8 Condition assessment

8.1 The approach

The approach of the condition assessment was based on GCI's earlier work[1]. Both the physical and the organizational aspects of the museum were taken into account. The physical environment is the actual set of conditions in which the collection is housed, exhibited and used. The organizational environment includes the museum's mission, functions, resources, and institutional activities. Both these environments are to a large extent interdependent and play a role in the preservation of museum collections.

The condition assessment was undertaken by an interdisciplinary team of professionals. This so-called core team (consisting of 2 conservators, a restoration architect, 2 conservation scientists and supported by museum staff) was responsible for gathering information to establish overall condition, pinpoint problematic areas and identify the need and type of specialized knowledge required from other experts. The core team carried out a first in-depth survey on site on 11, 14 and 15 August and liaised with museum staff throughout the assessment process. On 21 August 2006, the findings of the core team were discussed with a larger 'resource team', which included experts whose knowledge and expertise complemented those of the core team (refer to list in appendix). The resource team consisted of (one or several) curators, building/interior historians, conservators, conservation scientists, and building physicists. This created an opportunity to share experiences, to draw upon specialized knowledge and to discuss the complex degradation processes in a historic house museum.

This approach was chosen as the most practical under the circumstances – rooms in the house are small and visitation in this period is high. Thus the impact of the assessment on the public and the building was minimized.

Busy line-up of visitors to the museum (photo: GCI)

The survey and discussions were recorded (audio/visually) for use in the case study.

[1]Refer to GCI publication: *The Conservation Assessment: A Proposed Model for Evaluating Museum Environmental Management Needs.*
http://www.getty.edu/conservation/publications/pdf_publications/assessmodeleng.pdf

8.2 Preparation

Prior to the condition assessment, base line information was gathered:

- The organization:
    - Mission, functions, structure, etc.:
        - Mission statement
        - Organizational structure and staff function descriptions
    - Current preventive conservation strategy (maintenance, cleaning, etc.):
        - Algemene Gebruiksvoorwaarden Museum Amstelkring 'Ons Lieve Heer op Solder' (2002) – General stipulations for use
        - Huisregels voor groepsbezoek aan Museum Amstelkring / Ons' Lieve Heer op Solder – House rules for group visits to the museum
        - Huisregels bedrijven die werkzaamheden in het museumpand verrichten (1999) – House rules for companies that carry out work in the museum building
        - Werkzaamheden Huishoudelijke Dienst – Tasks for the household staff
        - Grote Schoonmaak – Schedule for major cleaning
    - Information on visitation:
        - Numbers of visitors since the early 1900's
        - Numbers of people attending church over the centuries – estimated, to be checked by museum staff in church records

- The building:
    - Maps and technical drawings:
        - Simple drawings to scale
    - Documentation of building materials and construction:
        - Museum Amstelkring te Amsterdam bouwhistorische opname Vlaardingerbroek & Wevers en Ingenieursbureau J. Tegelaars (1998) – Research report into the history of the building and the interiors (1998).
        - Rapportage omtrent de staat waarin de konstruktie van de vide-ophanging in de kerkzaal zich bevindt door Ingenieursbureau Grabowsky & Poort B.V. april 1988 – Report on the construction of the galleries in the Church by engineering company Grabowsky & Poort B.V. April 1988
    - Historic documentation of previous restoration/maintenance work:
        - Restauratie logboek fase 2; 18e/19e eeuwse voorkamer en receptieruimte (2003) – Log book of the restoration of the 18/19th Century antechamber and reception area (2003)
        - Logboek Dakrestauratie 2005 – Log book of the restoration of the roof (2005)
        - Logboek Gebouwbeheer 2006 – Log book of building maintenance (2006)

- Report by 'Monumentenwacht Noord-Holland' (Periodic survey reports of the state of the building):
    - Tusseninspectie (26/10/2004) – interim inspection (26/10/2004)
    - Inspectierapport 2006 (9/6/2006) – inspection report (9/6/2006)

- The fixtures/fittings:
    - Documentation of materials/finishes:
        - Museum Amstelkring te Amsterdam bouwhistorische opname Vlaardingerbroek & Wevers en Ingenieursbureau J. Tegelaars (1998) – Research report into the history of the building and the interiors (1998).
        - Slijtage door bezoekers in Museum Amstelkring: stageverslag Marjolein Versluijs (Reinwardt Academy Amsterdam, 2006) – Internship report into visitor impact (2006)
    - Historic documentation of previous restoration/maintenance work
    - Conservation/restoration reports on treatments of individual elements:
        - Verslag conditie nagelvast meubilair en houten interieuronderdelen en offerte voor herstel door Bruijs & Streep 2006 – Condition report of the immoveable furniture and wooden interior elements and an estimate for their repair by Bruijs & Streep 2006

- The collection – individual objects:
    - Collection catalogue or database:
    - Information on provenance of individual objects
    - Conservation/restoration reports on treatments of individual objects:
    - ICN, eindrapportage Museum Amstelkring maart 2004 – ICN end report Museum Amstelkring March 2004 (unpublished report)

- The environment:
    - Climate data:
        - Digital climate data from 2005/2006
        - Ing. E. Neuhaus, Dr.ir. H.L. Schellen: Museum Amstelkring te Amsterdam Adviesrapport binnenklimaat – two indoor climate advisory report reports by TU/E, 22 and 94 pages (March 2006).
        - CO_2 data 2006
        - TU/E report Edgar Neuhaus, Air exchange rate measurements museum Amstelkring (2006)
        - Climate charts from thermohygrographs placed in several rooms, recording over many years – these were not retrieved and examined

- Climate control measures in place
    - Toepassing Be- en ontvochtigers 12 aug. 2005 – Guidelines for the use of (de)humidifiers

- Archival information/secondary sources, such as old photographs and documentation of Museum Ons' Lieve Heer op Solder (outside/inside):
    - Old photographs, some dating back to 1890

8.3 On-site survey by core team - organization

The survey on site was carried out by the interdisciplinary core team, which consisted of:

- ICN project coordinator (conservation scientist); Bart Ankersmit
- GCI project coordinator (conservator); Foekje Boersma
- ICN conservation scientist; Agnes Brokerhof
- Restoration architect; Daniel Querido (Werkgroep Restauratie)
- Senior consultant preventive conservation; Jaap van der Burg (Helicon Conservation Support b.v.)

On Friday 11 August 2006 the team met for the first time at ICN, where the collaborative project and the objectives of the assessment were discussed.

Introduction of Condition Assessment (photos: Paul Ryan)

The core team was split in two: one collections/fixed furniture group (Bart Ankersmit, Jaap van der Burg, Foekje Boersma with assistance from Annemiek van Soestbergen) and one buildings/fixtures/ fittings group (Agnes Brokerhof, Daniel Querido with the assistance of Peter Schoutens). To ensure the exchange of information, the groups reported back to one another over each break.

The buildings'/fixtures'/ fittings' group: Daniel Querido, Agnes Brokerhof, Peter Schoutens. (photos: Paul Ryan)

The collections'/fixed furniture group: Foekje Boersma, Jaap van der Burg, Annemiek van Soestbergen, Bart Ankersmit (photo: Paul Ryan)

Due to time restrains for the actual assessment, it was decided that the assessment would focus on certain objects[2]. In this way the assessment could also generate more detailed information, rather then a global description of a lot of things. Criteria were set to select these objects.

The selection criteria:

- Provenance: how long has the object been in this location – the longer the better
- 'Valuable' objects for the museum, because of their authenticity or because the object is important for delivering the storyline to the public.
- The presence of documentation (history if the object, treatment records, old photographs, etc.).
- Representative for a group.
- Priority to be given to objects in the Church, Canal Room and Sael, as the climate in these rooms has been recorded.
- An especially different situation or problem.

It was decided that the requisite collection (which is still in use) would not be assessed as these objects will never enter the collection and are considered replaceable.

[2] NB an object can also be a building element, a fixture or fitting.

The following selection was made:

- Church:
    - 1st Gallery on SW side of Church
    - Wooden floors (including the floors of the galleries)
    - Choir bench on SW side of Church
    - Painted marble columns of altar
    - Hidden pulpit and cabinet
    - Communion bench
    - Monochrome painted wooden statue of St. Paul
    - Polychrome painted wooden statue of putto
    - Priest chair
    - Panel painting
- Sael:
    - Marble floor
    - Built-in 17th century built-in cabinet with wooden doors
- Canal Room:
    - Cabinet-on-stand
    - 17th Century stairs
- Confession room and corridor:
    - Monochrome painted wooden statue of St. Peter and St. Paul
    - Confession space (room, furniture, statue and painting)
- Antechamber:
    - Paper wall decorations (restored in 2003) and mantle piece
    - Sandstone building fragment
- House at the back (Heintjehoekssteeg):
    - Marble floor
    - Plateau of stairs leading to 17th century kitchen
    - Wooden stairs (protected in the 1970's)
- Corridors
    - Polychrome painted wooden Maria statue

Due to time restraints, paintings were not part of the condition assessment. The initial tour through the building did not show significant or common types of damage in the paintings. Paintings on inside and outside walls were briefly compared for differences in their condition. Over all, the collection of paintings appeared to be in good condition. It was also believed that the painted wooden statues are in general more susceptible and their assessment would give a proper indication of current damage factors that would also affect the paintings. In section 10.2, some comments referring to the impact of incorrect RH and T on paintings are discussed.

The survey took place on Monday and Tuesday, 14 and 15 August 2006 and was recorded using a documentation sheet (see 8.4 and appendix), digital and analogue (medium format) photography, analogue video and digital voice/sound recording.

8.4 Documentation of assessment

Data collected during the on-site survey was later transferred to a simple Access database, consisting of a one-to-many-relationship between two tables, 'Description of area' and 'Objects' (see appendix). This combines information about the building, its use and interior climate with the objects within. The first table 'Description of area' describes the space in terms of area orientation, floor level, date, treatment history, maintenance, dimensions, doors, windows, source of heating and ventilation, temperature, RH and AH observations, light sources, UV or IR measures and occupation. (Refer to appendix for an example of data entry for the Sael).

As the building and its interiors are considered part of the collections, 'objects' include moveable collection and immoveable items, such as floors, stairs, walls and ceilings. The table 'objects' links the to the 'Description of area' table by means of a unique area reference number. Other information recorded included: object number, category (i.e. furniture, statue, architectural element, etc.), orientation within the area, materials, techniques, construction, finishes, original and current function, frequency of use (when applicable), display or storage method, previous treatment, maintenance, susceptibility, visible damage, causative factors for damage, date of assessment and assessor. (Refer to appendix for; an example of data entry for the statue of St Paul in the church; summary of the data extracted from 'objects' table in database).

To describe susceptibility and causative factors of damage, use was made of the ICN damage list created for their previous risk assessment of the museum (refer to appendix). These risk factors are grouped by risk type[3]:

- type 1, which are rare in frequency and catastrophic in severity
- type 2, which are sporadic in frequency and intermediate in severity
- type 3, which are constant in frequency and gradual/mild in severity

Each damage factor was then further defined by describing its nature or scenario as used in the risk assessment.

[3] Waller, Robert (2003) *Assessing and managing risks to the Netherlands' cultural property*. Amsterdam: ICN, unpublished.

Agents of deterioration	
PF 1/1 earthquake	
PF 1/2 collapse	Collapse of nearby building causing physical damage to museum building
PF 1/3 explosion	
PF 1/4 storm	
PF 1/5 collision	Truck or grounded plane colliding with building
PF 1/6 neg. water flow	Physical forces from negative water flow causing structural damage to the building
PF 2/1 vibration from building work	Vibration during repair work from surrounding activities
PF 2/2 crowds	Physical damage to the building from crowds during events
PF 2/3 maintenance/repair	Accidental physical damage during maintenance, security or repair operations
PF 2/4 use	Accidental physical damage during use by staff, visitors and users
PF 2/5 object transport	Mechanical damage during internal and external transportation
PF 2/6 sampling	Sampling of collection objects causing loss of elements, pieces
PF 3/1 frequent maintenance	Maintenance activities: dusting, sweeping, etc causing damage or loss of objects
PF 3/2 continuous vibration	On-going vibration from visitors and the pipe organ causing damage to objects
PF 3/3 handling	Physical damage resulting from continual staff handling of objects
PF 3/4 portable fitting transport	Continual handling and damage from installation of exhibits and movement of items
PF 3/5 abrasion	Impact from visitor use causing cumulative damage to objects
PF 3/6 lack of support	Insufficient support causing damage to objects (exhibition and storage)
PF 3/7 overcrowding	Overcrowding causing damage to objects
PF 3/8 frequent use	Use of doors, organ, religious objects
PF 3/9	Inherent stress (damage caused by the object's own weight, construction, use of materials, and natural degradation processes such as shrinkage of wood)
F 1 large fire	Damage by large fire, including smoke and water damage
F 1 local fire	Damage by small fire, including smoke and water damage
W 1 severe water damage	Severe water damage caused by downpours, burst water mains or flooding
W 2/1 roof leakage	Roof leak causing damage objects
W 2/2 pipe leakage	Plumbing or sewage leak causing damage to objects
W 2/3 equipment failure	Malfunctioning equipment causing damage to objects
W 2/4 equipment maintenance	Spill during maintenance activities causing damage to objects
W 3/1 condensation	Condensation causing damage to objects
W 3/2 rising damp	Rising damp causing damage to objects
W 3/3 wet cleaning	Mopping causing damage to objects
Crim 1/1 major theft	Major theft (professional heist) causing damage to objects and loss of objects
Crim 1/2 major vandalism	Major vandalism causing damage (e.g. defaced, pieces broken off, etc.)
Crim 2/1 isolated theft	Isolated theft during use, maintenance, repair, security operations, tours
Crim 3 internal theft	Theft by insiders

