Craftsmanship and Building Materials

by Ebbe Hædersdal

»Conservation of Buildings and Urban Areas«
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AN IMPORTANT ISSUE discussed on the conference on "Conservation of Buildings and Urban Areas" in Gothenburg 25–26th of March 1993 was the relationship between, on the one hand industrial materials and methods, and on the other, those requiring the skills of craftsmen used in building conservation. An opening argument was delivered by *Ingmar Holmström,* architect, The Royal Institute of Technology, School of Architecture, Stockholm. His remarks on the present situation can be summarized as follows.

Experiences by Ingmar Holmström

During the last decades the interest in our cultural heritage have increased and a great deal have been done in Western Europe to take care of old buildings as well as art and artefacts. A lot of old buildings have been restored. Still the results are annoying. The heritage values are falsified or gone, severe damage have been rendered by use of inappropiate materials and methods, the costs have increased. Why is that? Architectural conservation is directed and supervised by the cultural authorities but executed by the building sector, mainly the constructing industry. These two parts have completely different traditions in their way of thinking and of achieving their goals. The historians do not understand construction well enough and the technicians do not know about conservation principles.

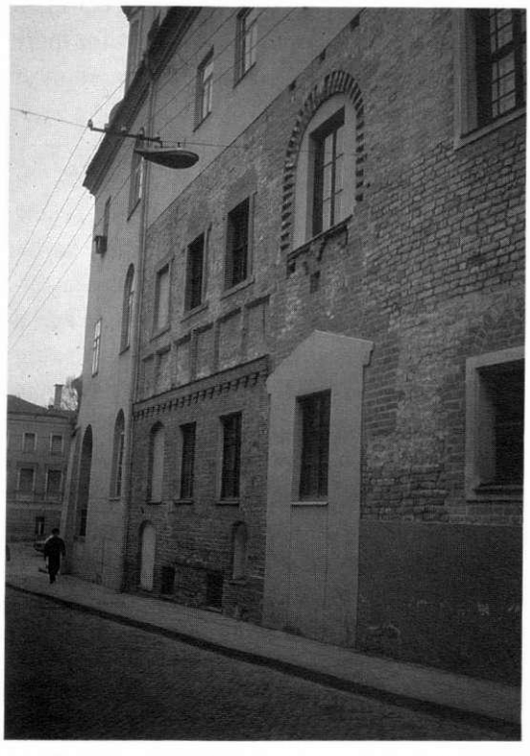
A paramount demand according to the European conservation theory is the integrity and the authenticity of the material substance of the object. The original substance is the "carrier of the message" and should be preserved for "eternity" without being falsified. The architectural heritage consists not only of prestigious monuments but of all kinds of buildings of historic interest and the heritage values present a complex of different aspects like scientific, emotional etc. not only varying from object to object but within the same object. If we look at each significant value separately we can easily understand that each value leads to one specific way of treating the object in order to protect that value. A façade regarded as a masterpiece of baroque architecture, an important work of art, should be restored to its original design and later additions should be taken away as they falsify the original. The façade with all its alterations, however, also illustrates the history of art and thus becomes a document of historic value. Not to destroy or falsify this document, all later stylistic additions should be preserved. In this way the action to preserve each separate value can be contradictory and therefore the architectural conservation always must be a compromize, the quality of which depends on the knowledge of those involved in the process. An evaluation of the heritage values naturally affects the technical solution, the execution of which is usually done by contractors, trained not in conservation but in modern technique. For that reason the work must be described in very clear terms. This is seldom done.

Compared to constructing in general, architectural conservation gives some additional demands on materials an methods. If buildings in general are supposed to have a service life, or in modern terms design life, measured in tens of years, the historic buildings are supposed to stay for "eternity". For modern buildings the situation has been completely different since the Second World War. Both the constructing in-

dustry and the society have regarded buildings as non permanent. Today the document ISO/TC 59/SC3 (1991) recommends "normal life" for modern buildings to be 60 years and "long life" to be 120 years. The design life for historic buildings is immense compared to the ISO standards. To take care of a historic building not only means to fulfill the ordinary demands but also to take into consideration the immense design life and the authenticity in material, workmanship, design, setting and use.

If you have a time dimesion in your head of a design life of the ISO standards, it might be possible to find materials and components of such durability that they can serve the whole period without maintenance. But when we deal with the immense design life of historic buildings, we can forget the idea of freedom from maintenance. Nothing can last that long without multi-repeated repairs, replacements and a continuous maintenance. Further, in order not to threaten the authenticity, a correct conservation-technique must be harmless to the material substance. That the future performance of a new material is difficult to predict is yet another reason for the possibility of harmless replacements. A faulty treatment must be possible to take away, must be reversible. The key to this is the joints and bonds. All joints between components must be weaker than the components themselves, and adhesions must be weaker than the substrate, otherwise they can not be taken apart.

