INSTITUTE OF BUILDING DESIGN

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KRISTIAN HERTZ

FIRE PROTECTION OF HISTORICAL BUILDINGS IN DENMARK

FIRE PROTECTION OF THE MONASTERIES OF MOUNT ATHOS - A CATALOGUE OF IDEAS

Den polytekniske Læreanstalt, Danmarks tekniske Højskole
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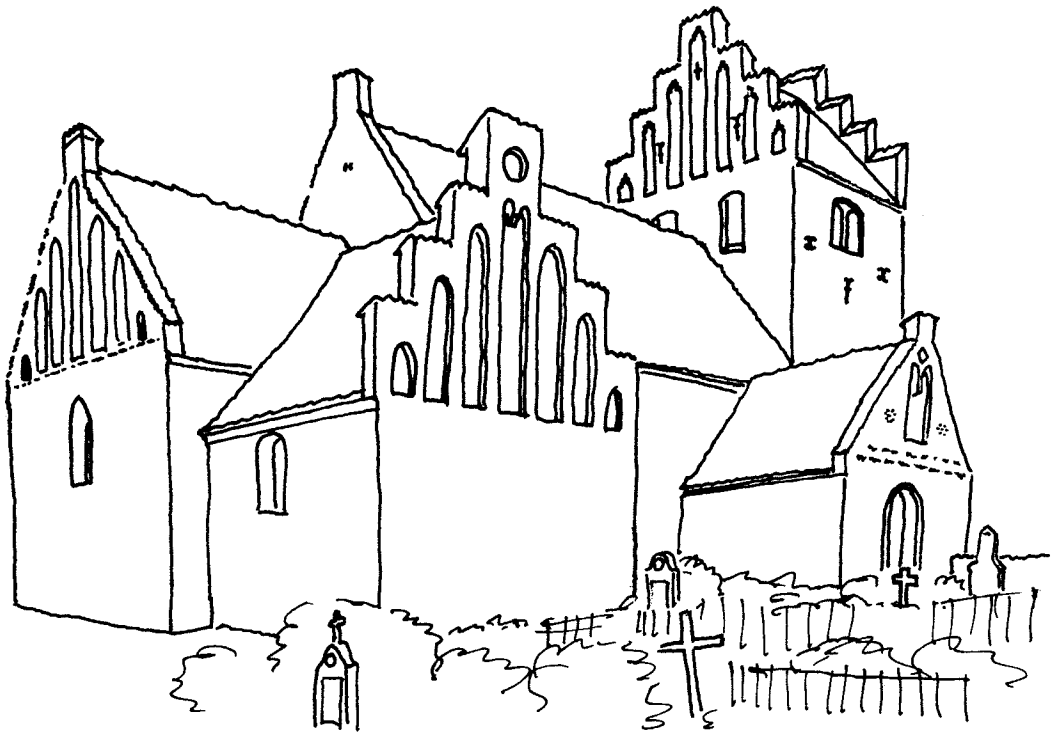
INTRODUCTION

This report contains two papers presented at the meeting concerning fire protection of historical buildings and monuments, especially those in the Mount Athos peninsula, Thessaloniki April 28th to May 4th, 1985.

The first paper deals with experiences from Danish historical buildings, and based on these experiences a catalogue of ideas is made in the second paper on fire protection of the monasteries of Mount Athos.

ACKNOWLEDGEMENTS

I would like to express my gratitude to senior lecturer Torben Jakobsen for reading the manuscript, and the staff of the Institute of Building Design at the Technical University of Denmark for writing and printing the report.