Agents of deterioration	
Pests 2/1 rodents	
Pests 2/2 insects	
Pests 2/3 birds	
Cont 1 nearby disaster	Contamination caused by nearby disaster (forest fire or industrial or transport accident) resulting in fumes or smoke
Cont 2/1 building work	Dust and fumes from construction and maintenance causing damage to objects
Cont 2/2 collection work	Damage to objects (i.e., ink stains) caused while working in collection areas
Cont 2/3 cleaning spills	Accidental spillage of cleaning products
Cont 2/4 object treatment	Treatment of individual objects resulting in contamination leading to eventual Loss in Value
Cont 3/1 dust	Dust causing damage to objects
Cont 3/2 oxidation	Oxidation causing damage to objects
Cont 3/3 air pollution	Permanent gaseous pollutants: SO2, ozone, etc. causing damage to objects (Indoor en outdoor)
Cont 3/4 inappropriate material use	Use of inappropriate material / preparation method causing damage to object
LUV 2 exposure to high intensity light	Exposure to film and photo light, spots, high intensity
LUV 3/1 light	Exposure to light from internal (artificial lights) and external sources (daylight)
LUV 3/2 security light	Security lighting causing damage to objects
T 2/1 heating system failure	Heating system failure causes thermal shock resulting in physical damage to objects
T 2/2 localized heat from lighting	Heat from film lighting causing damage to objects (e.g. cracking, drying, bubbling, etc.)
T 2/4 thermal shock	Thermal shock during cleaning, treatment, or transport
T 3 seasonal changes	Seasonal temperature outside specifications causing damage to objects
RH 2/1 drastic RH change	Drastic and sudden RH change in transit causing physical damage to objects
RH 2/2 equipment failure	Humidification/dehumidification equipment failure
RH 3/1 incorrect high/low	Continuously higher (or lower) RH than ideal (specified)
RH 3/2 micro-climate	RH higher than specified in a local area due to temperature gradient or moisture flux (inappropriate micro climates)
RH 3/3 fluctuations	RH fluctuations causing physical damage to objects (e.g. warping, cracking of bone and teeth, etc.)
L 2/1 abandonment	Short term collection abandonment causing damage and loss of sub collections
L 2/2 data carrier loss	Loss of object data or associated data (written, computer)
L 2/3 data incomplete	Irretrievable objects due to lack of location registration
L 3 data loss	Loss of object data or associated data (non-written) e.g. departure of staff, memory loss

9 Observations

9.1 Building

Some comments can be made with regard to the current condition of the building. It should be noted here that the on-site survey was limited due to time and available equipment, so that only easy accessible parts of the building were visually assessed. An in-depth inspection of the roof, attic, and basements and of structural elements such as the foundation was not included.

For the assessment, use was made of existing knowledge of past building work. The documentation of the immoveable collection is scarce and information on the building history, maintenance and repair has either not been recorded or recorded only in a haphazard way. The building was last restored in the 1950's and the roof in 2005. No other major types of conservation, maintenance or repair activities to the inside have been recorded since 1950. Following is a chronological brief list of known maintenance and repair work to the building:

In 1894, the roof was repaired.
In 1904, windows with relatively easy access (windows in the alley, on the roof and facing the court yard) were fitted with iron bars as burglary prevention.

From 1954-1960, the building was restored with the help of the 'Monumentenzorg' (bureau for the care of monuments) of the city of Amsterdam. This restoration was extensive and integrated the two houses at the back with the main building. The second house at the rear was reconstructed creating the present layout. The original stone floor on the first floor (the Jaap Leeuwenberg Room) was uncovered and reinstated. The additional wooden floor and balustrades were newly installed. The kitchen on the ground floor was restored to a 17th century style. Apart from the Canal Room, Sael and reception area (reconstructed in 2001-2003), the painting of most of the interiors dates back to this restoration.
The foundation at the corner of Heintje Hoekssteeg and Oudezijds Voorburgwal and the walls of the former inner court were repaired up until approximately 5 meters above street level[4]. The original division of the windows was reinstated and the roof was fixed. The entire building was fitted with central heating.

In 1974, the public toilets were placed in the basement of the first house on the Heintje Hoekssteeg.

The last time the outside was treated was in the late sixties and seventies.

[4] Grabowsky & Poort B.V. (1988) *Rapportage omtrent de staat waarin de konstruktie van de vide-ophanging in de kerkzaal zich bevindt*. Den Haag: 1988 (unpublished report)

In the period 1999-2001, the Canal Room and Sael were renovated and their 17th century interior reinstated. In the Canal Room the wooden floor was painted and the walls were covered with textile hangings, which were newly woven based on an authentic piece of textile that survived at the Swedish castle Skokloster. In the Sael, several broken and damaged stone floor tiles were repaired or replaced. The painted wooden cassette ceiling was cleaned and cracks were filled in. The original plaster on the walls was uncovered and the door, which was at one point installed next to the chimney, was removed (in a reversible way).

Around 2001, damage to the top of the tension rod, connecting the galleries on the SW side of the church (closest to the altar) to the roof construction was welded. It was already noticed in the 1970's that this tension rod had corroded through and through at the top part, where it connects to the wooden beam of the roof construction. It is unclear if any action was undertaken at that time. Just before repairing this damage, temporary measures were put in place to allow access to this gallery to ordinary museum visitation, and not to large crowds. After repair, this restriction was lifted.

In 2003, the entrance and antechamber were renovated and decorated in 19th century style. The wallpaper in the antechamber was reconstructed as it was in 1888, with wallpaper specially made according to a small sample that survived from that time.

In 2005 the roof was restored; old tiles in good condition were re-used as much as possible, new tiles were used to complement. Lead was replaced were necessary and gutters and downspouts were replaced. Gable anchors were conserved and rotten wooden combles ('spanten') were treated or replaced.

In 2005, the piece of leather and stuffing on the railing of the balustrade on the first gallery was removed. This was very badly damaged (by use?) and the exact purpose of the upholstery was unknown. This upholstery may be reinstated during the planned restoration of the church.

View of balustrade on 1st gallery with the leather upholstery still in place (photo: museum Our Lord in the Attic)

9.1.1 Comments with regard to the current condition of the building

Beam heads

There has been an issue (first mentioned in the 1970's) with the rotting of beam heads in the north wall of the building at the Church's third level floor (the 6th level of the building), which is exposed to the elements (there is no connecting building at that level). No other rotting has been found in other walls except one with an obvious rain infiltration problem.

Damage to one of the beam heads (photo: TU/E)

The beam heads were repaired (potted in an epoxy resin), the walls were stuccoed and painted. The old wall may have developed cracks that were infiltrated by outside rain, resulting in the rotting beam heads. Rain generally wets north-facing walls in the Netherlands, and these walls tend to remain wet for long periods afterwards. Therefore, it is considered highly unlikely that rotting of the beam heads was caused by *in situ* condensation of the humidified air inside the building. Instead, it was a building maintenance issue in which the wall had cracked and rain infiltrated into the wall cavity and rotted the beam heads.

Glazing: the windows in the building are of single glazing. Sheets of lexane have been installed on the inside of the northeast and southeast facing windows in order to reduce UV levels and also as a protective measure against burglary (to avoid damage by broken glass in case a window is thrown in)

In winter, there is often condensation on the inside of the windows, resulting in rapid decay of the windowsills.

Condensation on the inside of window in the church (photo: TU/E)

Damage to window sills, accelerated by consensation (photo: Paul Ryan)

<u>Condition of the galleries in the church</u>

The church and its galleries were built on the existing attics in 1663 (refer to 3.5).

View of the 1st and 2nd gallery (photo: Paul Ryan)

The flexing of the galleries by their own weight and when loaded with people is mitigated by the vertical tension rods. However the galleries are slightly dipping closer to the altar. One rod (near the altar, on the SW side) was broken (first noticed in the 1970's and not repaired until 2001). At this point the SW 1st gallery is sagging more, which could be an indirect result of this damage. The gallery on the opposite side also has a bend, but to a much lesser extent.

There is obviously some movement in the SW 1st gallery – the plaster underneath is crumbling away and there is damage to the beam heads.

This movement may also be affected by traffic outside, especially heavy garbage trucks and street cleaning machines.

(photo: Paul Ryan)

Following is more detailed description of the condition of immoveable and moveable collection items.

9.1.2 Wooden floors

Material: pine, standard plank thickness 30–35 mm

Construction: 'groove/spring' construction (both boards have groves and are connected using oak wood springs). Nails are also used to fix the planks to the supporting beams. In many areas, the floor is the ceiling of the space underneath it.

Previous treatment: filling of gaps between floor planks with strips of wood and sometimes wood putty, repositioning of worn planks to areas of lesser use, replacement of planks (1938 recorded that worn out floor parts in the church were replaced with wood from a demolition site). Floors were traditionally waxed (?) and there are remains of old wax (?) along the lesser worn edges of the floors.

Maintenance: vacuum cleaned once a week

Floorboards showing shrinkage in width

Darker area around edge of floor (photos: Paul Ryan)

Damage: crimp in the width of the planks causes deformation of and splits in between floorboards. There is chipping and loss of wood in places where the springs are exposed. Around the edges of floors there is a brownish discoloration caused by ingrained dirt in old remnants of wax (?). There is damage caused by wood boring insects, although this appears to be inactive. Abrasion (less in areas of knots) is on average 5 mm in the routing, and 8 mm upon entering the church (which is a turning point). The worst abrasion (of 12 mm) is found in the area next to the organist's bench (the wood is worn away to expose groove, loss of spring).

Details showing an exposed spring and related wood chipping (photos: Paul Ryan)

Observations: the floors inside this house are not level and slope down towards the alley. Small splits between floor boards/beams can be caused by this sagging, although the natural drying and shrinkage of wood is also a contributing factor. Floorboards have an average width of 25 cm and will shrink considerably within the first 5 years after being placed. These splits were in the past usually filled in with strips of wood, especially when the floor was in view and in use. As wooden planks dry, they curve slightly. A good carpenter would have positioned planks of wood with the rounded side up, so that when the wood shrinks, the plank would level. In several areas in the house, wooden planks are positioned with the hollow side up. This could be a result of replacing wooden planks in a floor. As the bottom side of a plank would be smoother and cleaner then the top, it is not unimaginable that planks were turned. However, this side of the wood is more prone to abrasion.

It can be seen from old photographs from the church that some planks were placed elsewhere.

Comparison studies by Marjolein Versluijs (Reinwardt intern with ICN 2006), showing that floorboards next to the steps have been replaced. (source: ICN)

Observations (continued): when the pine floorboards abrade for 3 mm, the oak spring may become exposed. The pine is vulnerable when this happens and there is a lot of damage caused by walking – placing a heel at these points chips off wood fairly easily. Vulnerability of pine versus oak: pine is softwood, oak hardwood. Because the floors were not maintained at a regular basis in more recent history, i.e. splits not filled and exposed springs left untreated, damage of the wooden floor is wide spread. If left untreated, the overall condition of the floors will decrease rapidly.

Of immediate concern is the wear in certain areas, where the thickness of the wood may have decreased to a possibly structurally unsound situation. A more detailed survey of the wooden floors is planned this year, which will identify the exact extend of this problem. The areas of concern are at the top of the stairs on the first gallery and next to the organ. The first area is a turning point and this obviously results in more abrasion. The other point is the spot where the organist jumps down from his high seat and immediately turns. This spot could easily be protected by providing a small step to avoid the jump or by covering it with a more durable material.

Area next to the organ that is more abraded. Loss of spring.
(photo: Paul Ryan)

9.1.3 Marble floors

The Sael with the marble floor
(photos: Paul Ryan)

A marble slate being lifted to show structure underneath

General description: The floor in the Sael was laid between 1661-1663 and mirrors the layout of the ceiling above in a geometrical pattern in black on white. The floor in the Jaap Leeuwenberg Room is similar in technique and materials to this floor.

