for health hazards in detail using health effect summary. For example the Aluminum Hydroxide is categorized into Flame Retardants and it has low toxicity, and could also be irritant to eyes and skin. However, researchers state that it could be carcinogenic but are not certain. Another

example is under the section asthma trigger, the HDI for example stands for hexamethylene diisocyanate is known to be cause asthma. The HPD provides the transparency by stating the cause but does not state the level of toxicity or if it is carcinogenic. This shows that there is still need for further research to be sure whether the material used in the building is harmful to exactly what extent.

One of main reasons why HPD have been invented is because general public want engineers to provide healthier living environment. Therefore, it become particularly important to all of us as an engineer to find out what society needs and improve upon it. Even though it is impossible to be absolutely sure that HPD can lead to higher living standards and it can be said that the transparency will force a behavioural change of the market towards healthier products. The common use of HPD will promote a behavioral change because it will be easy to know what hazards are directly related to each chemical. Same pattern is observed in the food labels: once one knows the contents of food, and its nutritional impact people try to make healthier choices.

3.3 Conclusions and Recommendation

The transparency of HPD allows for the clear explanation of all the potential hazards from medium to high. The continuous use of HPD will promote a positive change that cause people to make healthier choices regarding the building materials. The recommendation to UBC building project is to promote the change by having an HPD labels for all the products. The small changes can grow to a larger scale helping the society and the companies to use healthier alternatives as mentioned in economic section of the report.