Sejrø Church

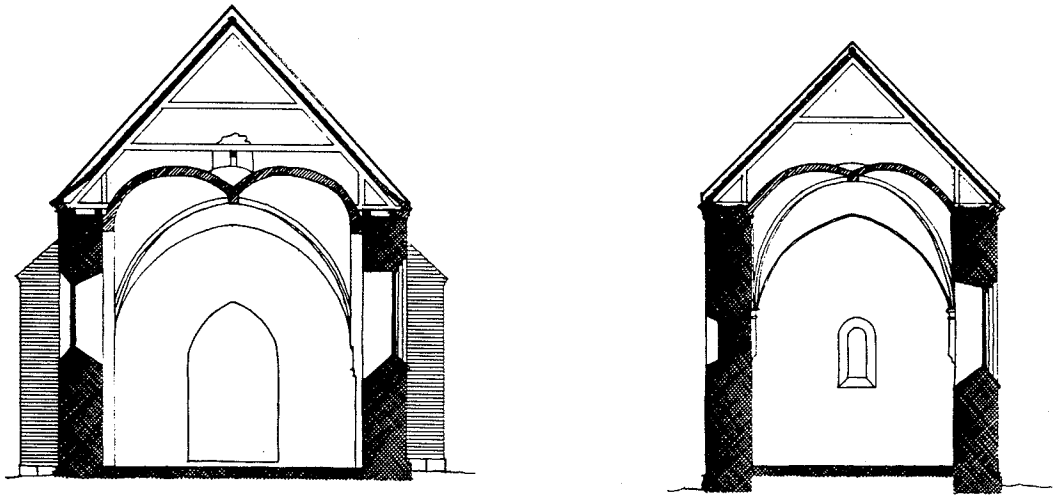
FIRE PROTECTION OF HISTORICAL BUILDINGS IN DENMARK.

For a discussion of the fire protections of Danish historical buildings it would be suitable to divide them into three groups: churches, castles and other mostly domestic buildings.

The first group is dominated by the nearly twothousand village churches mostly from the twelfth century.

One essential reason why these churches have survived through the centuries is their extremely good fire resistance.

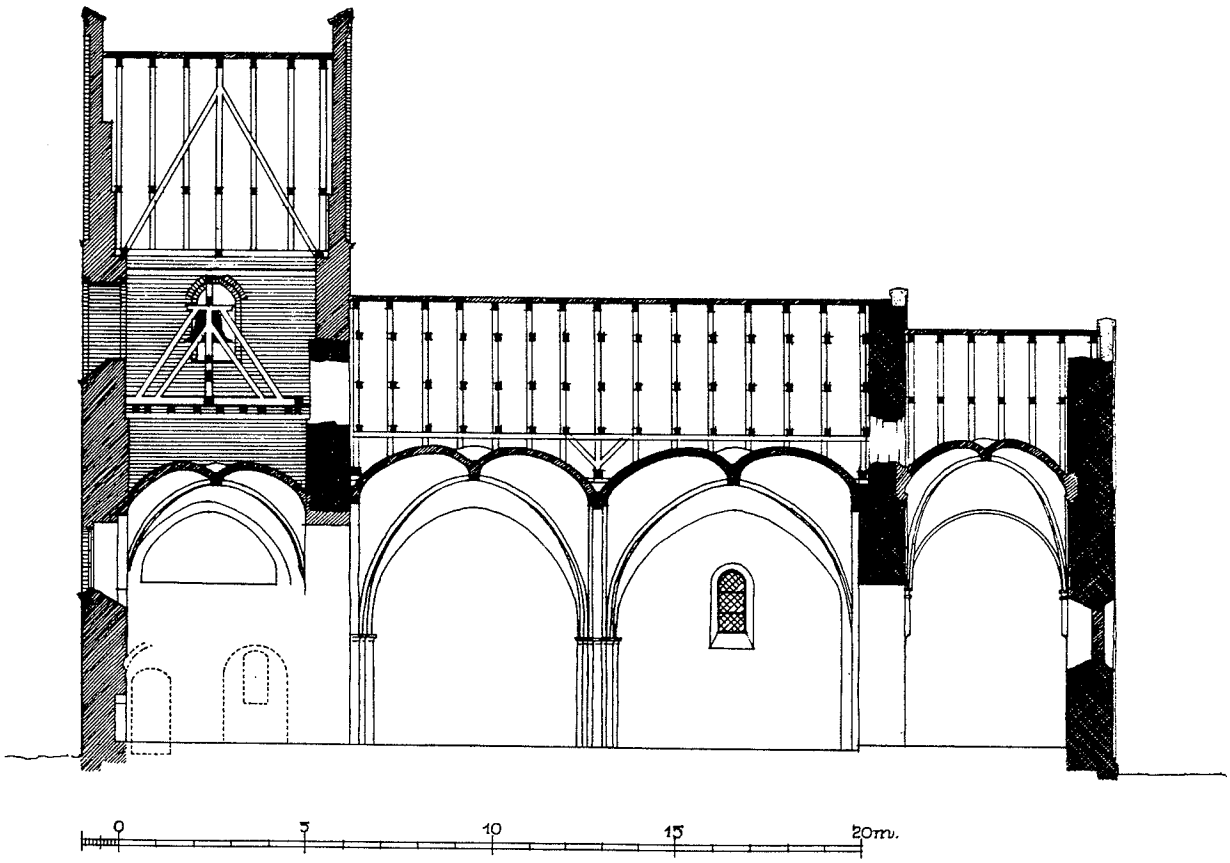
The main construction consist of thick walls of stones or brick, and the timber construction of the roof is separated from the church room by heavy brick vaults.