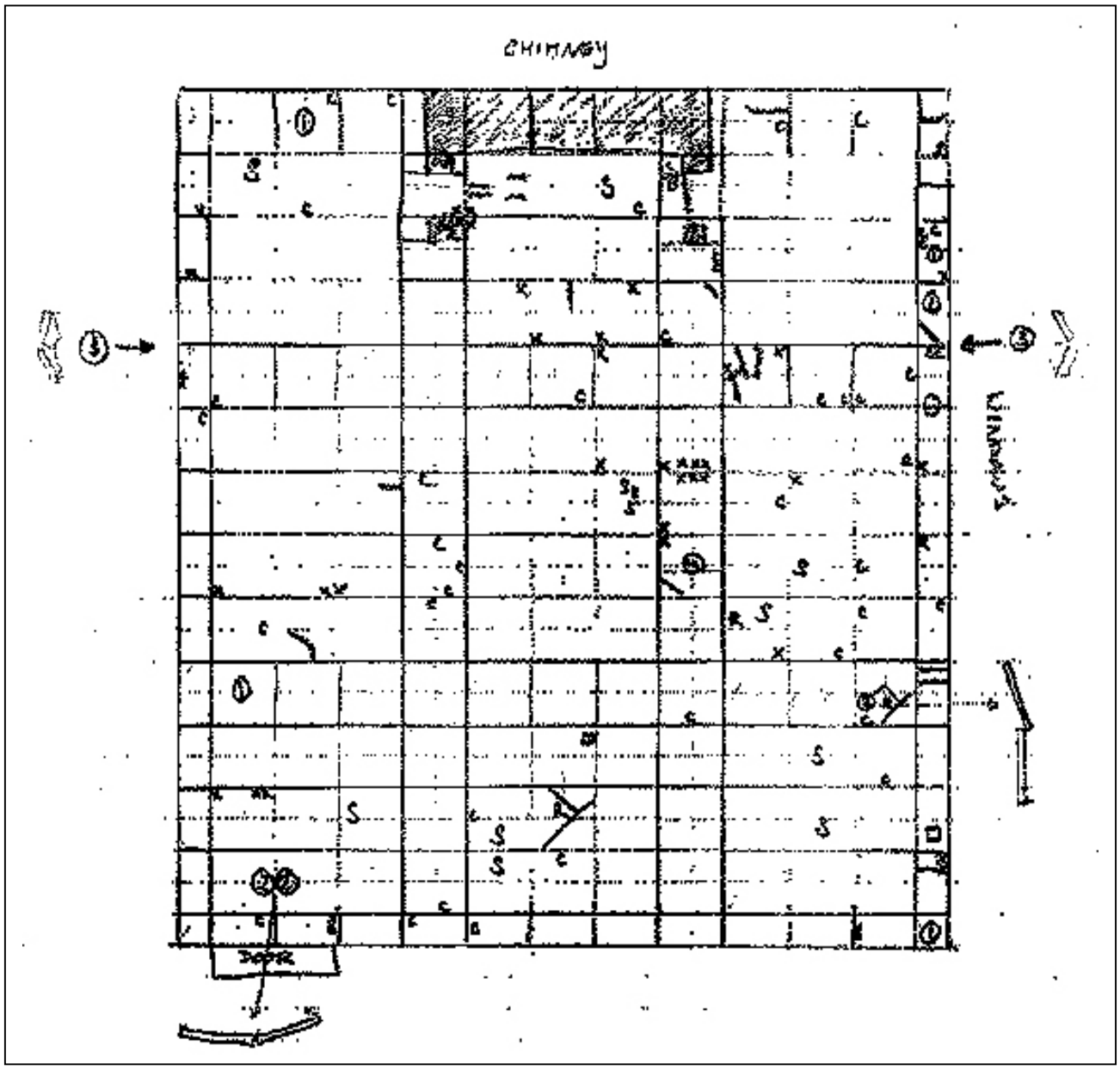
Material: black stone from Belgium, white marble from Italy.

Construction: traditionally the marble and stone slates lay on a bed of grinded seashells of approximately 3 cm thick (sometimes mixed with lime ('kalk')), placed directly on the wooden floor, which was often lowered. The shells make the wooden floor surface more even. The wood changes shape due to natural shrinkage, response to changing RH conditions and deformation due to stress). The shells would thus compensate changes in the floor surface. The slates were placed loose on top of the bed of shells. The slates are curved on the bottom and are fairly rough, to create a good grip in the bed of shells.

Previous treatment: the bed of shells would probably have been refilled over the years, as shells crush and become powdery. Traditionally, these types of floors were usually fully lifted and re-laid once every 100 years. Some slates have been replaced over the years, most recent intervention in 2000, when a few slates were repaired and fixed in place.

Maintenance: the floors are vacuum cleaned with a frequency dependent on visitation (from daily in busy times to once a week in quieter periods). Sometimes the floors are cleaned with a damp cloth and 'Ecover', a biodegradable soap, when necessary and often only locally. The frequency of damp cleaning varies with the weather and seasons, but is on average once a month. When it is wet outside, more dirt is walked in.

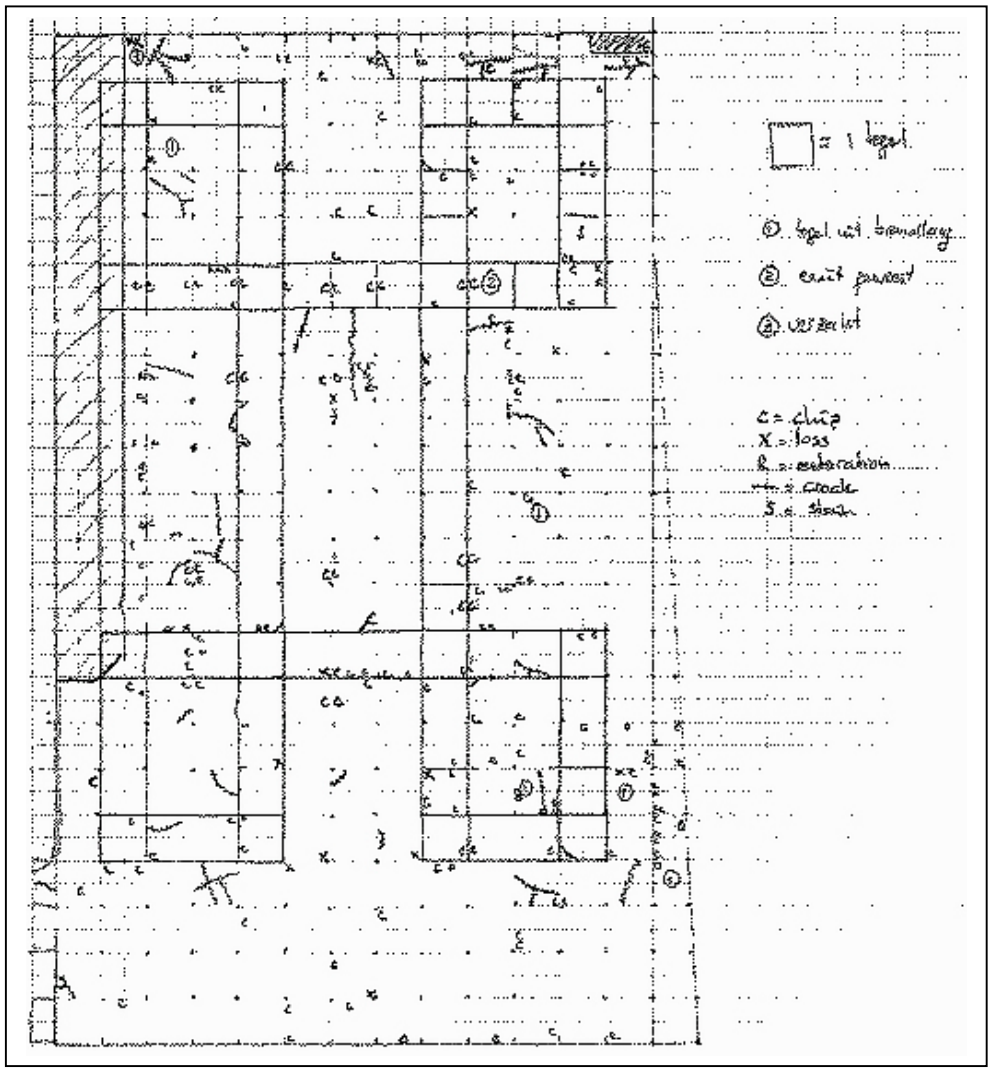
Damage: some scratching all over, chipping along edges and in corners, a few cracks, and sloping of the floor in the Sael.



Sketch of the damage to the floor in the Sael (c=crack, r=repair, s=stain, x=loss) (source: Agnes Brokerhof)

Details of damage to the Sael floor (scratching; chipping). NB: right photo shows white vein in black tile, easily mistaken for fracture . (photos: Paul Ryan)

Details of damage to the Sael floor (deformation; cracking due to structural pressure of chimney piece). (photos: Paul Ryan)



Sketch of the damage to the floor in the Jaap Leeuwenberg (c=chip, r=repair, s=stain, x=loss) (source: Agnes Brokerhof)

Observations: the stone floors are susceptible to wear and tear, not so much in the abrasion of the material, which is relatively strong, but more in damage related to the stability of the floor. As the seashell bed is crushed over time, the curved slates will start rocking as ones walks over the floor, resulting in chipping at the edges and eventually cracking of the slates. Another contributing factor to the overall stability of the structure is the wooden floor underneath– in the Sael the floor is sagging towards the alley and the bed of seashells is not compensating for this deformation. At the moment, the slates are still secured in the shell bed. In order to avoid unnecessary damage in the future, maintaining a stable shell bed is crucial.

In terms of material strength: the white marble is more vulnerable then the black stone – it will break more easily and is more susceptible to abrasion and staining (it is more porous). Keeping damp cleaning to a minimum is therefore good practice.

The floor is overall scratched by shoes – a protective measure to prevent unnecessary scratching would be to forbid the wearing of hard or pointed shoes, such as stilettos or boots with metal reinforcements. Also shoes and boots with a deep profile can trap small stones that can cause scratching.

9.1.4 Stairs

17th Century stairs from ground floor to 1st floor

Description: in 2002 they were closed to the public and were taken out of the normal museum routing, because of the extensive abrasion of the steps. These stairs have since only been in use during weddings, and only by the bride.

Material: Oak

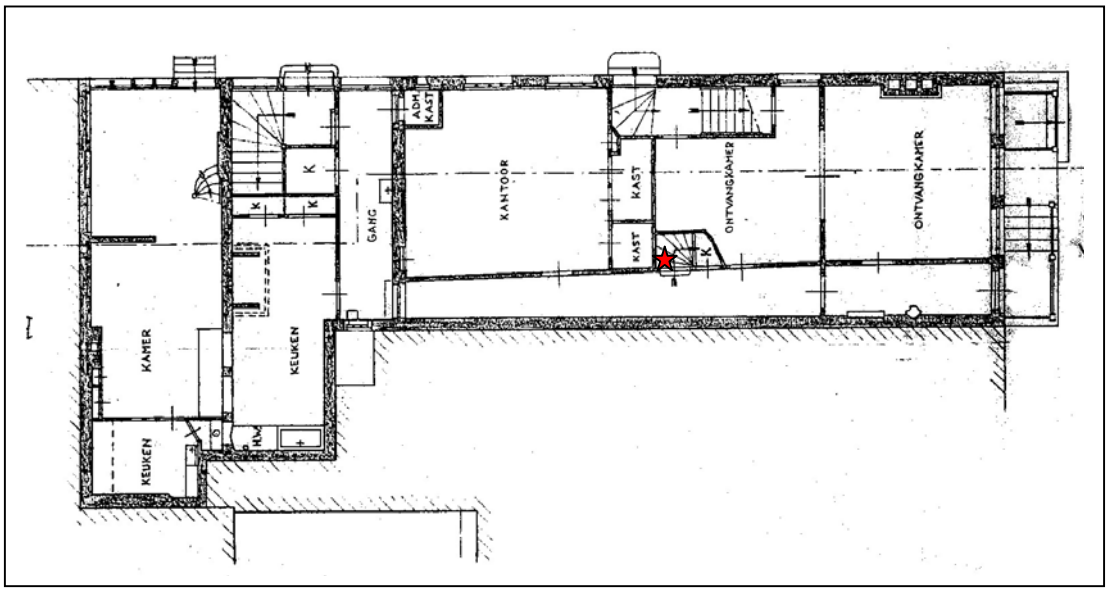
Original thickness of steps: 31 mm

Maintenance: unknown, assuming occasional vacuum cleaning.

Damage: severe abrasion of steps, especially in the wider part of the triangular shaped steps.

The 17th century stairs as seen from the first floor down.

Detail of wear and tear on one of the steps. (photos: Paul Ryan)



Location of the stairs on the ground floor (map source: Museum Our Lord in the Attic)

17th Century stairs from 1st floor to Canal Room to Chaplain's Room

Description: the current situation was created in 1663, although it is believed that the steps leading up to the chaplain's room must be older. Traditionally, these stairs were not used by churchgoers, only by the family and their staff. Since the house became a museum, these stairs are used to enter the Canal room and are used by visitors in both directions. It is unclear if the steps to the chaplains' room were ever part of the museum routing in the past but they have not been used for some time now, as this room is closed off for visitation.

