

Site Measuring and Building Physics

Importance of re-utilisation of redundant farm buildings

Many farm buildings stand unused and empty nowadays. One reason is that basic information required for re-use investments – possible utilisation, building substance, condition, renovation costs for alternative uses – is often unavailable. Problem areas and solutional methods are presented here.

Many farm buildings have been empty for years without any practical alternative re-use available. They still cost money for insurance and minimum maintenance without any prospect of income and without the expenses being covered.

According to statistics [1] there's been a reduction in farms of over 70% over the past 40 years. Where farms are expanding, too, the erection of new buildings – usually on the edge of communities or on greenfield sites – is necessary for many reasons, and the older buildings are then left unused.

Where village disintegration is to be avoided in the medium and long term, suitable measures have to be introduced. Practical possibilities are very different according to region and depend on many factors such as communication, workplaces and leisure value. For instance holiday apartments are not in demand in all regions, not can businesses be grounded everywhere, or the empty buildings used as domestic housing in the stockbroker belts of financially strong cities. And because of past usage, building type and construction method, not every building offers itself for a lucrative new usage. But in every case a thorough survey of the situation is an absolute necessity for the development of use alternatives.

Depending on future usage the building must be surveyed in detail. As well as pure building measurements it is also important to include details of the constructional condition and estimates of damage present which in many cases cannot be established at first or second glance but only through intensive investigation. These investigations should be conducted before the start of construction so that nasty, but avoidable, surprises do not spring-up during the actual renovation, surprises which make the planned financing no longer realisable through additional costs possibly many times higher than original estimates.

Recording methods

For some years now, many technical aids for building surveys have been available. Whereas 10 years ago tape measure, metre stick and sketch block were the practical

hand tools for survey recording and drawing board, T-square, drafting machine and felt tip pen the tools for presenting the results, these have been increasingly replaced by laser-range finder, tacheometer, Réseau camera, computer and plotter. Many software programs are available to help translate length, height, breadth, thickness into 2-D or 3-D drawings.

A hand laser with visible beam eases distance measurements and can, with appropriate equipment, store these measurements for later transfer to PC or transfer them on the spot to a laptop of HPC whereby the software gives a questioning rhythm, and input is checked through calculations of diagonals.

Reflectorless tacheometry is suitable for interiors as well as facades, allowing as it does a relatively rapid and continuous „sensing“ of surfaces/corner points. This enables „deformation true“ surveying which is repeatedly required especially in the case of historic buildings.

The multi-picture photogrammetry is a picture-measuring method by which with the help of a very complex calculation method (bundle equating) geometric relationships can be deduced. Through photos taken from different aspects by a Réseau camera, the same points in the facade are marked and via several working stages transferred into a 2-D/3-D representation (*fig. 1*). Compared with other measuring methods the photogrammetry has the advantage that the survey can be further refined by progressive processing according to planning office requirements. All points recognisable on the photos can be later measured in the office, whereas with all other methods the measurements that are not made on-site can only be established through a further visit to the site. Photogrammetry is a process which is optimum for facade pictures, measurements can be made of building parts and corners that are visible but, through height, e.g., are difficult to reach. There are clear limitations to this technique where complex interiors are involved, where corners and edges cannot be seen.

As a rule, therefore, a combination of different techniques and systems come into use

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Literature

- [1] Statistisches Jahrbuch für Ernährung, Landwirtschaft und Forsten
- [2] Energieeinsparungsverordnung EnEV

in measurement of buildings with a return still made to the old hand measurement instruments for supplementary surveying information. A good laser range-finder costs from DM 1500 to DM 2000, a Réseau camera with suitable software DM 30,000. Also to be considered is the time factor required when an inexperienced person starts to learn how to use the equipment.

The involvement of a survey office specialised in this sort of work should be considered.

Chemical and physical constructional aspects

Depending on planned use, detailed information on load-carrying capacity of walls and ceilings and their physical constructional aspects are required. Existing damage, e.g. through salt or damp, have to be permanently repaired through appropriate methods and building faults through choice of wrong material be avoided. The effect on the building though year and decade long absorption of evaporation emissions, moisture and gases from livestock dung and urine and their exhalations leads to chemical stress on building components which requires special consideration and possible considerably limits the number of re-usage possibilities, when not actually substantially limiting any further use.