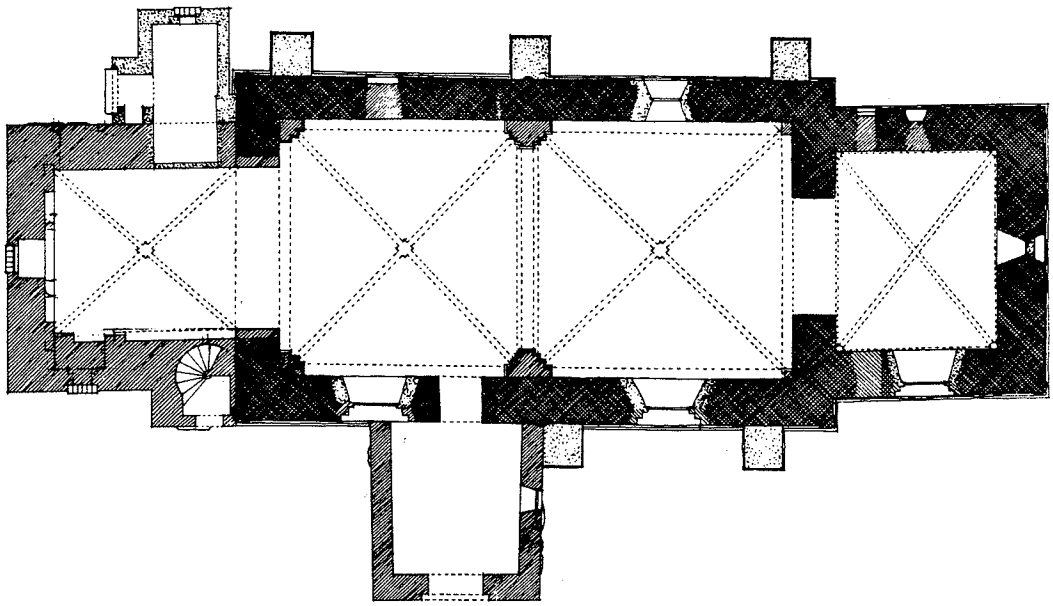


Cross Section of Skt. Jørgensbjerg Church

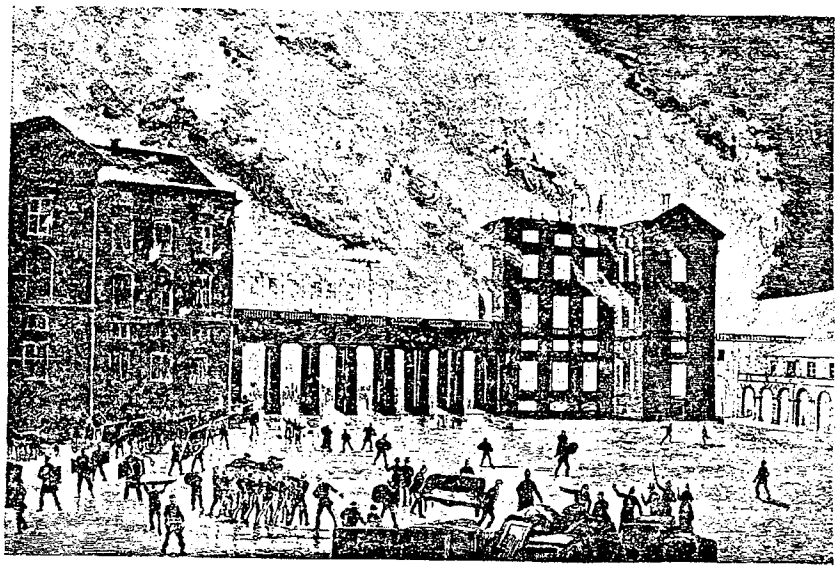
During the time of reformation in the sixteenth century most of the old Gothic interiors with their rich ornamentations were removed and replaced by simple Protestant furnitures representing a very small fire hazard.