Material: Oak

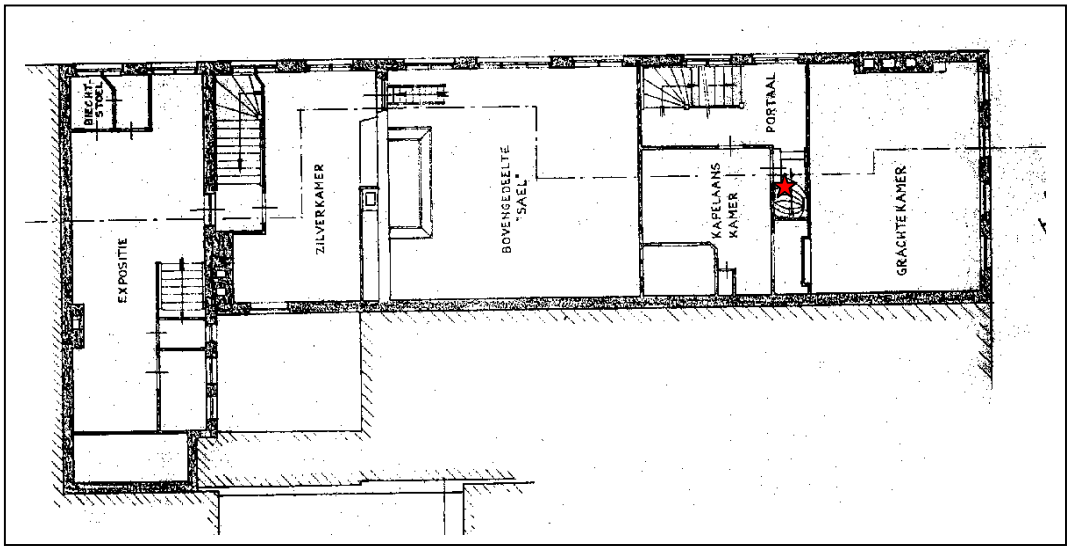
Original thickness of steps: 62-64 mm

Maintenance: regular vacuum cleaning (at least weekly).

Damage: abrasion of steps, especially in the middle part towards the front of the step.

The 17th century stairs as seen from the Canal room. (photos: Paul Ryan)

Detail of wear and tear on the steps.



Location of the stairs on the first floor (map source: Museum Our Lord in the Attic)

17th Century stairs in the house at Heintjehoekssteeg from ground floor to 1st floor

Description: these stairs lead from the 17th century kitchen to the Leeuwenberg room. The original stairs date back to the 17th century (1663), but in the 1970's, the original steps were covered with new protective steps. These new steps have been integrated in the stairs, with subsequent loss of original material.

Material: original stairs oak, new steps in 1970's

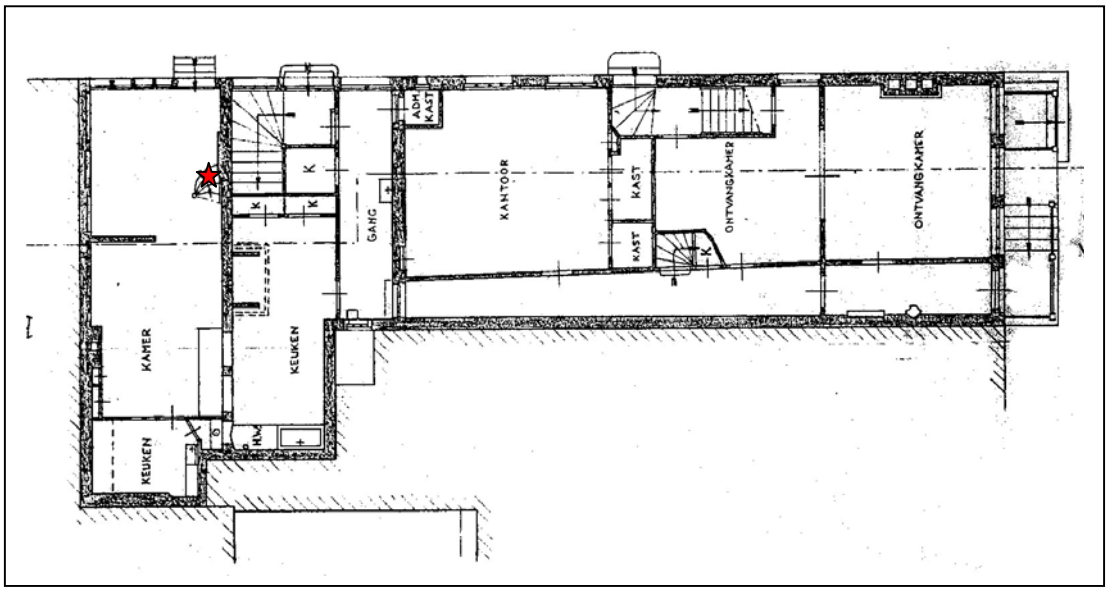
Original thickness of steps: unknown

Maintenance: regular vacuum cleaning (at least weekly).

Previous treatment: the top of the stairs is painted red and the balustrade yellow. This painting was probably last carried out around 1995.

Damage: minor abrasion of steps, especially in the middle part towards the front of the step.

17th Century stairs
(photo: Paul Ryan)



Location of the stairs on the ground floor (map source: Museum Our Lord in the Attic)

Damage (continued): the top of the stairs is dipping and the floor plank closest to the stairs is severely flexing when stepped upon. The red paint is abraded away in the area where one turns ones feet to enter the Leeuwenberg Room. The brown paint on the railing of the balustrade is largely worn away and in areas there is a thick layer of accumulated grime (from hands). As this layer is also brown, it is difficult to distinguish between paint and grime.

Top of the stairs looking down (photos: Paul Ryan)

Damage to railing of balustrade on top of the stairs

<u>17th Century stairs in the church from main floor to 1st gallery</u>

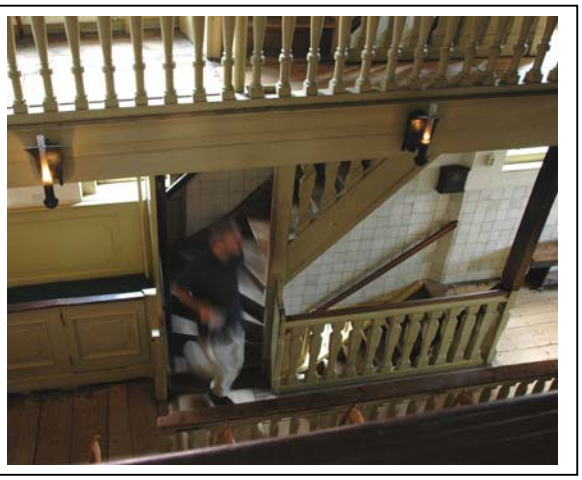
Description: In the 1970's, the original steps were covered with new protective steps. These new steps have been integrated in the stairs, with subsequent loss of original material.

Material: original stairs oak, new steps in 1970's.

Original thickness of steps: unknown

Maintenance: weekly vacuum.

Damage: minor abrasion of steps, especially in the middle part towards the front of the step. Abrasion and grime deposition on railing and posts.



Stairs in the Church

Detail of railing (photos: Paul Ryan)

Overview of abrasion on stairs:

Location	Date	Position	Original thickness of steps (mm)	Abrasion (mm) minimum	Abrasion (mm) maximum
To 1st floor, in front of the house	17th C	1st step	31	11	13
		3rd step (turning point)	31	15	
		top step	31	11	
To Canal Room	17th C (1663)	1st step	62-64		
		2nd step	62-64	10	
		6th step	62-64	6	
To Chaplain's Room	17th C (before 1663)	Top step	62-64	3	
		1 below top step	62-64	3	
To 17th cent. kitchen	1970's steps on 1663 stairs		unknown	1	2
Church (main floor to 1st gallery)	1970's steps on 1663 stairs		unknown	3	

The 17th century stairs lost on average 10 mm in the past 100 years with approximately 1.2 million visitors, equaling $8x10^{-6}$ per visitor.
The replaced steps on the stairs show an average loss of 0.4 mm loss in 20 years caused by 800,000 visitors, 5×10^{-7} mm abrasion per visitor (0.4/800,000 mm). This century may result in 6 million visitors, which would result in 3 mm loss of the same steps. This equals 15% of a step of 20 mm thick.

Observations: the stairs shows sign of wear and tear, not only in the abrasion of the Steps, but also in dents to the upright part of the next step, caused by the shoes kicking into it. This is most obvious in areas where steps are narrow. As most stairs have a slight bend or curve, the abrasion is worse in these areas. Most stairs are difficult to climb and descend and the provided railing does not give enough safety nor comfort for visitors. Observing visitor behaviour on the stairs, there is a strong need to hold on to other surfaces, such as balustrades, posts or walls. It is in these areas that paint is worn away, exposing the wood underneath and grime from hands is building up.

9.1.5 Church – damage observed by use

Several areas and objects in the church were assessed to determine the impact of use of the church.

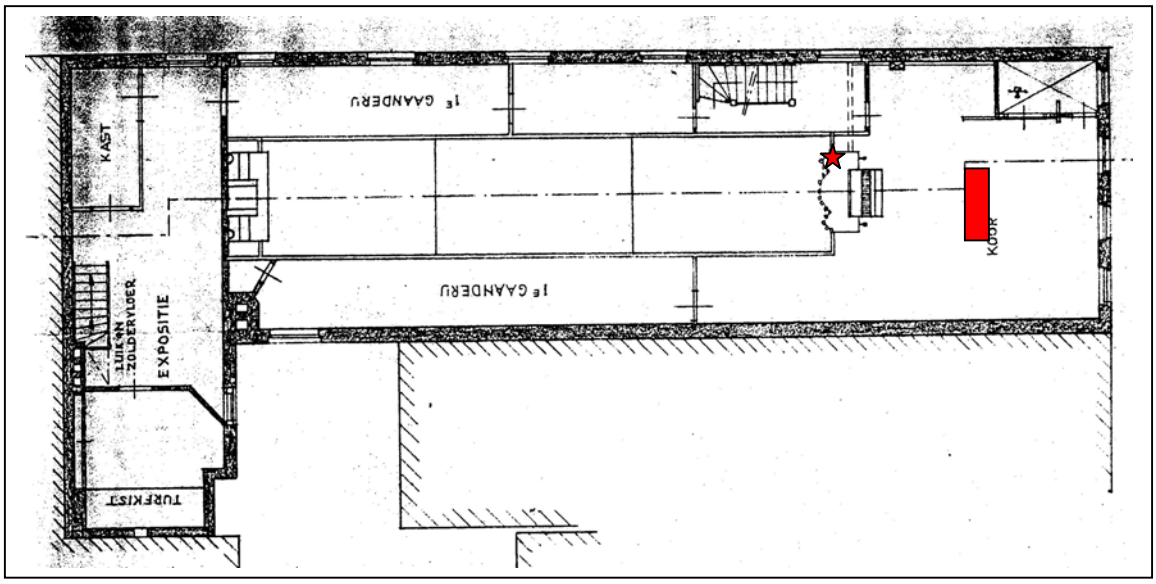
Organ

Description: the organ was placed in the church on the first gallery in 1794. It was restored several times. It is still in use for Sunday mass and occasional concerts.

The organ is still being played. When played, the balustrade on the first gallery resonates at certain pitches. It is not unlikely that certain building elements and consequently objects attached to these also resonate – some statues in this area are known to 'walk'

The Organ on the 1st gallery
(photo: Paul Ryan)

Next to the organ, the floor is severely worn away (refer to 5.5.3).



Position of organ (star) and silver showcase (rectangle) on 1st gallery (map source: Museum Our Lord in the Attic)

However it is difficult to distinguish if the movement of some objects is more related to the organ being plaid or to visitor movement, or even outside traffic. The silver objects in the showcase behind the organ are also displaced over time. It is more obvious that visitor movement, causing flexing of the floor, is the main causative factor here. The showcase is unbalanced and the objects within rock when the visitors walk in this area.

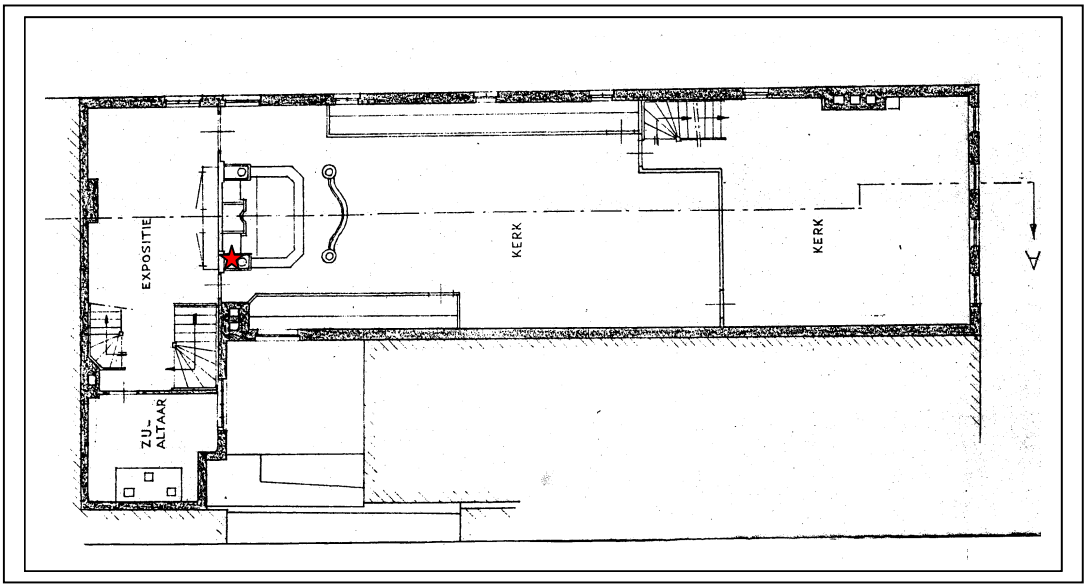
Chalice in the showcase on the 1st gallery, showing displacement of the cover by visitor induced vibrations. (photo: Paul Ryan)

Pulpit

The pulpit is always stored away in the built-in 'cupboard' on the left side of the altar. Until 1999, the pulpit was shown twice a day and was used for every mass. Currently it is never shown and used only for Christmas mass.