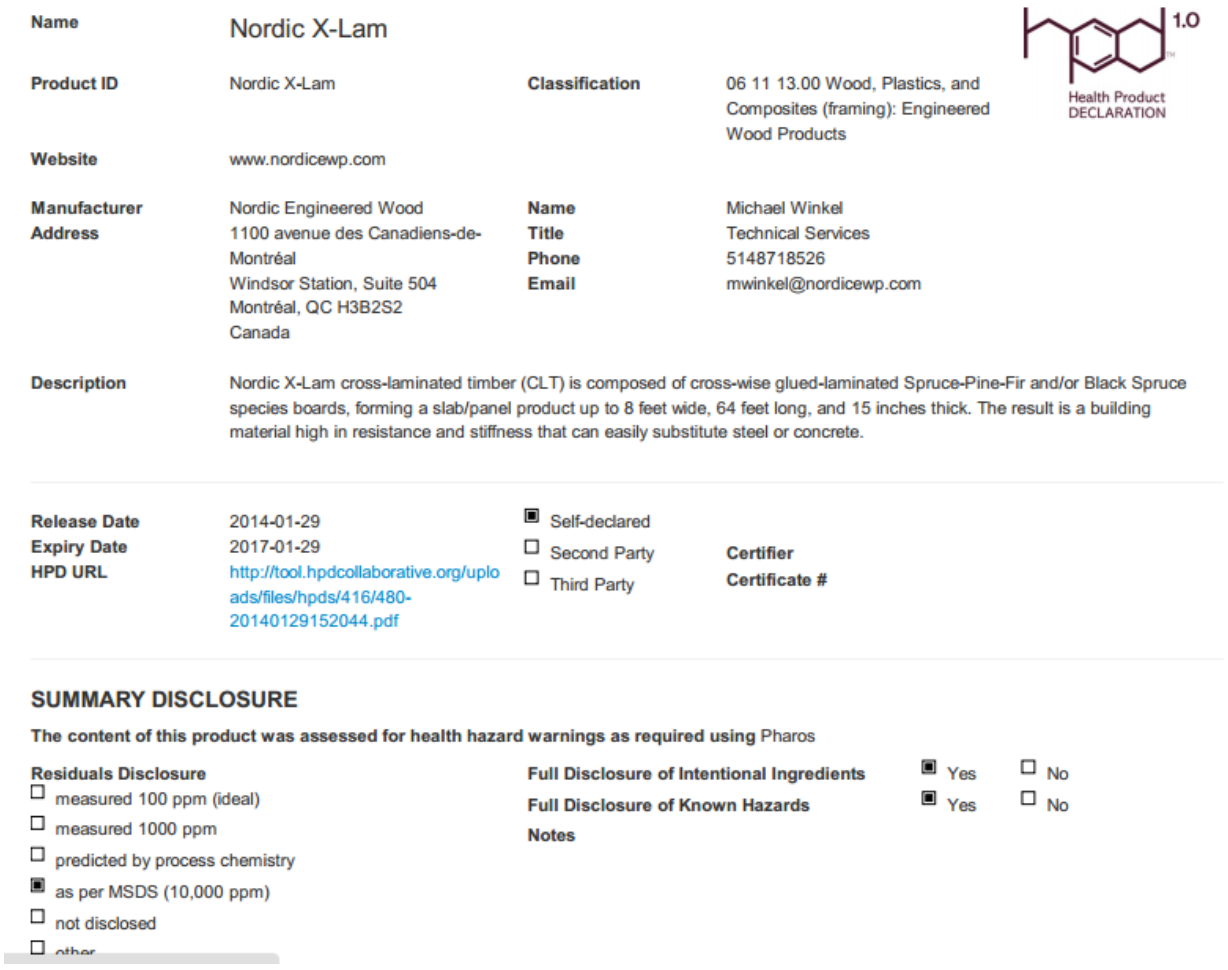
Conclusion and Findings

Health Product Declaration is highly recommended for UBC Projects. HPD is free of charge, easy to maintain, it has higher transparency, and continuous use can promote a positive change in society. The alternatives suggested for UBC Projects are to avoid using any building materials that contain PVC. Instead of using PVC flooring, it is recommended that Linoleum flooring be used in spite of its high cost to preserve the health of students. Instead of using PVC- based paints it is recommended that the paint be changed to water-based paint which does not contain any PVC ingredients. The wide range of emissions by PVC based materials used in UBC are toxic to human health especially students

The small change could lead to larger scale if these two most exposed surfaces like walls and flooring could be replaced with healthier alternatives.

Appendix A : HPD Label for Nordic X-Lam, wooden flooring

The following shows the Nordic X-Lam's (wooden flooring type) HPD Label. This section of the HPD Label shows the company's details and their disclosure methods. It shows the information in the summary disclosure section.



Name	Nordic X-Lam		
Product ID	Nordic X-Lam	**Classification**	06 11 13.00 Wood, Plastics, and Composites (framing): Engineered Wood Products
Website	www.nordicewp.com		
Manufacturer Address	Nordic Engineered Wood 1100 avenue des Canadiens-de-Montréal Windsor Station, Suite 504 Montréal, QC H3B2S2 Canada	**Name** **Title** **Phone** **Email**	Michael Winkel Technical Services 5148718526 mwinkel@nordicewp.com
Description	Nordic X-Lam cross-laminated timber (CLT) is composed of cross-wise glued-laminated Spruce-Pine-Fir and/or Black Spruce species boards, forming a slab/panel product up to 8 feet wide, 64 feet long, and 15 inches thick. The result is a building material high in resistance and stiffness that can easily substitute steel or concrete.		

Release Date	2014-01-29	■ Self-declared	
Expiry Date	2017-01-29	☐ Second Party	**Certifier**
HPD URL	http://tool.hpdcollaborative.org/uploads/files/hpds/416/480-20140129152044.pdf	☐ Third Party	**Certificate #**

SUMMARY DISCLOSURE

The content of this product was assessed for health hazard warnings as required using Pharos

Residuals Disclosure
- ☐ measured 100 ppm (ideal)
- ☐ measured 1000 ppm
- ☐ predicted by process chemistry
- ■ as per MSDS (10,000 ppm)
- ☐ not disclosed
- ☐ other

Full Disclosure of Intentional Ingredients	■ Yes	☐ No
Full Disclosure of Known Hazards	■ Yes	☐ No
Notes		

This part of the HPD shows the content of the product in the order of descending quantity. It shows the type of harmful emissions in this product.