Therefore, only a very few additional fire precautions have been necessary to make for this large group of buildings such as rebuilding some roofs using fire impregnated timber, installing fire equipment in towers and in seldom cases alarm systems, which can be combined with selective infrared burglary alarm systems focussing on objects of special value.





Skt. Jørgensbjerg Church



Fire of Christiansborg Castle 1884

For the castles the situation is much more complicated than for the churches.

Many of them have burned down, and for instance Christiansborg Castle in Copenhagen, which has been the residence of the King for centuries and at present houses the parliament, has now been rebuilt two times within one hundred years after fire catastrophes.

The last fire destroyed the castle totally because it was able to spread through a great number of wood cladded ventilation pipes. The spread of fire was so rapid, and new fires broke out at so many random places in the castle that it was impossible to save the many precious paintings which were collected in the building.

Frederiksborg Castle

This single accident therefore left a big gap in the representation of Danish painting of the eighteenth and nineteenth century.

A broad view of the Danish culture of the period consequentially must be supported by descriptions and illustrations of varying quality of these paintings.

This shows the value of a good documentation on unique objects of cultural importance.

Another example on the value of a good documentation is Frederiksborg Castle in North Sealand built by King Christian the IV in 1608 in the style of Dutch Renaissance and burned in 1859.

The castle was completely reconstructed, but although it became a very impressive building, many details had to be recomposed by renaissance details known from other castles.

However, the question is whether a thorough and careful reconstruction of a historical building can be considered as the building itself or not.

If it can not, which parts of a building can then be renewed if the building should not loose its identity ?

Renewing is a necessary part of the maintenance of any building, and if it is not made, the appearance of the building will change in time.

Is a ruin a more original building than a well preserved house ?

Some Japanese temples have been rebuilt each twentieth year for many centuries in strict accordance to the old tradition. Are they not to be considered as historical buildings ?

These philosophical questions can hardly be answered in general, but must be discussed each time a historical building should be restored or renewed after a damage or protected from a damage for instance by fire, and the key to the discussion will be the use of the building.

Frederiksborg Castle serves well as a museum for the National Portrait Gallery, and still gives an overall impression of King Christians architecture, but it can not be a source for studies on the original materials and details of this architecture.

Since many historical buildings are important sources for research on old materials and details, the possibilities of renewing parts of them for the purpose of maintenance or fire protection are very limited.

In these buildings each room must be evaluated and eventually classified as a guideline for the practical work.

Rooms where nothing can be renewed could be specially guarded and if possible participated from the rest of the building by protection of the surrounding rooms.

Objects of special value should if possible be removed from the areas of high risk to rooms, which are or can be made more safe.