The pulpit is constructed of mahogany, lined on the inside with oak. The cupboard where it is normally stored and hidden from view, is constructed of soft wood, painted on outside to resemble marble; on the inside it is painted black.

It is swung into place in front of the altar by a two step movement, in which the difference in height between starting point and finish is ingeniously being over won by a mechanical system of metal rails and hinges.



Position of the pulpit cupboard behind the altar in the church (map source: Museum Our Lord in the Attic)

The pulpit being swung into position

The inside of the cupboard in which the pulpit is stored (photos: GCI)

The pulpit is in good condition and has some minor scratches. The wax is blooming because of the microclimatic conditions inside the cupboard. This visual effect is not harmful and can easily be polished. There is some dust deposition. The cupboard is the weakest part with many signs of use – mainly abrasion caused by the movement of pulpit.

Communion bench

This slightly curved, 3 meters long, mahogany bench was traditionally used for communion. It is most likely placed around 1794, just in front of the altar (it can be seen in the previous map of the church). The parishers would have knelt on the bottom part to receive the wafer (in Dutch 'hostie'). This bottom part has mahogany veneer. The bench is constructed from several parts – the decorative pomegranet cones on either end are loose.

Nowadays it is only used in weddings, when it is decorated with drapes and fake flowers. For maintenance it is occasionally waxed.

Detail of the water stains caused during baptism.

The set up at a recent baptism – the baptism font is placed in front of communion bench.
(photos: Paul Ryan)

On top of the bench there are fingerprints in the wax – people stand behind the bench to look at the altar. The dents, scratches and abrasion on the public side are more related to its original use. On the altar side, there are more scratches and dents, possibly caused by the more recent use of tripods during events. There is some loss of veneer. The cones are often touched, and are darker in colour.
Recent water damage on the floor and the communion bench could be observed, caused by a baptism on 11 Aug 2006.

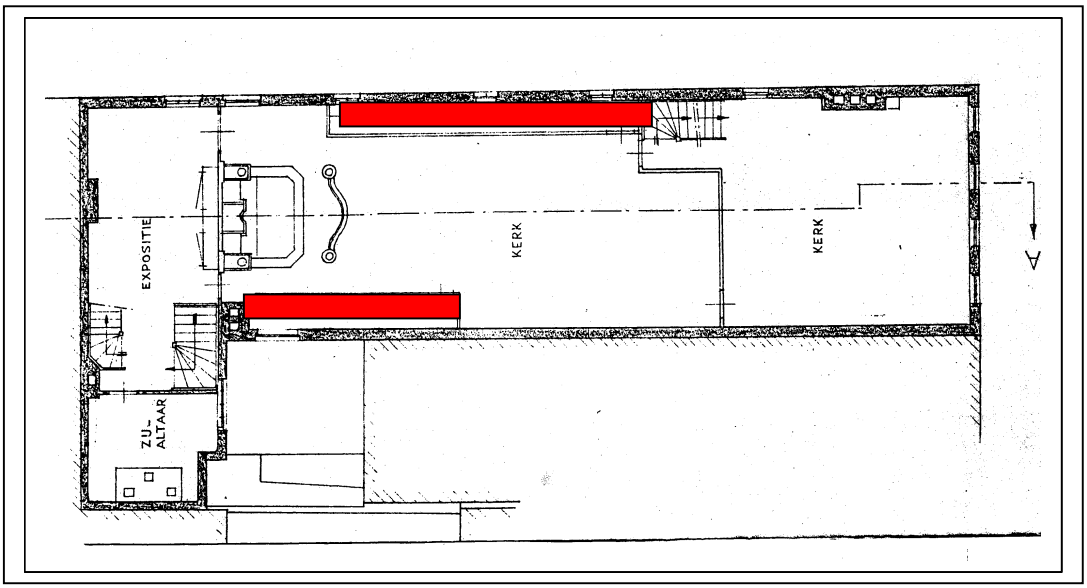
Fixtures

There is specific damage that appears to have been caused prior to the time the building became museum, when it was still in use as a church. For example, the worn away areas of wood in between the columns of the balustrade and, to a certain extend, the abrasion of wooden floors. On the floor there is a built up layer of dirt in areas less walked over. More recent damage can be observed in abrasion of paint and built up of grime on balustrades and doorposts caused by people touching these elements for support as they walk through. Damage caused by bumping and scratching both resulting in paint loss or dents in surfaces. In addition, some more modern nails are visible, and could possibly have been used during events to tack down cabelling. At present, the house rules forbid this kind of action. There are also signs that the handling of tripods and stands results in scratching of surfaces.

Detail of severe abrasion of the balustrade, caused during the time this was still a church (photos: Paul Ryan)

Detail of abrasion of posts of the stairs in the church

The fixed wooden benches for dignitaries



Position of the benches in the church (map source: Museum Our Lord in the Attic)

The fixed wooden benches for dignitaries on either sides of the church (placed around 1737) are not commonly used, but are still in use during events. The bench on the SW wall is shorter and narrower then the one on the opposite wall. Both benches show many signs of use: the wood is deformed and the balustrades are unstable from people pressing against them. There is paint loss, butches and scratches from direct contact with people. The SW bench is especially unstable and the back seat of the bench is dislodged by people pressing their backs against it. This bench is also at a narrow pathway on the left hand side of the altar.

The church bench on the opposite wall is longer and wider; although unstable as well, the back seat is not deformed. This can be explained by the fact that it is wider. It also has less damage to the woodwork as it is further away from the altar and the pathway is less restricted.

Bench for dignitaries on SW wall
(photos: Paul Ryan)

Detail of the dislodged back

9.2 The moveable collection

9.2.1 Painted wooden statues

Monochrome painted wooden statue of St. Paul in the Church

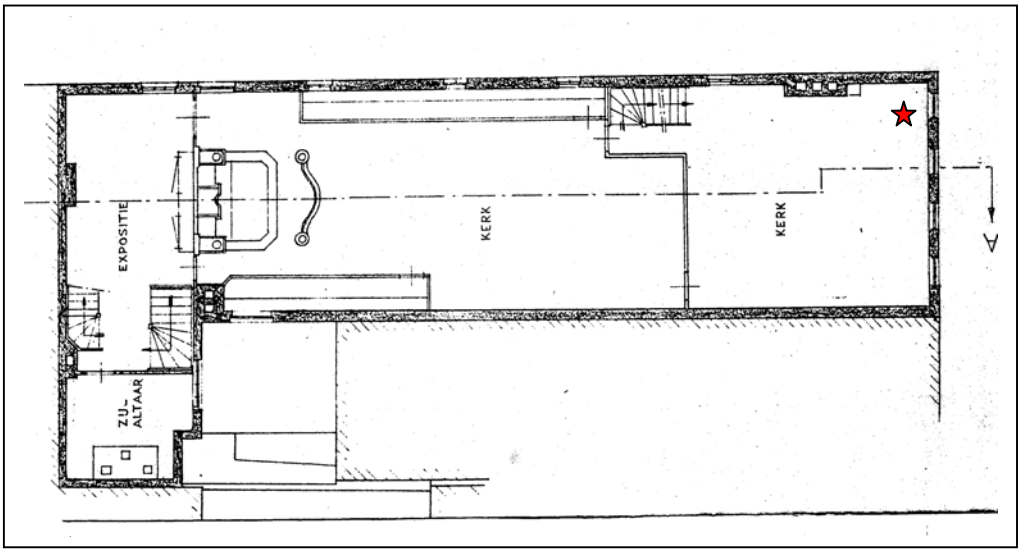
General description: a man-size statue of St. Paul (pair with St. Peter), dating to around 1740. It has been in the museum since 1880, and since 1950 in its current location.

Material: pine wood, ground layer, white paint

Construction: semi-hollow at the back, cavity painted. Composed of several parts, such as arms and hands. Statue stands loose on a low pedestal.

St.Paul in the church

Detail of cracks in the wood (photos: Paul Ryan)



Location of statue in church (map source: Museum Our Lord in the Attic)

Previous treatment (taken from object's records): repair of sword, extensive cleaning in 1989. Condition assessment in 1990's.

Maintenance: dusting once every 3 to 6 weeks with soft brush, brushing the dust towards the hose of the vacuum cleaner, which is covered with a cloth to trap any flakes that may be dislodged.

Damage: extensive cracking/splitting of wood, local paint and ground layer loss, some abrasion on protruding areas, dust deposition and discoloration due to dirt, small brown stains at bottom (caused by previous wet cleaning of floors?), wood chipped and areas of loss at bottom, old repairs (nails, infills), old insect damage. A few dust cloth fibers are caught on the rough surface.

Since the last condition assessment there are no new signs of damage observed.

Observations: since the last condition assessment in the 1990's there is no further paint loss and cracking of the wood. The severe cracking of the wood most likely occurred when the church/building became centrally heated, which caused a severe drop in relative humidity (RH) that would have been kept over a relatively long term (several months each year). The photograph taken around 1890 shows only some minor cracking, which could prove this assumption.

Detail of damage to lower left leg and drape (photo: Paul Ryan)

Statue photographed around 1890
(source: Museum Our Lord in the Attic)

The current location of the statue is difficult, right in front of a humidifier, central heating and south-facing window. The wood responds to the climates changes present but because of the major cracks, this does not appear to result in a tension built-up within the statue. This could explain why no further damage is noticed.

Although the object is vulnerable to damage caused by visitors touching it, there is no visual proof that this is happening. The statue is in a fragile, but stable condition. Treatment of the statue to consolidate the paint and make it more presentable will only be successful if its surrounding conditions are changed. This can most effectively be achieved by placing the statue somewhere else in the museum where more stable conditions exist.

The dust cloth fibers are not recent; the museum cleaner minimizes dusting of this object and only uses a soft brush on intact and stable areas.

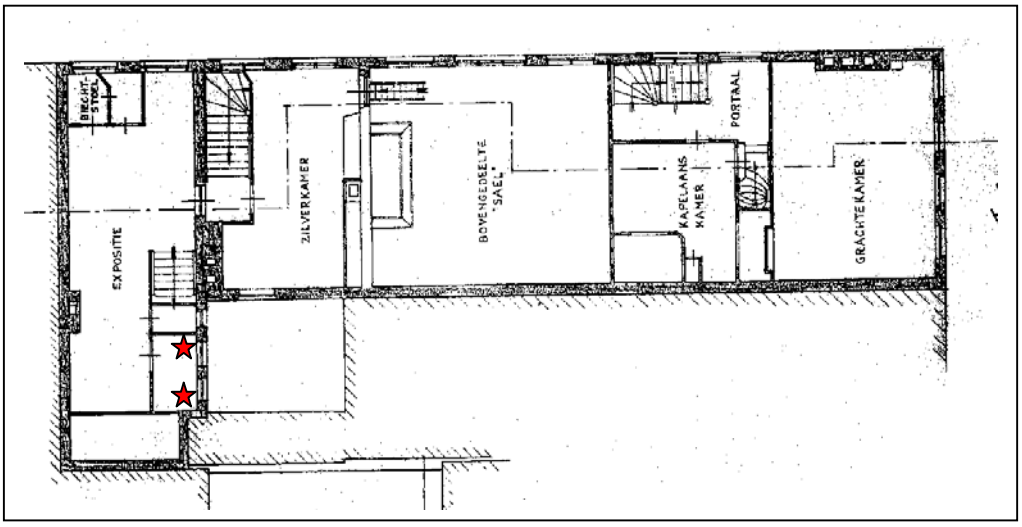
<u>Monochrome painted wooden statues of St. Peter and St. Paul in the former Confessional</u>

General description: two large statues of St. Peter and St. Paul (1735/1736). Originally from the French church in Amsterdam, which collection was sold in 1912. It is unclear when exactly these statues entered the building, but they were definitely here since 1952.

Material: pine wood, ground layer, white paint

Construction: semi-hollow at the back, cavity painted. Composed of several parts. Statues stand loose on a low pedestal.

St..Peter and St. Paul in the former confessional (photo: Paul Ryan)



Location of statues in the confessional (map source: Museum Our Lord in the Attic)

Previous treatment (taken from object's records): in 1989, one of the statues was cleaned and both (?) statues were treated with deltametrin. In 2003, loose paint flakes were fixed. St. Paul's pink was reconstructed.

Recently, St. Paul's sword was removed by the curator, in anticipation of possible loss or damage. The sword was loose and visitors were known to touch it, hence the abrasion marks on the robe of St. Paul.

Maintenance: dusting once every 3 to 6 weeks with soft brush, brushing the dust towards the hose of the vacuum cleaner, which is covered with a cloth to trap any flakes that may be dislodged.

Every Christmas, these statues are moved to an adjacent room in order to create space for the nativity scene.

Detail of abrasion near the sword of St. Paul. (photos: Paul Ryan)

Detail of minor wood cracking

Damage: St. Peter was investigated more closely: St. Peter's keys are missing. Most of the damage is concentrated to the bottom part of the statue (loss of wood, cracks, etc.). The paint layer is crazed and appears locally to be pushed upwards. Minor loss of paint and ground. Some abrasion on protruding areas, dust deposition and discoloration due to dirt, small paint stains (from previous decorating work, possibly before entering the collection). Old insect damage. Since the last condition assessment there has been some minor loss of paint on one of the cracks in the shoulder.