Contents in Descending Order of Quantity
Black Spruce , POLYURETHANE

Hazards

☐ PBT (Persistent Bioaccumulative Toxic)	☐ Development	☐ Neurotoxicity	☐ Land toxicity	☐ Multiple
☐ Cancer	☐ Reproductive	☐ Mammal	☐ Physical hazard	☐ Unknown
☐ Gene Mutation	☐ Endocrine	☐ Skin or Eye	☐ Global warming	
	☐ Respiratory	☐ Aquatic toxicity	☐ Ozone depletion	

Highest concern GreenScreen score - Unspecified

Total VOC Content

Material (g/L)	N/A	**Does the product contain exempt VOCs?**	■ N/A	☐ Yes	☐ No
Regulatory (g/L)	N/A	**Are there VOC-free tints available?**	■ N/A	☐ Yes	☐ No

Notes

Certifications + Compliance

VOC Emissions	Not tested	**VOC Content**	N/A
Sustainable forestry	Forest Stewardship Council (FSC) - Chain of Custody (COC)		APA Green Verification Report
LCA	Environmental Product Declaration (EPD)		

Appendix B: HPD Label for Tectum Panel

The following shows Tectum Panel's HPD label. It also shows its summary disclosure.

Name	Tectum panels		
Product ID	TIWP	**Classification**	
Website	www.tectum.com		
Manufacturer	Tectum Inc.	**Name**	Steve Udolph
Address	105 S. 6th St. Newark, OH 43055	**Title**	Marketing Manager
		Phone	740-345-9691
		Email	sudolph@tectum.com
Description	Cementitious Wood Fiber panels		

1.0 Health Product DECLARATION

Release Date	2013-12-06	☑ Self-declared	
Expiry Date	2016-12-06	☐ Second Party	**Certifier**
HPD URL	http://tool.hpdcollaborative.org/uploads/files/hpds/343/294-20131206120816.pdf	☐ Third Party	**Certificate #**

SUMMARY DISCLOSURE

The content of this product was assessed for health hazard warnings as required using Pharos

Residuals Disclosure

- ☑ measured 100 ppm (ideal)
- ☐ measured 1000 ppm
- ☐ predicted by process chemistry
- ☐ as per MSDS (10,000 ppm)
- ☐ not disclosed
- ☐ other

Full Disclosure of Intentional Ingredients	☐ Yes	☑ No
Full Disclosure of Known Hazards	☐ Yes	☑ No

Notes
There are no residuals other than the products intentional contents.

Contents in Descending Order of Quantity
Undisclosed (Aspen Wood Excelsior) , Undisclosed (Magnesium Oxide) , Undisclosed (Sodium Silicate Glass) , Undisclosed (Magnesium Sulfate) , Undisclosed (Calcium Carbonate)

The following is part of the HPD label for Tectum Panel, it shows the content in descending order of quantity.

CONTENT IN DESCENDING ORDER OF QUANTITY

All ingredients must be assessed for health warnings against Priority Hazard Lists, regardless of disclosure level.
Priority Hazard Lists and information on the GreenScreen Benchmarks can be found at www.hpdcollaborative.org/hazardlists.
***GS**: GreenScreen Benchmark; **RC**: Recycled Content, **PC**: Post Consumer, **PI**: Post Industrial (Pre-consumer), **BO**: Both; **Nano**: comprised of nanoscale particles or nanotechnology*

Name	CAS RN	% weight	GS	RC	Nano	Role
Hazard	**Warnings**					**Notes**
Undisclosed (Aspen Wood Excelsior)	Unknown	44 %		N	N	Substrate
Unknown	Not disclosed					Aspen Wood Excelsior (Trembling Aspen - Populous Tremuloides) is the main ingredient in Tectum panels.
Undisclosed (Magnesium Oxide)	Unknown	25 %		N	N	Binder Ingredient
Unknown	Not disclosed					Magnesium Oxide is mixed with Sodium Silicate to form Tectum panel's binder.
Undisclosed (Sodium Silicate Glass)	Unknown	16 %		N	N	Binder ingredient
Unknown	Not disclosed					Sodium Silicate Glass is mixed with Magnesium Oxide to form Tectum panel's binder.
Undisclosed (Magnesium Sulfate)	Unknown	9 %		N	N	Binder Ingredient
Unknown	Not disclosed					Magnesium Sulfate is mixed with other ingredients to form Tectum panel's binder.
Undisclosed (Calcium Carbonate)	Unknown	6 %		N	N	Binder ingredient

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