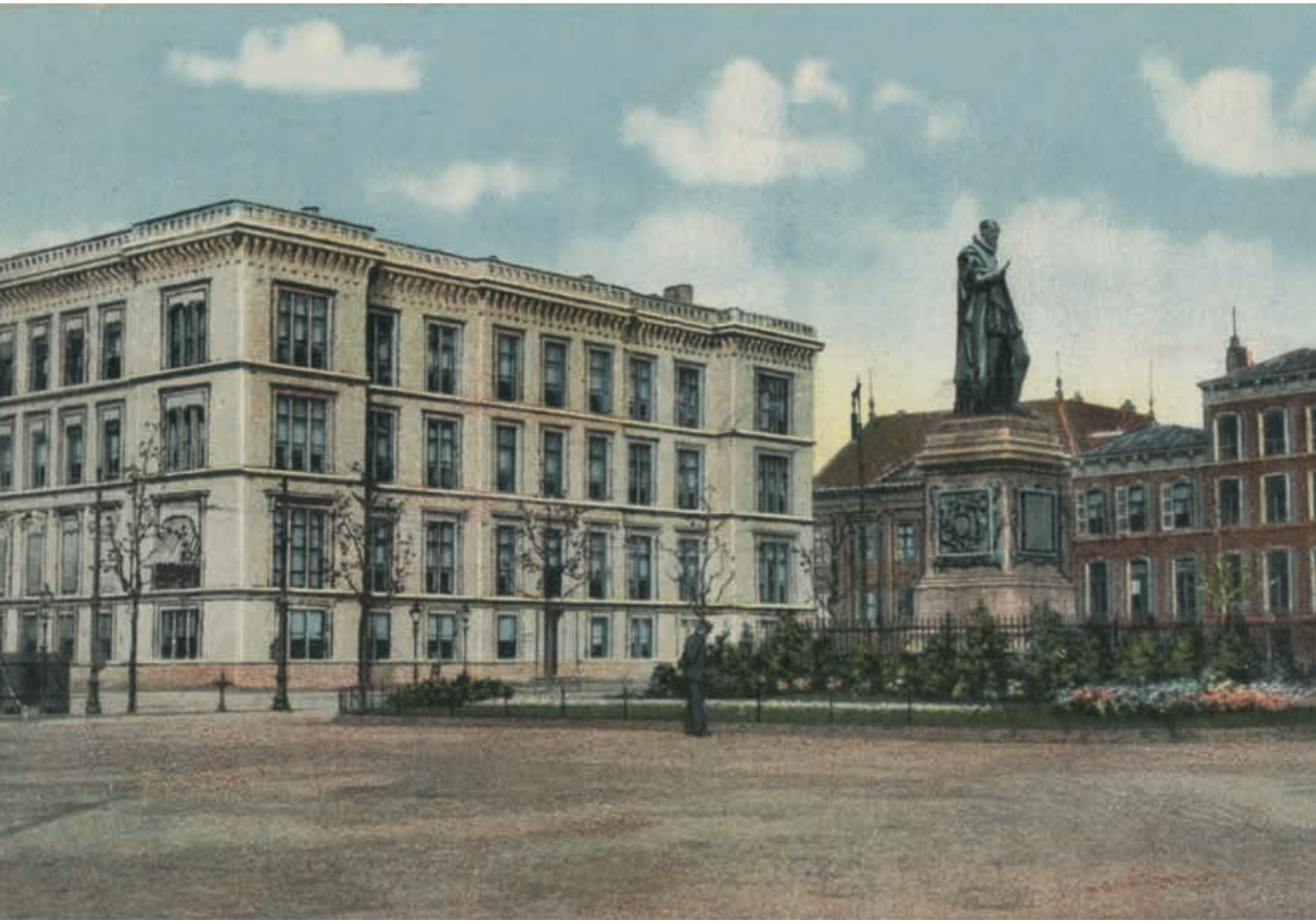


'A MAGNIFICENT FIASCO'

WILLEM NICOLAAS ROSE'S INNOVATIVE CLIMATE CONTROL DESIGN FOR THE DUTCH COLONIAL OFFICE

NATASJA HOGEN

The new premises of the Dutch Colonial Office (departement van Koloniën) on Het Plein in The Hague, built between 1859 and 1861 to a design by the then government architect, Willem Nicolaas Rose (1801-1877), represents an early and consequently important attempt to deal with thermal comfort and indoor climate in buildings in the Netherlands (fig. 1).[1] Stimulated by new ideas about health and thermal comfort and related technical advances, the heating and ventilation of buildings was the subject of keen interest in the nineteenth century. Whereas buildings had traditionally been heated by means of fireplaces and stoves, and little thought had been given to ventilation until the nineteenth century, from around 1840 central heating and mechanical ventilation systems started to come onto the market. They had a huge impact on architectural design. Many public buildings had high occupancy levels in the nineteenth century, often resulting in deplorable air quality. Controlling the indoor tem-