Observations: the statue's condition appears stable since the last treatment, with only minor paint loss on one crack. The paint crazing and uplifting could be a result of the response to climate fluctuations. The shrinkage of the wood is minor and has not resulted in major cracks. Some damage, such as abrasion and dirt, can be directly related to visitors touching the objects. The damage, mainly to the bottom part of the statues, is related to the annual move of these statues. The museum should reconsider moving these statues regularly – if moving them is absolutely necessary, more appropriate moving equipment will have to be used.

<u>Polychrome painted wooden statue of putto</u>

General description: Small statue of a putto (one of a pair) dating 1570, since 1924 in the collection. It is located on the SW wall in the Church.

Material: lime wood, ground layer, white paint

Construction: Composed of several parts; the hollow pedestal is part of the statue. Statue is standing loose on a plateau, but is fixed to the wall at the back of the statue.

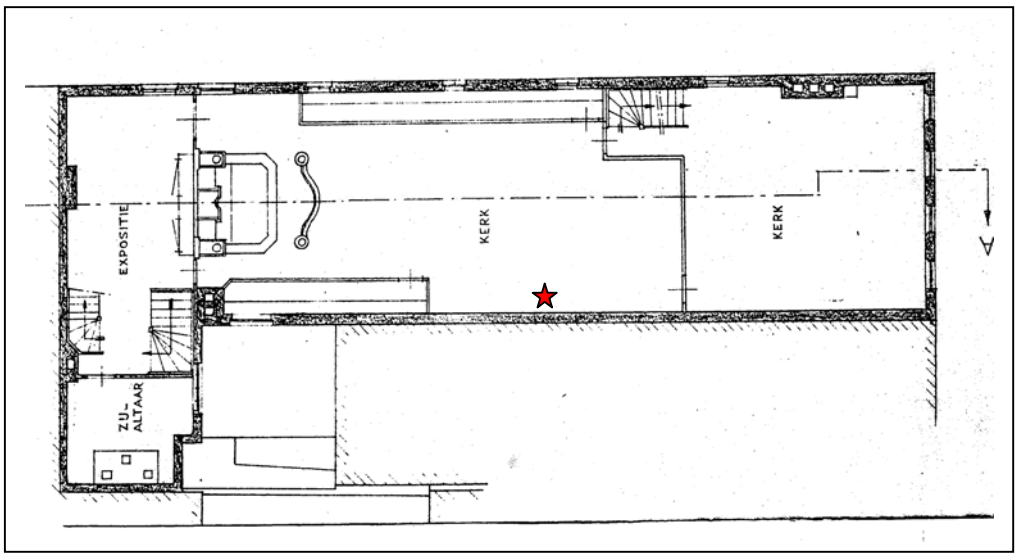
Previous treatment (taken from object's records): in 1997 local retouching of areas of loss with a gray colour – new paint loss damage is visible by uncovered white ground layer.

Maintenance: minimal dusting with soft brush, brushing the dust towards the hose of the vacuum cleaner.

In 2005, the statue was temporarily removed during an evacuation (roof leaking incident[1]) – statue had some water spray on it.

(photo: Paul Ryan)

[1] There was a calamity near the end of the roof restoration: the plumber had lifted the lead seal along the length of the building (SW wall) and had left the site temporarily. Although the weather was fine when the plumber was working, in his absence it changed drastically and there was a heavy downpour of rain. Rainwater penetrated the building and ran along the SW wall in the church. Objects hung or placed near this wall were removed quickly. These objects have been surveyed and will be conserved (insurance case).



Location of statue in church (map source: Museum Our Lord in the Attic)

Detail of damage, showing gray infills and new paint loss (white ground layer exposed)

Detail of damage showing recent paint loss (photos: Paul Ryan)

Damage: paint layer is cracked, local paint loss, local paint and ground layer loss, dust deposition and discoloration due to dirt, few water stains, old insect damage.

Observations: Since the last treatment there has been a fair amount of paint loss, which can easily be distinguished from older paint loss (now tinted gray) as it exposes the white ground layer. The object is unstable. There are several contributing factors to this paint loss. Most important are: an inadequate binding of paint to ground layer; fluctuating climatic conditions causing stress in the surface layers; recent handling in calamity.

The perception that the recent water incident stained the wall behind the statue could easily be misinterpreted, but this staining was caused by a previous leakage and was already there in 2004 (photographic evidence). The statue may therefore have been exposed to damp or wet conditions prior to this incident.

9.2.2 Furniture

Cabinet on stand in Canal Room

General description: cabinet decorated with polychrome painted panels. It has been on loan to the museum from the Rijksmuseum in Amsterdam since 1956. It is located on the SW wall in the Canal Room.

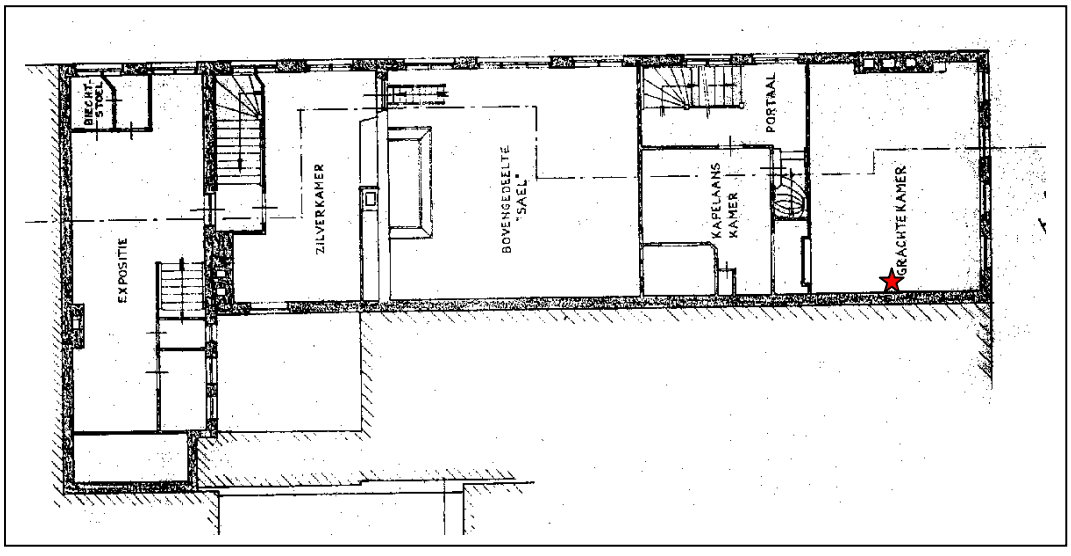
Material: oak with ebonized veneer, oil paint, textile on the top, inside.

Construction: composed of two main parts, a 17th century top and bottom 19th century cupboard, not originally belonging together.

Previous treatment: the painted panel of the top left hand drawer was stolen – all other drawers are now fixed in place using screws at the back and the missing panel was reconstructed. There is a clumsy repair at the bottom of the cupboard where elements have been fixed with nails.

Maintenance: weekly dusting with dust cloth of the horizontal unpainted surfaces. Once every 6-12 months the inside is vacuum cleaned with a museum vacuum cleaner.

Cabinet in the room and detail of reconstructed stolen panel (photos: Paul Ryan)



Location of cabinet in Canal Room (map source: Museum Our Lord in the Attic)

Damage: abrasion of protruding parts, veneer is locally split and it extends minimally from the surface. There is a small crack in one of painted doors with minimal paint loss. Damage at ball feet caused by bumping (feet or vacuum cleaner?). The cabinet is dusty, even though it was dusted a few days before the assessment.

Details: signs of abrasion

Small area of paint loss (photos: Paul Ryan)

Observations: this object is free standing and is inviting to people to touch. This occurs on a regular basis and has, in the past, resulted in a theft. The fact that all drawers are now fixed in place by screws at the back has changed the functionality of the cabinet, but does not appear to result in stress.

The small splits in and extension of the veneer is a common damage type and relates to the difference in shrinkage of the main wood and the veneer over time. This makes the veneer more vulnerable, as it can easily break off when dusting or handling the object. The fact that that is not the case can be seen as a sign that cleaning is carried out with care. The abrasion seen on the protruding parts is most likely caused by cleaning over the years.

Fluctuating climatic conditions are a contributing factor to the veneer splitting, caused by the difference in shrinkage of the main wood and the veneer (different types of wood, cut in different directions).

The crack in the door panel is most likely a result of fluctuating RH. The paint loss appears fairly recent and is expected to slowly continue along the same line in the panel, if current fluctuations persist. This could also occur in other similar areas.

Priest's chair in Church

General description: upholstered vesper chair.

Material and construction: hard wood base with veneer, upholstery consisting of a base of webbing, stuffing with horsehair and a woolen pile fabric. The fabric is nailed with decorative brass nails.

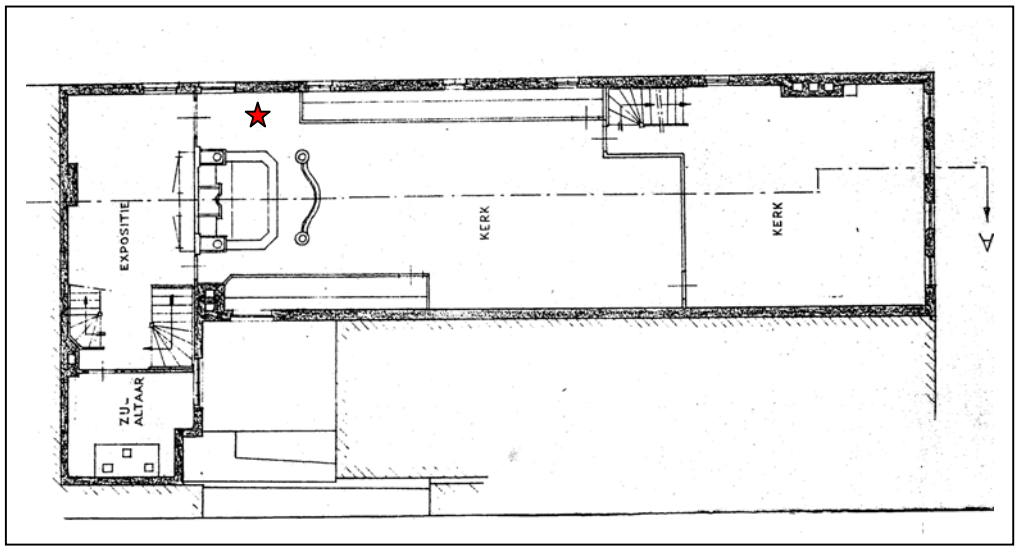
Previous treatment: possibly reupholstered some time ago, as the color of the seat and the reverse of the back are different in color, which effect is unlikely caused by fading.

Maintenance: weekly vacuum cleaning of seat.

Damage: grime built-up on the armrests. Scratching, denting and some water stains on the legs. Some abrasion of the upholstery and a couple of large tears in the upholstery fabric on the front edge of the seat. Severe dust deposition on the reverse side of the chair.

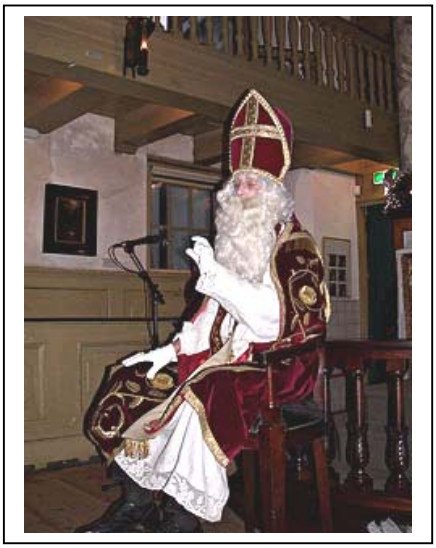
Priest's chair in the church

Detail of tear in seat (photos: GCI)



Location of priest's chair in the church (map source: Museum Our Lord in the Attic)

Observations: this chair is occasionally used – it is the chair of Sinterklaas (refer to 3.2.3). However, it is known that visitors occasionally sit on the chair, because it is in line with two other chairs that are not museum objects. This is obviously confusing to the public. There is no barrier or cord to indicate that this chair is not for normal use. The tear in the fabric of the seat is possibly accidental tearing of an already weakened part in the fabric. If left untreated the tear will rapidly grow and a larger area will be affected – whenever somebody sits on the seat, the tension on the tear causes it to rip further. Other then that, visitors are attracted to touch and poke such areas of damage.



Sinterklaas sitting on the priest's chair
(source: Museum Our Lord in the Attic)

The museum will have to decide the importance of this chair in its current condition and weigh this against the value of the chair in use for Sinterklaas. This will establish if the chair should be conserved or reupholstered.
The dust deposition on the reverse side of the chair is a sign of lack of cleaning. The frequency of cleaning the parts that are out of sight should be increased. These pockets of dust are ideal breeding grounds for insects.