The traditional historic buildings were hand made. They were erected before industrialization reached the constructing sector. One major difference in relation to modern technique is that the old relied on the craftsmen who handled the whole process from the raw materials to the finished building. The modern technique is an assembly from pre-manufactured parts. The most important difference when it comes to architectural conservation is the possibility of harmless repeatability. The old building technique is excellent in this respect. All joints are possible to take apart and the elements used are small or



This façade restoration in Vilnius shows older and newer parts as marked contrasts, in an interpretation of the Venice Charter.
Photo: Ingrid Appelbom Karsten

modest. They are also simple to manufacture and easy to reuse. Recycling was the standard procedure in older days. We can call the historic products intelligent or ecological. The modern technique is based upon another concept: Man is lazy, manpower is expensive but energy is cheap and endless. We use the industrial linear processes all way through from the materials to the assembling of the whole building. Modern buildings are not meant be repaired. By using durable materials they are planned to last their time and then be demolished. In this system there is no need for joints to be taken apart, for materials or components to be reused. But they allow a fast production if you have an elaborated infrastructure, industrial tradition, experienced assemblers and cheap energy. We could call it the industrialized disposal system. As it unfortunately creates pollution and waste as well as a consumption of limited resources

it has forced us in the last years to reconsider. This might lead to a growing interest for more ecological systems and a new appreciation of craftsmanship.

Theme group discussion

The keywords of Ingmar Holmströms opening argument: repairability, replaceability, harmless to the material substance, multi-repeatability, minimum intervention, original material and design and regular craftsman-based maintenance. These concepts resounded and were supplemented in the presentations and discussions at the following sessions in the theme group, headed by *Maija Kairamo* from Helsinki.

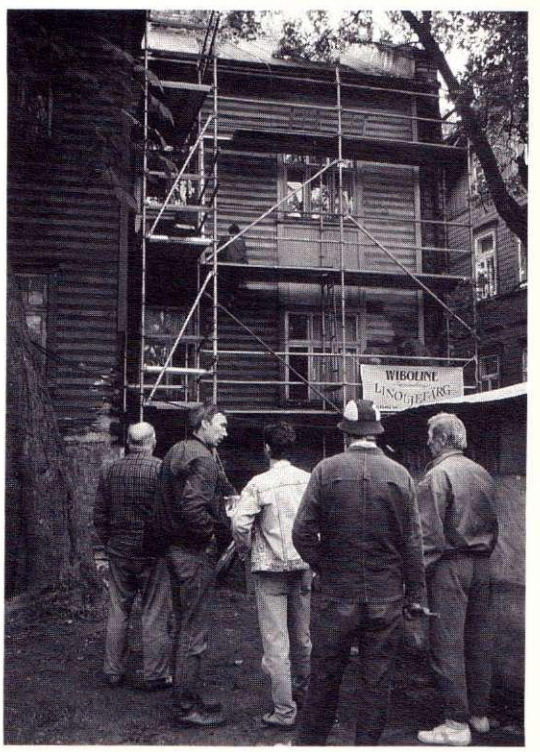
Heikki Pyykkö, practising architect in Helsinki, told about the restoration of the cast cement ornamentation of the façades of the church of St John 1990–91. The church was designed by the Swedish architect Adolf Emil Melander in 1879 and erected in 1888–91. Repairs of the cement ornamentation had been undertaken in 1910, in 1934, in the early 1950's, in 1975 and extended in 1977–78. The latter work was originally based on the use of polyester resin. The idea was to cast new ornamental elements from a mixture of very fine-grained quartz sand and polyester resin, which was also to be used for repairs. This medium, however, had not survived major changes in temperature. A small experimental work site was established at the chancel end of the church for testing various methods. Samples were drilled of the cast parts for analysis. The original concrete was observed to be dense on the surface, but more porous on the inside. After several experiments a concrete was developed with technical properties and colour closely corresponding to the original. Compared with normal concrete S 100 the distribution of the fine aggregate and the pores in the concrete is much more homogeneous and thus has a better durability. The concrete ornaments beyond the possibility of repair were casted with traditional methods, but using partly new materials like acid-resistant corrugated steel bars and stainless wire. A "restored original", varnished and oiled to prevent it from sticking to the mould, was used to make a mould of vinamold, a rubbery plastic. When the concrete was cast, the vinamold mould had to be encased in a plaster supporter. Other ornaments could be repaired on the scaffolding by recasting the damaged parts. All the cast concrete surfaces, both replacements and the original, intact, but weather-worn, ornaments were polished and smoothed by discs on grinders or special drill-bits. Some of the better-preserved areas could be cleaned by a mixture of sand and water sprayed with compressed air at low pressure.