▲ 1. The Colonial Office seen from Het Plein, 1914 (The Hague City Archives)

perature was equally complex. These buildings relied heavily on central, mechanical systems for a healthy and comfortable indoor climate and the functioning of those systems was dependent on the design of the building. This applied to technical components like plant rooms for the machinery, storage places for fuel, and associated infrastructure like ducts and plenums, but also to spatial and architectural aspects like the arrangement and orientation of rooms, ceiling heights and window types.[2]

This article is the fruit of cultural-historical research carried out in 2021 by the author and Jacqueline de Graauw of Bureau Bouwtijd at the request of the Central Government Real Estate Agency and in preparation for the renovation of the Colonial Office building. De Graauw's focus included the historical interiors, while Natasja Hogen investigated how the original climate system worked.[3] The article describes how the handling of the indoor climate in the new-build Colonial Office revolutionized the way Binnenhof buildings were heated and ventilated. It considers Rose's influence on this in his role as government architect, the connection with the development of the ministerial building as a new building type, the operation of climate control systems and their integration with fabric of the building and, not least, whether the system worked to the satisfaction of client and users.

ROSE AND THE MODERN MINISTERIAL BUILDING

Willem Nicolaas Rose was appointed chief government architect for national buildings in 1858. In the previous twenty-five years – as in the ten years that followed Rose's honourable discharge in 1867 – the post had been filled by a chief engineer from the Ministry of Water, Trade & Industry (Waterstaat for short). Appointing an architect, who was more conversant with building construction and favoured a more aesthetic approach, made it possible to cater better to the growing ambitions of the Ministry of the Interior and the House of Representatives. These included the demolition and rebuilding of part of the Binnenhof in line with a proposal made by the responsible minister in 1851.[4] Since there was no government mandated construction policy or building style at that time, Rose was free to put his own stamp on building projects and to put his modern ideas on architecture and technology into practice. While it is true that he operated within an administrative framework, the fierce reactions his designs elicited from members of parliament and others, indicate that Rose pursued his own course where possible. One of those contentious designs was for the renovation of the Great Hall and the new building to house the Supreme Court and the Department of Justice, designed in conjunction with the Colonial Office but never built. During the restoration of the Knights' Hall, Rose replaced the thirteenth-century timber roof with a slender cast iron structure. These Hague buildings and his earlier work, including the Coolsingel hospital in Rotterdam (1838-1840), clearly demonstrate how Rose experimented with modern materials and technologies, such as iron, cavity walls, large expanses of glass, and technical installations for heating and ventilation. Rose also had a considerable impact on the development of architecture in the nineteenth century by virtue of his flexible approach to the spatial layout of buildings and his use of classical visual language, including the introduction of the round-arch style (*Rundbogenstil*). However, his unswerving belief in progress and his highly individual evaluation of historical buildings also attracted strong criticism.[5]