10 Interpretations of the climate and condition assessment

In assessing the indoor climate and condition of the building, interiors and collections one can observe the following, arranged according to the agents of deterioration:

10.1 Agents of deterioration

Physical forces:

- There are many signs of abrasion:
    - Abrasion of floors and stairs, in some areas rather severe – a large part of this damage is caused in the time when the building was in use as a church (from 1663–1880's). A rough estimate of the number of churchgoers over the centuries, based on the curator's knowledge of the archives, is several million, with an additional 2 million visitors since the house became museum.
    - Abrasion of more recently painted surfaces (floors, staircases, doors) caused by recent visitation and use of the building. Wherever paint layers are not maintained, the wood underneath is started to be affected.
- There are signs of sagging and deformation of the building and floors:
    - According to the architect these are common for this type of building, especially when an alley runs along one side (no pressure form another building). The building most likely slanted in the first 50 years after it was built, as it was settling. The slant is stable and not dangerous.
    - The galleries in the Church are unusual: in order to create the galleries, the existing floor beams were partly cut away, hence the thick and heavy supporting beams of the galleries. Additional tension rods stabilize the galleries and extent the weight to the beams in the roof. On the SW side of the Church one of the tension rods was rotted away, a defect that was not taken care off for several decades. This is now repaired, but it cannot be said without more investigation if the current dipping in the gallery at this point was caused by this defect.
    - Localized sagging of the marble floors is causing damage to the stone slates. Maintaining the proper shell bed underneath is crucial. Unfortunately this skill is now lost. Currently, as a way of repair, slates are fixed in place. This practice should be reviewed.

- Shock and vibration:
    - Visitors cause vibrations in the building (propagated and possibly enhanced by the somewhat flexible floors). Damage is difficult to observe. The objects in one showcase on the first gallery move inside the case and serious rocking and movement of loose elements in these objects can be seen as visitor walk around the showcase. A nearby statue is also said to walk on its pedestal.
    - It is not clear if traffic causes vibration – in the current situation the traffic has to slow down considerably on the narrow canal street, so the expectation is that this effect is minimal.
    - The organ when played causes vibrations, which can be felt in the balustrade on the first gallery. Different registers create different levels of vibration. It is not expected that these levels are damaging to the building. They may have an effect on nearby objects (such as in the showcase).

- Touching/handling:
    - The moveable collection is overall in a fair to good condition. Objects are mainly on open display, and show some signs of damage caused by visitors touching them (abrasion, finger prints, scratching). However, considering the fact that objects are seldom cordoned off, it is remarkable that this type of damage is not worse.
    - Handling: damage observed in moveable objects can often be related to periodic handling and replacing of objects: e.g. the two statues of St. Peter and St. Paul in the confessional are moved out of the way every year to make place for a Christmas Nativity scene (refer to 5.5.1). Observed damage such as paint loss and wood chips appears to be related to these events. The lack of a proper preparation area for exhibitions and the current situation with the store across the alley increase the risk for damage.
    - The immoveable collection is more impacted by the visitors touch – walking through the building, visitors have to steady themselves when climbing up and down stairs. Inside the church, visitors tend to touch, lean or rest against fixtures.

<u>Thieves, vandals and displacers:</u>

- There have been several thefts from the museum (e.g. the panel from the cabinet's drawer in the Canal room, a small Maria statue). Recently, security measures have been improved and staff has been made more aware. During the assessment the system was unconsciously tested: as the assessors were handling or touching objects, this was obviously observed by museum staff on duty as they immediately alerted the Head Internal Affairs.

Water:

- The building, interiors and collections suffered in the past from flooding of drainage water or roof leakages. Most recent was an extensive flood of rainwater along the SW wall of the building – this occurred during the recent restoration of the roof. It is still early days, but the roof seems now to be waterproof.
- Condensation on windows – this is a serious problem. Condensation occurs in winter when large amounts of moisture are introduced to the indoor environment to keep RH levels around 40 to 50%.
- There are some signs of water spillage near humidifiers.
- Water used in the church for the service occasionally leads to staining.

Light:

- All windows are single glazed. The windows in the main facade and partly in the alley (i.e. those windows that do not have to be opened to close the shutters) are fitted with lexane sheeting on the inside as UV-filtering and extra security measure. The windows in the Sael do not have this measure, as they have to be opened twice a day in order to open and close the outside shutters.
  Some rooms have replica curtains, but these are mainly for display purposes. In the church some windows have roller blinds or curtains that are closed and opened by the museum staff according to the presence or absence of sunlight.
  The collection on display is overall not extremely susceptible to light, although exposure to direct sunlight should be avoided at all times (localized heating, increased UV level). Some objects are situated closely to windows, e.g. the statues of St. Peter and St. Paul in the church, which stand in front of SE facing windows. The main risk here is localized heating from the sun, as UV radiation is filtered to a certain extent by the lexane sheeting.
- Artificial lights complement daylight. There are many different types of lights used in the rooms and in showcases. The lights inside the showcases adversely affect the microclimate (refer to 10.2).
- Filming with professional lighting occurs a few times per year. The heating up as a result of recording with digital cameras is considered negligible. During concerts and performances, light is mostly aimed at performers.

Pests:

- The building, interior and collection are prone to infestation by wood boring insects. There are plenty of signs of previous insect activity in the wooden objects (floors, statues, etc.), but there is currently no activity. The roof and other non-public areas are more at risk and will have to be inspected regularly. There are plans to give the roof a preventative treatment.
- The threat of other damage causing insects such as carpet beetle and moths is always present – the fact that some windows are opened for ventilation or to access outside shutters increases the risk of these insects entering the building (not all windows have insect screens). However the use of the building (activity) and the cleaning practices appear to be sufficient to deter insects.

- There is however a small moth problem in the Canal Room, which appears to reside in the replica woolen curtains. It is recommended to have these curtains moth proofed. The textiles in the cupboard bed were thought to be the source, but the textiles are mostly of a vegetable nature, thereby not attractive to moths.
- In the alley, at the canal side, the rubbish from local houses is collected. This occurs twice a week and poses a high risk for the museum. It attracts rodents and cockroaches, which could enter the building. Other than that, it is a very unpleasant sight and not welcoming for visitors. In the red light district, the area the museum is located, alleys may attract homeless people or drug users and it is important to keep them clean.

Pile of rubbish waiting to be collected by the council. (photo: Paul Ryan)

Contaminants:

- Dust: visitors bring dust in and higher visitation numbers increase dust levels. This is noted in the museum. The first rooms, i.e. the antechamber and reception area on the ground floor and the Canal Room of the 1st floor are the most dirty – these are at the beginning of the route.
  There is a cleaning regime of all spaces in place. The cleaning of objects however is always a fine balance. It was however noted that some cleaning appeared to be cosmetic, leaving areas out if sight, potentially creating niches favorable to insects.
- Air pollution: levels of air pollution appear to be acceptable. Collections most susceptible, such as metal (silver in particular), are exhibited in showcases and in current conditions there is hardly any need for polishing. Two silver birds on either side of the altar have been coated in the past.
- A close eye should be kept on events – there are some relatively new nails in the wooden church floor near the altar, presumably to fix electric cabeling during events.
- Graffiti is sometimes sprayed on the outside of the building – the museum has a contract with the council to have it directly removed.

Fire:

- There is a no smoking policy in the museum and church and the use of candles is forbidden.
- There is frequent contact with the local fire brigade, as the building is open to the public and organizes events. The fire officials have set maximum numbers of occupants for the church and other rooms in the building (refer to 6.3).
- Rooms are equipped with portable fire extinguishers and there are water hoses in the church and all floors. Some of the staff members are instructed to handle this equipment and they are also trained on a regular basis in providing first aid.
- The fire extinguishers are sometimes difficult to reach because of objects placed near or in front of them.

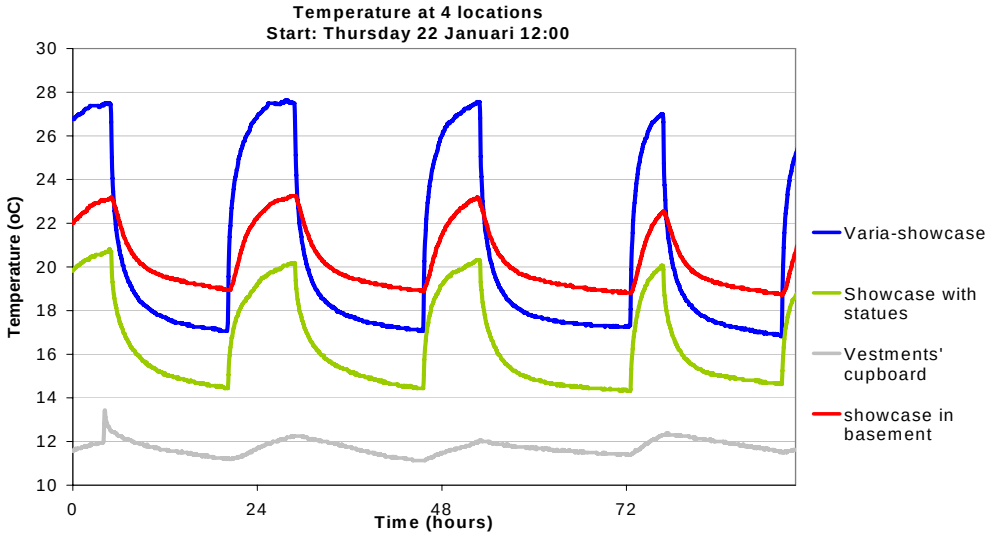
Chair placed in front of fire extinguisher (photo: GCI)

Climate (incorrect T/RH): (refer to 10.2)

- Objects show damage caused by incorrect climate conditions. Almost all wooden objects have splits or cracks, signs of the release of internal stress. The damage is caused over the years and it appears that most severe damage was caused in the time when central heating was installed and no additional climate control measures where in place. The natural drying process of wood is also a causative factor to wood deformation. Most objects appear to be stable in the current climate conditions (although perhaps not always presentable) – the tension that would normally built up when wood swells or shrinks in changing climatic conditions can immediately be accommodated by the present cracks. Some painted wooden objects suffer more as exchange mechanisms occur in the outer layers, affecting the adhesion and cohesion of paint layers, resulting in flaking paint. Conservation treatment of affected objects (such as the statues of St. Peter and Paul in the church) will only be effective, if the direct environment of these objects becomes more stable.

- For human comfort there is an issue over the summer months, especially in the church and during events. Visitors have complained about feeling hot and in lack of fresh air. During the recent heat wave moveable fans on stands were placed in some rooms and visitors were provided with small disposable fans. A window on the 5th floor (second balcony, N side of building) is sometimes opened to increase ventilation. As this increases the risk of theft, the 2nd gallery will be closed off with a new door (placed at the bottom of the stairs leading to the 2nd gallery) whenever this window is open.

- Previous measurements by ICN (2003-2004) inside some of the showcases show that the climate within can differ greatly with the climate conditions in the room.



Data and graph from ICN[1]

[1] *ICN, eindrapportage Museum Amstelkring maart 2004* (unpublished report)

The temperature in the showcases, which are lit from the inside, rises drastically within the first hour. For the 'Varia showcase' behind the altar, the temperature increases by 7 ºC within the first hour and there is a 10 ºC difference between the day and night situation. The cupboard with the vestments is closed and keeps a fairly stable but low indoor temperature, with a high relative humidity of 68-70%.

Varia showcase behind the altar (photo: ICN)

10.2 The indoor climate and damage to objects (incorrect T/RH)

Objects in the collection of 'Our Lord in the Attic' have been subjected to a range of indoor climates, for different periods (refer to 7.5). Before the climatic damage observed on these objects can be assessed, the response of objects to changes in RH has to be discussed.
Hygroscopic materials react to RH changes by releasing moisture when the RH drops, or absorbing moisture when the RH increases, thereby shrinking or expanding in dimension. There are several important parameters to take into account when changes of RH are discussed in relation to possible damages. The major parameters are:

- The magnitude of the RH change. The larger the change, the more moisture will be transported into or out of an object and the more this object (or its surface) will change dimensions.
- The duration of the RH change. The longer the change, the more of the material will respond. Short RH fluctuations will lead to moisture transport within a surface layer while the bulk of the material will not respond to this change.
- The RH range in which the fluctuation takes place: in general fluctuations outside the 40 to 70% range have greater impact on dimensional changes.
- The material of the object - some materials are more hygroscopic then others.

The estimated maximum temperature (T) and RH changes (with a minimal duration of approximately 1 week) that the collection has been subjected to in the museum between 1901 and present day are summarized in the following table (refer to 7.5):

	1901 – 1953		1953 – 1990	1990 – today	
	Rooms	Church	Building	Rooms	Church
ΔRH_{max}	45%	40%	80%	15%	14%
ΔT_{max}	17 °C	17 °C	10 °C	6 °C	4 °C

It is obvious that the largest RH fluctuations have occurred in the period that the building was heated by central heating without humidification.

Material response times

Response times of the various materials present in a collection can greatly vary from minutes to several weeks.[2] The implication of a materials response time is discussed using some examples from the collection.