In many cases the aim will be to re-use old buildings as domestic housing. Here apply special laws and regulations that have to be recognised and observed, e. g. regulations on energy-saving insulation [2] so that, in modernisation, energy-utilisation improvement possibilities are fully exploited.

In the choice of material and wall construction it not only has to be watched out for that the exterior wall construction has achieved the required insulation coefficients but also that the building components are not damaged by dew and that insulation is thus

not adversely affected. Suitable software programs enable a rapid overview and, especially in the comparison of different wall building/constructional variants, information is available in shortest time without much calculation effort (fig. 2).

Unfortunately, moisture damage in the facade of livestock buildings is again and again wrongly attributed to seeping of precipitation water and to frost/thaw interaction. Often the cause is more likely to have been moisture transport through warmth transmission. Through the high air moisture content in livestock buildings relatively large amounts of dew moisture/condensate can appear on the outside wall. Should the constructional factors mean that this dew point is situated only millimetres or centimetres behind the outer wall surface in a frost-liable area, frost damage can occur despite perfect outer surfaces with facing or harling.

The renovation of the energy saving law has resulted in much more work required for the necessary calculations for the insulation certificate. On the other hand, for a creative planner there are now many opportunities to set focal points and balance weak points.

An example of the latter is found in historical facades which can only achieve the required insulation through interior insulation. In recognition of the resultant physical constructional problems action has already been taken in the past so that the responsible off ices according to state law can, on application, issue exemptions to the regulations for protected buildings, or other constructions worth preserving, where actions for limiting the annual heating requirements could affect the appearance of the building or cause an unacceptably high amount of work.

Especially with insulation work on half-timbered houses, faulty renovation in the past 30 years has led to irreparable damage. Now, through the altered certification process bonus points can be earned from uncritical points of the building and a compensation created.

A special, hardly noticed, problem is caused by wood beam ceilings where the beam heads break through interior insulation. Through this the wood moisture content changes in this area and even creates an area susceptible to attack by damaging influences.

Where exterior wall surfaces are subject to strong weathering it should be considered whether a special protection with tiles or wood shuttering can be applied over a half-timbered wall for a better permanent solution. In most cases this would also be accepted by those involved in protected building legislation. With this type of renovation, the less problematical and better physical-constructional exterior insulation can be chosen.

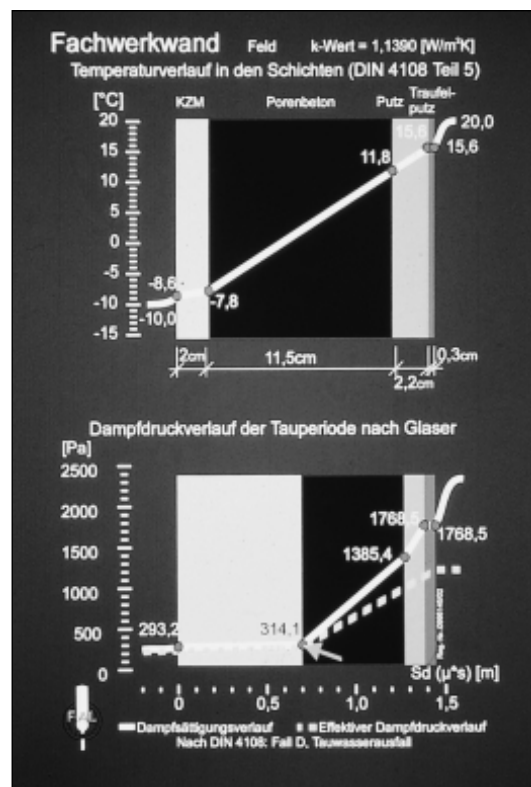


Fig. 2: Calculation of heat conductivity and dew point can help to avoid later building damage. The graphic shows the condensation water due to construction and material



Fig. 1: Digital picture of an agricultural building, taken with a photogrammetry camera. It is possible to identify the crossings of the Réseau screen, needed as referring system image analysis