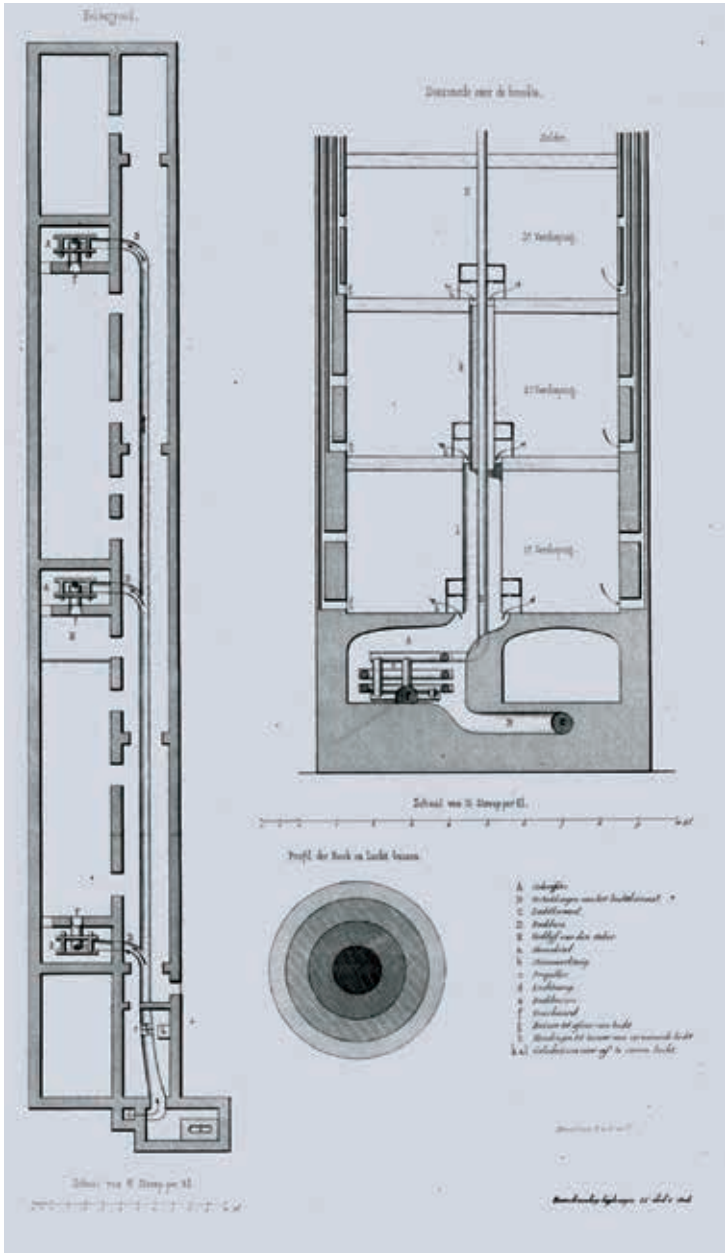
In the mid-nineteenth century government ministries in and around the Binnenhof were housed in buildings from the seventeenth, eighteenth and early nineteenth centuries, and had usually undergone several renovations or extensions to satisfy changing functional requirements. The Colonial Office was the first building to be designed specifically to house a ministry.[6] This was associated with the emergence of the office building as a new building type: in the nineteenth century the workplace became part of modern life, resulting in more attention being paid to the architectural, functional and building physics qualities of such buildings. The design for the Colonial Office boasted several architectural and technological innovations, including an E-shaped plan with corridors on the inner sides and offices on the outer sides, so that they could be easily accessed.[7] The service spaces and rooms for archives, installations and fuel were on the ground floor. The committee room occupied a fairly central position on the main floor, with the offices of the minister and secretary general in the corners and one or two offices for 'ordinary' civil servants, most of whom were housed on the second and third floors. This hierarchy was also clearly reflected in the interior finishing.

Because of their location on the outer side of the building, all the offices enjoyed plenty of daylight. Rose designed large double windows with a casement on the outside and a sash window on the inside. He also used innovative building materials, including zinc as roof covering, wrought iron for window frames, cordons, brackets and gutters. But what really set this building apart from the existing buildings in and around the Binnenhof was the use of an innovative, integrated climate control system.[8]

THE INDOOR CLIMATE OF THE COLONIAL OFFICE

Ministries housed in existing buildings were heated and ventilated in the traditional manner. Natural ventilation was achieved by opening windows, doors and grilles, and heating with the help of (enclosed) fireplaces and stoves. Although it had been theoretically possible to integrate modern central mechanical systems since around 1840, retrofitting existing buildings was expensive and technically complex because it involved a lot of alterations, chiefly to accommodate the dedicated plant rooms for steam or hot water boilers, the drainage of flue gasses, and the ducts needed to distribute the air and heat. One exception was the House of Representatives chamber. In around 1860, at Rose's suggestion, fresh air was introduced with the help of ventilators. However, these were operated manually because the installation of mechanical drive was not feasible here.[9]

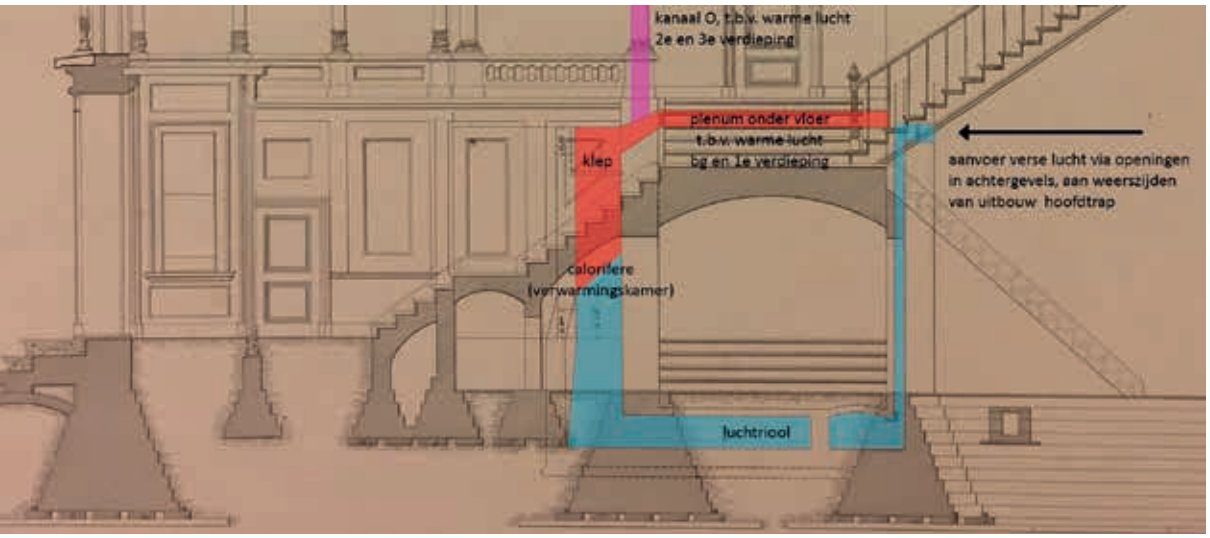
2. The Van Hecke system as implemented in the Necker hospital in Paris (*Bouwkundige Bijdragen* 1863, plate III)



