

# Outcome of environmentally conscious material choices

an excerpt from a comparative study of environmental benefits versus cost



*In the spring of 2013 the new neonatal department of the local Central Hospital opened. Premature babies and sick newborns are cared for here. During construction only materials that met Landstinget's (the County Council's) environmental requirements were chosen.*

What impact in terms of reduced unwanted chemical presence does Landstingsfastigheter (Count Council's building department) in Värmland achieve through its environmentally conscious construction project and how much of an increase in expenditure does this entail?

A summary of how much of an environmental benefit Landstinget has made and the expenditure it has brought in connection with the construction of a new neonatal department at the main hospital in Karlstad.



## Background

In order to achieve sustainable development and long-term environmental consciousness a shift in paradigm is imperative. As consumers and purchasers of goods and services we are able to influence production. A large organization such as a Landsting may be influential through their purchases and affect manufacturers and entrepreneurs.

Landstinget in Värmland has long acted consciously to choose and regulate the "best" environmentally friendly products in construction. In its buildings Landstinget does not wish to build in material which it subsequently may have to sanitize or retrofit later or which might cause illness. By controlling the selection of materials and managing output, risks and problems can be minimized reducing later stage impact to the environment.

What impact in terms of reduced unwanted chemical presence does Landstingsfasigheter in Värmland achieve through their work and at what increased expenditure?

The report, from which this is an excerpt, recognized a specific completed construction project with a number of undesirable substances that have been excluded as well as the expense in order to achieve this result. The report contains more detailed information on chemicals and work method implementations.

Byggdialog as main contractor has developed two different aggregate calculations regarding materials. One of these is based on the project's selected materials while the other is made with the assumption that the cheapest material that meets the functional requirements regardless of chemical content would be selected. Quantity calculations have been augmented with regards to the expenditure of materials and other overhead costs.

## Construction and environmental processes

Landstinget in Värmland works actively with environmental issues in order to prevent such environmental problems and issues that may arise in the future. The overall operational guidelines for Landstingetsfastigheter is its environmental program.

## Means

All products used in construction must be checked against Landstingsfastigheters overall environmental guidelines through the chemical database, SundaHus. Additionally this database, besides containing classifications of different chemicals by current applicable

law and recognition, contains a filter which can sort out those chemicals Landstingsfasigheter in Värmland wishes to reduce or phase out entirely according to its environmental guidelines.

## Work method

Product selection and SundaHus in plan document and construction document

All construction materials used shall be registered and actively chosen in the planning stages. The sooner consequences of technical engineering solutions are scrutinized the more you can control the end result.

## Material selection and SundaHus

Already during the planning stage it is imperative to make active material choices. All products must be source traceable by location and amount.

## Current project and its prerequisites

In the current project certain specific conditions apply. The project involves a reconstruction on an existing building, this limits certain installations and installation spaces in a different way than in a new construction. This project, for safety reasons, required anti-static flooring due to technical medical equipment in certain areas. Another factor that should be noted is that this project manifests in a structure where environmental concerns in selecting materials is paramount and this means that it could be difficult to see the choices made contra that available from a different supplier.

## Material

Within the parameters of this project there were two disciplines, construction and electrical, where alternative materials were available. The tables below show what has and what might have been used.

## Chemicals

### Phthalates in electrical cable:

The alternative cables of type RK and FKKJ contain the specified phthalate DIDP. In the present case, we have used a halogen-free RQ-cable and FXQJ cable instead. This has meant that between 14 and 31 kg of DIDP was not used.

In the alternate cable type EKLK phthalate is the only listed ingredient. We have used EQLQ in this case reducing phthalate emissions with between 177 and 288 kg.

Has been used	Options that could have been used	quantity
Halogen free electric cable	PVC cable	20 915 m
halogen free Conduits	PVC tubes	2 830 m
LifeLine CS (PVC-free vinyl flooring)	Tarkett iQ Granit 2.0 (PVC floor)	840 m2
Alkortop roof cover of FPP Protan	SE Roof cover	250 m2

Table of materials used and alternative cheaper materials with comparable functionality and quality but which cannot manage the environmental requirements.

### PVC-free wiring casing:

In construction we have used halogen-free conduit instead of PVC pipes, this along with halogen-free cable means that we have saved large amounts of PVC plastic from being installed. Just by using halogen wiring, we have saved 229 kg in PVC.

### DINCH phthalate and PVC flooring:

Where there haven't been demands for antistatic flooring, Lifeline, a PVC-free plastic mat has been used.