Ewa Malinowski, Ph. D. architect and engaged in research projects at the Central Board of National Antiquities in Sweden, presented her reflections on the changes that plaster and plastering practices had undergone between the thirties and the sixties and how they affected the attitudes towards the use of lime plaster. New materials with qualities that differed from lime mortar were needed after the Second World War to achieve housing policy targets and meet the requirements on materials and techniques made by the industrialization of construction. Therefore, plaster and plastering techniques were developed to meet demands like "fast and cheap", façades that did not require maintenance, simple procedures, or extension of the construction season. Lime mortar did not prove to be inferior. It simply did not suit the large scale and speedy process of industrialized construction. The answer to a question about how and in which way one should repair and renovate plastered façades should be found in the building itself; in the way its plastered façades were once erected and in their condition at the present time. Materials and methods for repairs or restoration must always be matched to the original. This concerns all buildings, even those built during the 60's, the 80's or the present time.

Hans Ponnert, architect, head of the Department of Building Conservation at the Central Board of National Antiquities in Sweden, informed in short about different research pro-

jects concerning lime mortar and lime plaster, heating and ventilation and different traditional roof materials like copper and lead, stone plates and woodsticks. The project "Timber and the art of timberbuildings – material, building technique, craftsmanship and restoration" was presented more in detail. Within the framework of this project several case-studies are performed, the principles being to expose the hidden knowledge in the building itself and the close collaboration with the remaining craftsmen. So far most of the building researchers have been historians who concentrated their studies upon written sources, whilst the craftsmen became fewer and fewer. The project aims to take care of the knowledge of the latter, to disseminate it as widely as possible and to secure a living basis for future craftsmen. One of the case-studies in progress is the construction by traditional methods of a timberspire of the church at Väskinde on Gotland. The original timber construction have been studied in detail and a model built as basis for the reconstruction works. The timber was found on the island, felled and treated with old tools and by traditional methods. So far it seems that the price of such timber per meter is lower than of machine-made timber.

Annika Haugen, MS and doctoral candidate at the School of Architecture in Oslo, spoke about her research project "What can we learn from Construction Methods and Materials in our old Buildings?" Due to the technical development people are now asking for a more comfortable climate in old as well as in new buildings. A higher temperature has led to damages in the interiors and in the materials. It is damages caused by too high moisture content, too low humidity or variations in the humidity. Today there is a great uncertainty if you can recommend heating of older stone buildings and what kind of heating system would be appropriate. To solve this problem you have to establish limits for the relative humidity and the temperature inside the buildings. The project aims to define these limits and reveal the parameters involved by studying the reactions within the building materials to changes in the relative humidity and the temperature. Only buildings erected in nature stone will be considered. The buildings date from the beginning of the middle ages to the beginning of the 19th century. Two buildings in Southern Sweden and two in Southern Norway have been selected for a case-study which in this way will estimate the influences of variations in the climate as well.



Painting of a wooden house with linseed oil in the district of Kalamaja, part of a renovation project in cooperation beteween the cities of Tallinn and Gothenburg. Photo: Conny Jerkbrant

Ebbe Hædersdal, architect, medieval archaeologist and doctoral candidate at the School of Architecture in Lund, presented a case-study in documentation methods "The Colour Investigation and its Methods". Such an investigation can provide the architect with a background for making decisions on the treatment of the interior of old buildings, for example, whether to give it a new colour scheme or to bring to light one of the previous settings. In addition the process can also be used to check the original

position or even the authenticity of individual components like panels, doors etc. in an apparently whole interior. An analysis of the samples taken during the investigation can decide which pigments and binders were used in the colour-coatings. There are four methods for making colour investigations: Chemical Removal "Strata" Method, Colour Cross-section (Cutting) Method, Colour Cross-section Drilling Method and Radiophotography. A test of the three first-mentioned methods have been carried out in order to assess, whether one or more of these methods could be used by the unexperienced architect to do preliminary studies in the field himself. The test showed the advantages and disadvantages of the assessed methods and that all three require a good deal of training. Although it is a good idea that the architect himself can gain an understanding of the interior colour schemes of the past, in general he ought to leave the more complex investigations to specialists.

Key words of the presentations and the discussions were:

Responsability. The industrialization of construction has led to dilution of responsibility. Who has the responsibility for the quality of the work? The firm? The contractors? The workers?

Skills. The craftsmen or the building workers have lost their skills because they had to work as rational as possible. They have had to minimize the number of working moments. They were deprived of their pride in the work.

Authorization. To assure the quality of the work, especially work done with traditional materials and by old methods an authorization policy might be a good idea.

Economy, consumption, energy, resources, recycling, ecology. The principles of industrialized constructing sector are in the long term no good for the economy. They have led to a consumption of energy and other limited resources and created immense amounts of waste. Society will benefit from recycling and a more ecological way of thinking. Traditional materials and methods ought to be applied to future construction.

The building itself. We have to learn from the buildings themselves. They are the main sources for knowledge on materials and lost handicrafts.

Education. Education must be combined with experienced knowledge to create understanding and a professional attitude.

The three articles summarizing the conference "Conservation of Buildings and Urban Areas" are edited by Ph. D. architect Solveig Schulz, School of Architecture, Chalmers University of Technology.