The painted cabinet e.g. is susceptible to changes in RH. Using the data for calculated humidity response times of wooden artifacts, presented in ASHRAE[3], a half time response of approximately 10 days is derived for this painted cabinet. It is assumed that the cabinet is constructed of wood with a 2 cm thickness across the grain and that a medium varnish covers the surface. This means that fluctuations taking place within a week do not influence the structure of the cabin to the full extent. However, it is expected that short variations, e.g. a day, are 'felt' by the surface of the cabinet and are therefore relevant, in terms of mechanical damage to the (brittle) paintings on the wood substrate. This cabinet was given on-loan to the museum in 1956, and was therefore exposed to the period in which central heating without humidification was the only climate control in the building. The observed damage of localized splitting of the veneer, the small crack in one of painted doors and the minimal paint loss are most likely caused by climatic changes. The maximum RH change with a duration longer than a week that this object would have been exposed to is about 80% every year for about 35 years. According to ASHRAE and Michalski[4], an RH change of 50% gives a high risk for mechanical damage to highly vulnerable artifacts. Apart from the small area of paint loss, which is recent, the observed damage is a result of previous climate regimes and is not likely to be accelerated by the current climate. In fact, it is astonishing to observe that this object has only very minimal damage due to wood shrinkage, considering the history of the surrounding indoor climate.

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[2] Michalski, S, Paintings - Their Response to Temperature, Relative Humidity, Shock, and Vibration, in Art in Transit: Studies in the Transport of Paintings, edited by Mecklenburg, Marion F. (1991) 223-248.

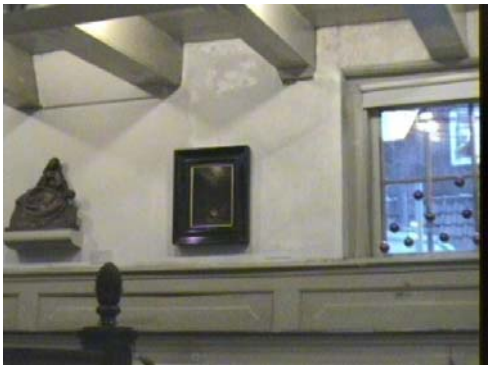
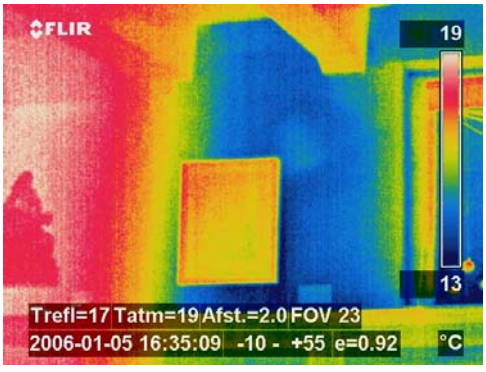
[3] American Society of Heating, Refrigerating and Air-Conditioning Engineers, ASHRAE handbook : heating, ventilating, and air-conditioning applications, Ch. 20: Museums, libraries, and archives -- (new guidelines on humidity, temperature, and HVAC sustems).20.1-20.13.

[4] Michalski, S., Quantified risk reduction in the humidity dilemma, APT bulletin, 27 (1996) 25-29.

Among the movable objects in Church it is assumed that both the paintings and their frames are the most susceptible to changes in RH. It is expected that the frames may crack at the joints at 10% RH change.


Details of panel paintings showing shrinkage and deformation (warping) (photos: ICN)

Many of the panel paintings in Church show shrinkage and the panels do not fit correctly in the frames. One example is a panel painting (object number AK0111) that was purchased by the museum in 1891. The planks of the panel are warped. Both material changes indicate permanent deformation caused by the natural shrinkage of wood over time, as well as high RH fluctuations for prolonged periods of time. These changes most likely occurred in the period 1953-1990. The curator informed us that during this time, one could hear the panel paintings snap in very cold winters (i.e. very dry winters).

The south west wall in Church, partly and outer wall and inner wall (photos: TU/E)

Above figures show a panel painting on an outer wall in early May 2005. The temperature difference between front and back of the panel was 3 °C, corresponding to approximately 10-15% RH difference. The reverse of the painting absorbs and desorbs moisture much faster than the obverse. This might eventually contribute to warping of the individual planks of the panel.

Another object in Church, which is expected to be highly susceptible, is the polychrome painted wooden putto (9.2.1), which would have been exposed to all climatic periods. The response time of this polychromed wooden statue is much longer than that for panel paintings. However, the flaking paint layer of this statue allows easy access to the wooden substrate. Furthermore, the damage to the paint at the base of the statue involves absorption or desorption at the end grain of the wood, which is a much faster process. Given the fact that observed paint loss can be caused by exposure to the current indoor climate, with daily fluctuations up to 15%, the susceptibility of this object should be categorized as high.

10.3 Damage factors and their extend

In the on-site survey, of the factors causing damage to objects that were recorded (refer to 8.4), it can be noted that physical forces type 3, which are constant in frequency and gradual/mild in severity, are the main damage factors in this museum. These factors are directly related to visitation of the museum and use of the building. The factor 'PF 3/9 inherent stress' also ranks high and describes the damage caused by the object's own weight, construction, use of materials, and natural degradation processes such as shrinkage of wood, etc. The affect of this factor is enhanced by another damage factor, incorrect RH. It is believed that major damage occurred in the time when central heating was installed and no other climate measures were taken to compensate for the drier climate.

no. of times recorded	Damage factor
18	PF 3/8 frequent use
14	PF 3/9 inherent stress
7	PF 3/3 handling
7	Cont 3/1 dust
6	PF 3/5 abrasion
5	PF 2/3 maintenance/repair
5	PF 2/4 use/touching
5	Cont 2/3 cleaning spills
5	Cont 3/5 greasy deposit from touching
4	W 2/5 spillage
3	PF 2/2 crowds
3	PF 3/2 continuous vibration
2	Cont 2/1 building work
2	Cont 2/4 object treatment
2	Cont 3/6 inherent degradation
2	Pests 2/2 insects
1	Cont 2/2 collection work
1	Crim 2/2 isolated vandalism
1	LUV 2 exposure to high intensity light
1	LUV 3/1 light
1	PF 2/5 object transport
1	PF 3/7 overcrowding
1	RH 3/1 incorrect high/low
1	RH 3/2 micro-climate
1	W 2/1 roof leakage
1	W 3/1 condensation

10.4 Discussion of findings with resource team

On 21 August 2006, the findings of the core team were discussed with a larger 'resource team', which included experts whose knowledge and expertise complemented those of the core team. The resource team consisted of (one or several) curators, building/interior historians, conservators, conservation scientists, and building physicists (see appendix for names and contact details). The main objective of the day was to create an opportunity to share experiences, to draw upon specialized knowledge and to discuss the complex degradation processes in a historic house museum.

Discussion meeting at ICN. (photo: GCI)

The resource team was divided into 5 groups, each containing a museum staff member and if possible one of the condition assessors. With a series of tasks several aspects of visitor impact were discussed.

The first task for each group was to get a sense of how susceptible the experts think the objects (building, interior and collections) are to visitor impact (rating 1 for very vulnerable, 10 for least vulnerable). They were also asked to indicate the type of damage and its causative factor for two of the most vulnerable elements they selected. The participants were given an overview of collection and building elements (derived from the ICN risk assessment) and their value in terms of authenticity and experience. Please refer to appendix of this information.

In the following tables, the vulnerability of the collection units and the damage types for the most vulnerable ones are ranked.

Vulnerability of collection parts for visitor impact

Collection part	Score of individual resource team members																							Average	Rank
Stairs	1	3	1	1	1	5	1	3	8	4	2	1	5	4	1	3	1	4	1	5	1	4		2.7	1
Floors	1	5	1	2	1	3	5	5	3	5	2	1	5	4	2	1	1	2	1	7	2	5		2.9	2
Wooden sculptures	1	3	4	1	2	8	1	3	5	6	4	2	6	4	7	2	5	7	7	3	4	8		4.2	3
Furniture	2	5	3	4	2	9	3	5	5	3	5	2	3	4	3	5	4	7	5	5	4	6		4.3	4
Books	8	8	6	10	5	1	1	8	4	1	3	7	4	5	6	8	6	4	5	4	7	1		5.1	5
Doors	7	5	2	3	7	6	4	5	3	10	5	3	5	5	9	2	2	7	2	6	4	10		5.1	6
Walls	9	7	2	2	8.5	2	4	7	2	5	4	3	9	5	4	8	5	8	2	6	7	3		5.1	7
Paintings	8	5	6	2	2	5	2	5	6	2	7	3	5	5	10	6	4	8	6	1	6	9		5.1	8
Architecture	2	4	3	2	8.5	10	8	4	1	6	6	3	8	5	8	7	4	7	1	9	5	7		5.4	9
Organ	3	8	9	3	5	5	10	8	5	7	4	2	7	5	5	5	4	7	2	8	5	10		5.3	10
Windows	6	8	4	3	7	5	10	8	3	10	10	4	5	5	10	1	3	8	2	7	4	10		6.0	11
Anorganic (excl metals)	8	7	5	10	5	4	4	7	9	9	8	9	8	8	10	7	6	7	6	5	5	10		7.1	12
Metals	10	9	3	8	8	7	9	9	6	8	9	8	4	8	10	8	6	8	3	2	7	10		7.3	13
Ceilings	10	7	10	10	10	5	10	7	10	10	10	8	9	5	11	6	2	8	8	10	10	2		8.1	14

1 = extremely vulnerable 10 = not vulnerable

NB: the few empty cells were given a 5, as the generated 0 would not be representative

Question: indicate for the 2 most vulnerable collection parts the type of damage and the possible cause

Object	Cause	Type of damage	Nr.	Comments
Floors (wood)	walking (physical contact)	abrasion of wood, material loss	12	Turning points extra damage
Stairs	walking (physical contact)	abrasion of wood	9	Turning points extra damage
Wooden sculptures	people touching	fingerprints, paint loss	4	What is damage in contrast to wear and tear of normal use?
Books	people touching	tears, fingerprints, discolouration	4	
Floors (wood)	walking (physical contact)	dirt, sand, etc.	3	
Floors (marble)	walking (physical contact)	scratches, material loss, breakage	2	
Stairs	heavy load/shock	structural damage/board breakage	2	
Architecture	people not recognizing the value, wanting to use	damage caused by use	2	Especially wooden components
Paintings	people nudging	material loss in frames, scratches in paint/varnish	2	
Paintings	people touching	dents, abrasion	2	
Floors (wood)	walking (physical contact)	abrasion of paint	1	
Floors (wood)	vibrations	loosing boards	1	
Floors (marble)	walking (physical contact)	loose and broken marble slabs	1	
Stairs	bumping shoe nose into steps	dents, material loss	1	
Wooden sculptures	climatic changes caused by visitors	cracks	1	dry air
Books	visitation	theft	1	
Walls	rubbing and leaning against		1	
Architecture	visitors touching	deposit of grease	1	
Architecture	temperature	material change	1	
Paintings	vandalism	vibrations in canvas, paint loss	1	
Windows	condensation	wood rot	1	
Windows	movement	abrasion	1	
Furniture	nudging, leaning against	mechanical damage	1	because of small spaces
Metals	people touching	corrosion, grease	1	
Metals	use	mechanical damage	1	

After this brainstorm session, which revealed that the majority of experts indicated floors and stairs when thinking of visitor impact, we moved towards group discussions. The larger group was divided into five smaller groups; each one was given a theme, reflecting the groups of objects that were discussed in the initial findings of the survey:

These groups were:

- Painted wooden statues
- Furniture
- Wooden floors
- Marble floors
- Stairs
- Church – damage observed by use

The furniture group in discussion (photo: GCI)

Each group was presented with photographs taken during the assessment and the findings as recorded by the core team (in a similar way to the presentation of the findings in this report). They were then asked how they feel about the observed damage, if they are concerned for the future and what they would do about it. Each group reported back to the larger group. Please refer to the appendix for a transcript of this information.

This session was followed by a plenary discussion about the findings of the assessment and what this means for the museum's future. Each was asked to give one advise to the museum and put this down on paper (with argumentation, pros and cons). Refer to the appendix for a transcript of this information.

General observations were:

- The term 'damage' was felt by some to be judgmental – especially the group discussing the 'church in use' felt that 'material change' was a more objective term. From the various backgrounds 'material change' was perceived differently, the best example being the water stains on the communion bench, which were caused in a recent baptism. Some experts felt this added to the experience of the church in use, others however stated that the baptism font should not have been placed so close to the altar according to Catholic practice and as such this damage should not have happened.

- It was almost unanimously felt that that the experience of walking and climbing through the house to find this hidden church in the attic is the most valuable asset of the museum. The signs of wear and tear and the sounds of cracking floors add strongly to this experience.
- It was felt that lack of maintenance is a particularly damaging factor. If replacing original parts (in a sympathetic way) this was considered appropriate for this situation and preferred to implementing measures of protection. Some argued that this was a very difficult issue and should be given more thought before making any recommendations.

The use of the Church was discussed in greater length. The periodic mass was believed to be adding to the value of the museum. Weddings were more of a discussion. As this is a fairly recent activity, the museum may have to reassess if the economic benefits weigh up against the disadvantages (having to close the museum for public, creation of a difficult setting to control and keep within strict boundaries, obvious signs of damage). Good housekeeping and clear house rules should be in place to cope with the use of the Church.

Nobody suggested reducing the amount of visitors, though some commented that the flow of visitors should be controlled. The use of slippers as a measure for protecting floors was discarded, as it was felt too dangerous for people to climb the stairs.

The monument/historic building side was not very well represented at the meeting. Several experts were invited, but almost all of them declined. The still existing gap in the heritage sector between moveable and immoveable was again highlighted.