Would an alternative PVC flooring like IQ granite been used, this would have led to an increased amount of chemicals. With the PVC-free selection, we have reduced the amount of PVC with 1172 kg and the amount of DINCH (phthalate plasticizers) by 443 kg in the building.

### Phthalate DINP and PVC roofing:

In the present case, Alkortop roof and membrane of FPP was used instead of the cheaper alternative product Protan roofing membrane. This has avoided 197 kg PVC and 153 kg of the plasticizer DINP.

### Expenditure

Based on the materials that the contractors have selected, a new spreadsheet was established. The calculation was based on the existing cost and augmented with material and labor expenditure. The difference between building with environmental or without environmental requirements but with the same functional requirements is in the present case estimated to 201249 SEK. The total cost for the construction was 59,229 thousand SEK, the subsequent increase in building environmentally consciously was 0.33% of the total budget, excluding equipment for this project.

### Discussion

Conditions differ between new construction and remodelling projects. In new construction, building materials and methods can be chosen more freely than having to take into account old materials which would need to be joined and connected. Many of the choices that have not been presented are at an early stage controlled via the environmental database and are difficult to quantify in a singular project where environmental criteria are implemented systematically. Despite this we can establish that through active en-

vironmental choices approximately 800 kg (787-915 kg) of phthalates have not been released and that the benefit to the environment is not insignificant. In addition, we know that we did not have to use 1598kg PVC plastic by choosing a different superior plastic. These savings have been made at a cost that is less than 0.33% of the total of the building construction portion of the project.

From a health perspective it will always be more important to control chemicals people come into direct contact with than those which people will not have contact with. Control of exposure to indoor surfaces will be more important than outdoor exposure from facades or roofs. Emissions that take place outdoors will be diluted and have a lower concentration than if indoors. From a property owner's perspective, it is equally important to keep track of a substance whether it is outdoors, indoors or in small amounts, if the property owner at some time in the future might be required to sanitize in regards to a particular substance.

How do the environmental requirements work with production? Environmental demands work very well within modern building criteria, as no contractor wants to use materials that are dangerous. Both the contractor and the developer want a long durability and high function, no one wants buildings that will need to be sanitized or that their premises make people unwell. To then ensure that there are procedures and tools for them to perform active selection is one of the keys to achieving success in a construction process.

It is also important to note that without documenting materials and where they have been used, it will not be possible to know where they are. In the event of a future environmental alarm, one can look in the document database of the project for specific chemicals and thus know where to sanitize. The knowledge created together with suppliers and contractors is invaluable and helps development move forward to everyone's advantage by allowing unwanted chemicals to be phased out.

Used divided by section or building part	Option	Difference in SEK including assembly
<b>Electrical</b>		
Halogen free Power Cable + tube	PVC cable + tube	101 000
<b>Roofing</b>		
Roofing membrane made of polypropylene, incl. baseplate	PVC roofing membrane, incl. baseplate	24 649
<b>Flooring</b>		
PVC-free plastic mat	plastic mat	75 600

Table of expenditure growth of the materials for which options have been specified.

## Chemicals, explanation and clarification

### Phthalates (including DIDP and DINCH )

Phthalates are a group of chemical substances which are used as softeners in plastics. Some phthalates are proven endocrine disruptors and others as suspected endocrine disruptors. Risks associated with phthalates are that they seep out of plastics and are absorbed by the body, several studies have shown this. In Sweden there is a ban on the use of the most dangerous phthalates in concentrations greater than 0.1 percent, as well as additional prohibitions on certain toys and child care articles. There are also certain identified phthalates which should be avoided as they are not good in high concentrations.

Phthalates have due to risks become the subject of different EU regulations. The use of six phthalates have been restricted and seven phthalates are included on the so-called candidate list, eleven phthalates are classified as toxic to reproduction, but there are suspicions that several phthalates have similar properties, and that the adverse effect is determined by the total amount of phthalates that we are exposed to.

### PVC

PVC is one of the most common types of plastic. The traditional raw material for plastic is oil and the plastic has a variety of special properties that make it superior in many surroundings. If it is to conform to the principle of least harm plastics should not contain recognized dangerous or unknown additives. Whenever there is an option to PVC plastic, we will replace it in accordance with the precautionary principle.

An important factor with the use of PVC plastics is fire. Fire will produce excessive smoke, which includes carbon dioxide, hydrochloric acid, dioxin etc. Dioxins are highly toxic to humans, hydrochloric acid causes caustic injury to buildings and its construction and carbon dioxide can cause asphyxiation as well as being a greenhouse gas.