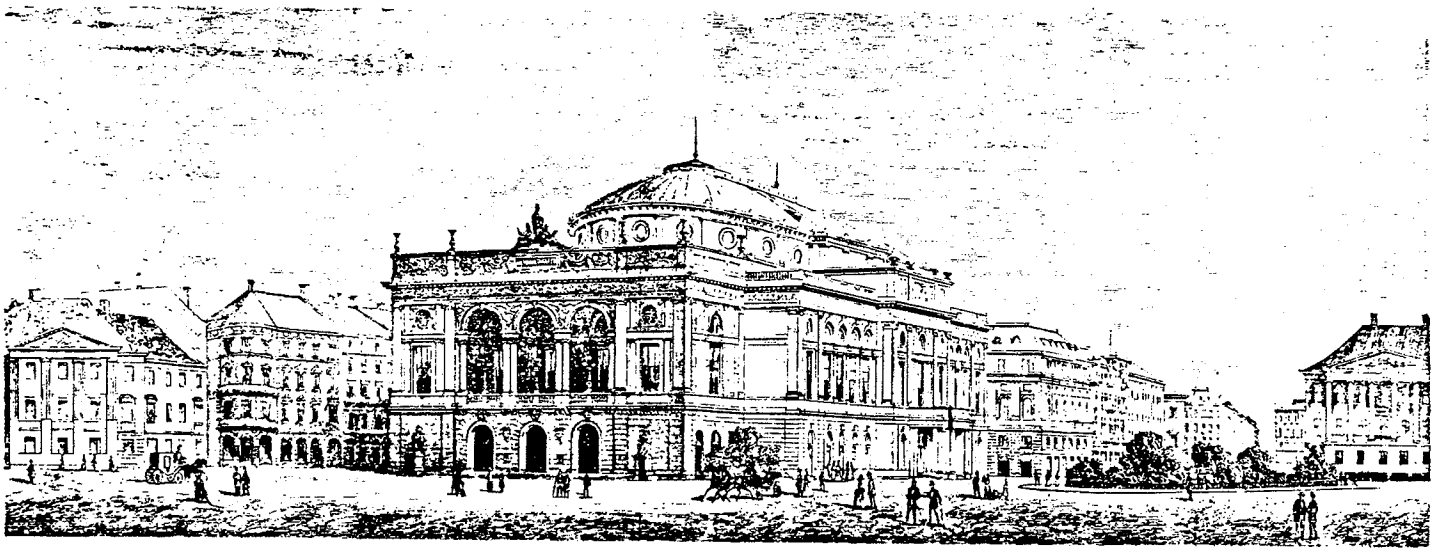
For many years the crown jewels of Denmark have been kept in an exhibition case at Rosenborg Castle (also built by King Christian IV).

In case of robbery or fire they would automatically sink down through the pavement into a safe room in the basement.

In this way they could be exhibited in the historical surroundings, where they belong, and still have the benefit of a more safe but less interesting shelter.

Recently however, even this arrangement was considered to be too risky for these precious objects, and they are now moved to a separate bunker outside the castle.

Rosenborg Castle



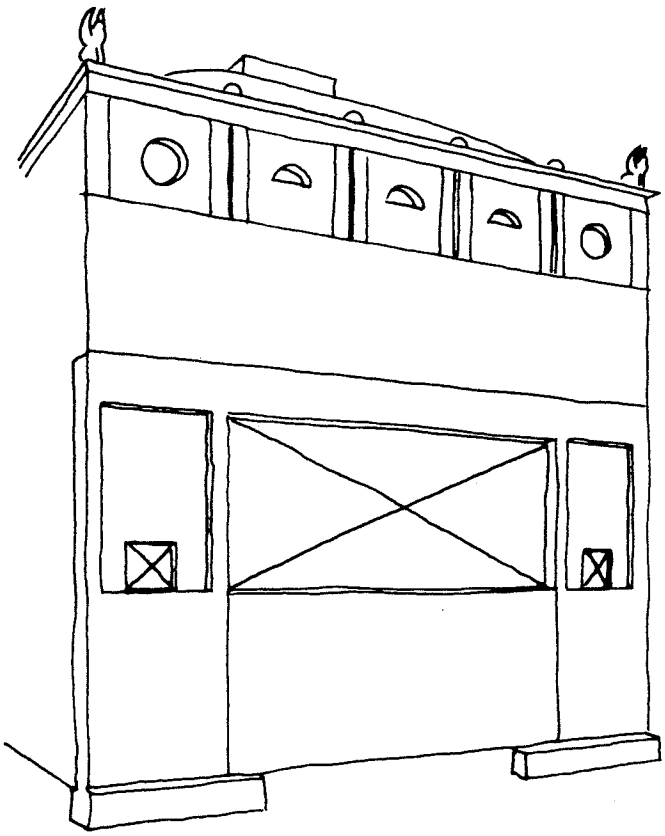
Royal Theatre in Copenhagen

The need for such precautions may change in time, when the value of the objects or the risk of the actual surroundings changes.

For a great number of historical buildings the demand of preserving the original materials and details is less strict than for the castles.

This is the case for many anonymous domestic buildings and some unique buildings for which many details are identical to those of several other houses of the period.

An example is the Royal Theatre of Copenhagen, which is presently being rebuilt and extended with a new building.



New construction built into the old back side wall of the Royal Theatre.

