

## **Steel windows: ready for the scrap heap?**

Taco Hermans

### *Introduction*

We know steel windows as part of the important architecture from the beginning of the 20th century as is demonstrated by the famous Van Nelle Factory in Rotterdam, built around 1925. But it is also used in smaller buildings like gas stations and in less important architecture like houses and apartment blocks. The use of steel was part of an important change in architecture: the slim contour was completely different from the then used massive stone and wooden window frames. Combined with the use of large sheets of glass it also had its downside. The offices in the HUF-building in Rotterdam, built after World War II and situated above a shoe shop, were unoccupied for many years because of building physics problems during winter and summer. The slim sections make it difficult to adapt this building nowadays to modern standards.

### *Threats*

The main threat for steel windows is however rust. This is mainly due to a lack of maintenance, especially of the horizontal parts of the window frames and of the putty as can be demonstrated by the Dresselhuyspavilion at Zonnestraal in Hilversum. The thickening of rusting steel is immense. But rust can also be the result of too much maintenance. The rear side of an office building in Arnhem was covered with a layer to protect the outer wall from getting too wet. Therefore the water that could get in but couldn't get out. Result: the wall remained wet too long which resulted in rusting of the steel from the inside.

Rusting from the inside can also occur however if there is an adequate maintenance. From the outside steel windows can look pretty good, even viewed from the inside they look good. But the damage of the wall plastering or the breaking of glass points out that there is something wrong.

### *Repair*

Eventually the windows need repair and have to be taken out. Even then it is not clear what the condition of the steel really is. Sometimes the condition of the steel looks pretty bad but after sandblasting it turns out better than was expected, but the other way around sometimes the condition seems rather good but when the paint is taken off by sandblasting it turns out worse than expected.

Whatever the case may be, steel windows and doors can most of the time be mended. Either bad pieces are taken out and are replaced by new or second hand pieces or new windows can be made from second hand windows or new sections.

The process is as follows: sandblasting, repair, sandblasting, Schooping metallization, painting, setting of glass.

One of the main problems concerning restoration is the lack of the right sections. Only two sections are still available: the so-called chair section and the Crittal section. However, both are not the same as they were in the 1920's. The problem can be solved by using second hand frames. Or one can choose to sacrifice frames from, for instance, the rear side of a building to restore the ones in the façade, and place new ones in the rear side. A building where this has been done is the famous Dresselhuys Pavilion of the Zonnestraal sanatorium in Hilversum. Here an investigation has been made of the frames and part of frames that could be reused. They were then situated in the main parts of the building where new sections have been made for the remaining parts by composing them of new sections with additions to match to the original sections as much as possible. For the central building of Zonnestraal this was no option because nearly all the steel frames had been replaced by aluminium in the past. Here complete new windows have been made in accordance with the original. The only change is that the original frames were made in one piece, the new ones consist of separate parts.

Apart from the reconstruction of the frames itself we try to restore or reproduce the original hinges and locks, but sometimes it is dropped because of the costs. But just these window furniture can tell us something about the factory that made the original windows if we are lucky to find them in a trade catalogue, an undervalued object by the way.

### *Insulation*

The care for the environment forces us to think about insulation. Even listed buildings have to deal with this matter, which can be a problem for listed buildings are most of the time not designed for, for instance, insulated windows. For years now the National Service is trying to find the right solutions for this problem and tries to keep up with the developments in glass.

Steel doors and windows can have insulation glass. Double glazing however is difficult, because of its size which doesn't fit in the traditional sections. Plastic solutions are on bad terms with the slimline of steel sections. For steel windows there are better solutions which fit well. First there is glass with a Low-E coating which has an invisible silver layer on the inside which reflects the heat. To prevent listed buildings from having a 'mirror look' because of the shiny surface of float glass, there is the Van Ruysdael glass® which is a laminated glass with drawn or mouth blown sheet glass on the outside. It is thick between 6 and 8 mm, has the Low-E glass on the inside and a insulation value of  $R = 3,6$ . A much better, but at this moment also expensive solution is vacuum glass, called Spacia glass. The glass is manufactured in Japan and is imported in The Netherlands by Van Ruysdael®. In combination with Low-E glass it has a value of  $R = 1,1$  and a thickness of 6,2 mm.

But instead of changing valuable old glass another way of insulation can be placing extra windows on the in- or outside.

#### *Changing into insulated steel or aluminium?*

No need to say that people not only focus on insulated glass but also on insulated frames. There is actually no need for that. When restoring old steel windows, they can be made so tight that they will close perfectly without the risk of draught. Because of the slimline of the steel sections the loss of energy through the sections is fractional. When painted well the condensation is negligible and no risk for the preservation of the steel.

Changing into insulated steel or aluminium also means changing the look of a building. As said in the beginning: the slimline of steel is an important part of the architecture in the first half of the 20th century.

Maintaining and restoring steel windows is also part of the care for the environment: it doesn't cost much energy to restore, but so much to make new windows and throw away windows which are most of the time in a fairly good condition.

#### *Conclusion*

- steel windows can be repaired most of the time
- sections are still available or can be reproduced
- insulated glass fits in traditional steel sections
- condensation is less than is expected
- keeping the craft
- authenticity architecture/character of an era
- sustainable conservation