The author is active as a consulting engineer on fire problems and several constructions among which is a post tensioned concrete girder supporting an old brick facade across the extended scene room.

The construction is crucial for the stability of the old building, and therefore it is carefully designed to have a sufficient fire resistance.

Such fire proof built-in constructions can be allowed, because what makes this building historical is to a very little extent its old walls, but the traditions combined with them.

Therefore, many materials and details can be replaced by good copies, and some alternatives can be accepted, if they improve the use or the safety of the building and do not change the general view of it.

Architecht: Nils Koppel.
Consulting Engineers: M.Folmer Andersen Consulting Engineers A/S.

Though, some fire safety problems still remain due to the use of the building and its special organization, and it is necessary to instruct the personnel in how to avoid fire and how to act in case of fire.

Also for ordinary historical domestic buildings it is important how the inhabitants take care of the fire problems of their particular houses.

As an example, the houses of the small villages Taarbaek and Dragoer near Copenhagen are built close to each other and many of them are provided with thatched roofs.

At the time, where the original population of fishermen and pilots lived in the villages, there vere only a few call for the fire brigade. The inhabitants handled the situations themselves.

During the recent years it has become popular for rich citizens of Copenhagen to settle in these historical milieus, and the fire brigade is called more than ever, and several houses have burned down.

This can only be explained from the fact that the new inhabitants have no tradition for living in the old houses, and perhaps also less common sense than the original population.

FIRE PROTECTION OF THE MONASTERIES OF MOUNT ATHOS - A CATALOGUE OF IDEAS

Since access of a fire brigade from outside is difficult and the escape routes are bad, the logical answer to these problems would be to train the local population in fire fighting.

This means that the inhabitants and the workers employed in the area should be given instructions on how to fight a fire, how to raise alarm and how to behave in case of fire.

Special tasks could be given to minor groups of the inhabitants according to an overall action plan for the case of fire.

Inspection of the critical points of the buildings (fire places, doors that should be kept closed etc.) should be a part of the everyday routine work incorporated in the time schedules of the monasteries.

Equipment for fire fighting should be at hand such as fire blankets and hand pumps, but even large amounts of water could be supplied in short time by utilizing the hillside building low cost water reservoirs that can be filled by regular pumping of sea water. (A low cost reservoir can be built as a bag of fibre-reinforced PVC supported by a steel wire mesh and supplying the monastery below through a PE- and steel-pipe).

As far as possible precautions should be taken preventing the spread of fire.

Wood constructions could be given a surface treatment of a fire retarding or intumescent paint or varnish.

The old fashioned water-glass treatment could be considered as a simple alternative.

In some cases the most efficient procedure would be to pull down the construction, impregnate the parts and reassemble them.

This treatment is especially needed for wood constructions built by small elements with many joints.

Wall surfaces and especially ceilings of wood should as far as possible be covered by a gypsum board cladding or a plaster.

The buildings should be divided into sections limiting a fire growth by repairing or renewing doors and walls creating fire proof partitions.

Possible fire sources such as fire places and lamps should be regularly inspected, and new heat sources among the tools of the workers should be checked before entering the area.

No matter how carefull the fire precautions have been made, the risk of fire will never be zero.

Therefore, the most valuable objects should be kept in the most fire safe rooms with walls and ceilings of stone, and perhaps also in fire safe boxes in these rooms.

This means, that the objects should be classified and placed according to their safety classes.

If some objects can not be moved from the place where they are, this could influence the requirements to the rooms in which they are and the priority of the work improving the fire safety of these rooms.

Objects and buildings of special value should be well documented by descriptions, drawings and photos, so that they can be replaced by new copies in case they are lost.

Facsimile prints of hand writings and casting of objects are of great cultural significance when the things themselves are lost.

Photogrammetric recordings can be an outstanding help rebuilding a house damaged by fire.

This could be summarized as follows:

1) Locate the places and objects of special value, eventually make a classification of them.
2) Try to find the safest places for the most valuable objects.
3) Instruct inhabitants and visitors.
4) Install fire fighting equipment.
5) Initiate a work of making the best possible documentation on buildings and objects of value.
6) Make fire proof partitions dividing the buildings into sections.
7) Improve the fire resistance of the buildings.