Although Waterstaat commanded a lot of civil engineering knowhow, knowledge about building services technology was still so underdeveloped (it did not even feature in the educational curriculum) that only a few engineers and architects had taken the initiative to acquire the necessary skills. In the mid-nineteenth century Rose was one of the first architects actively engaged in achieving a comfortable and healthy indoor climate in buildings. His military training in civil and military engineering at the Artillerie- en Genieschool in Delft, where he also later taught, would undoubtedly have nurtured his technical ambitions. At that time this was *the* place where new technical knowhow was being developed.[10] Rose proved himself in this field early on with his design for the Coolsingel hospital, possibly the first building in the Netherlands to embody new ideas about a healthy indoor climate in a modern and above all integrated way.[11] In this case he employed a central hot-air heating system. Although this caused problems in practice, such as overheating and insufficient ventilation capacity in the wards, Rose regularly employed the hot-air heating system in subsequent years. From 1858 onwards he had a strong preference for the Van Hecke system, which had come onto the market a few years earlier and for which Rose had obtained the Dutch patent.[12]

THE VAN HECKE SYSTEM

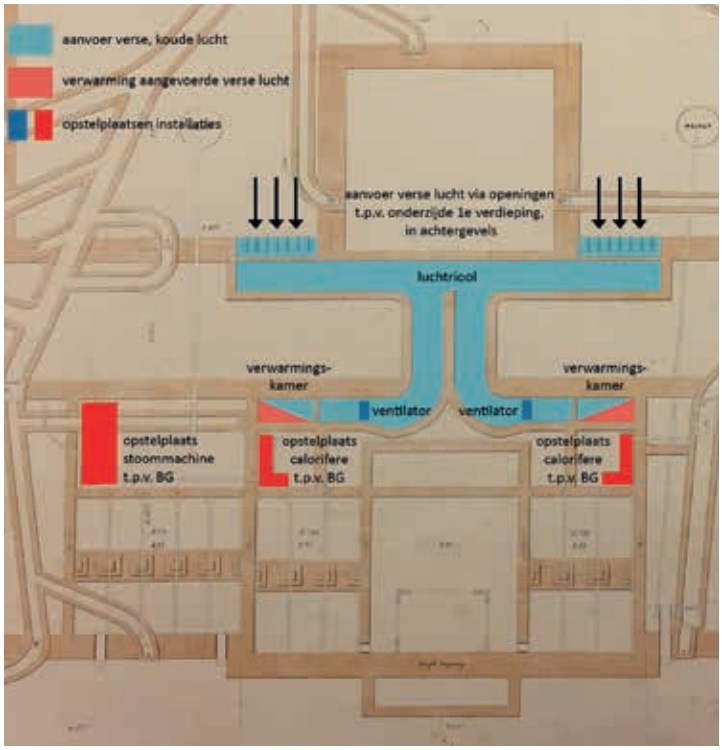
The Van Hecke system was invented in the 1850s by the Belgian physician M. Van Hecke.[13] Despite Van Hecke's claim that the system was suitable for all types of buildings, it was initially used mainly in hospitals.[14] Van Hecke tried to truly integrate adequate ventilation into the heating system, rather than 'merely' distributing warm air with ventilation as an incidental by-product, as was the case in many other hot-air heating systems.[15] In his system ventilation was mechanical, with ventilators boosting the air flow. The air could be preheated by first piping it through heating chambers. Van Hecke claimed that his method was about fifty per cent more economical than the hot-water heating systems on the market at that time. Moreover, the technology was simpler in design than other heating systems.[16] The innovative application of the system in the Necker and Beaujon hospitals in Paris in particular received a lot of publicity, including in Dutch professional journals (fig. 2).[17] Rose made four trips to Paris, three of which were specifically to learn about the climate control systems in these two hospitals.



3. Detail from contract drawing 1859, section E-F, showing the supply of fresh air to the heating chamber and from there to the various rooms (Central Government Real Estate Agency, adapted by the author)

THE CLIMATE CONTROL SYSTEM IN THE COLONIAL OFFICE

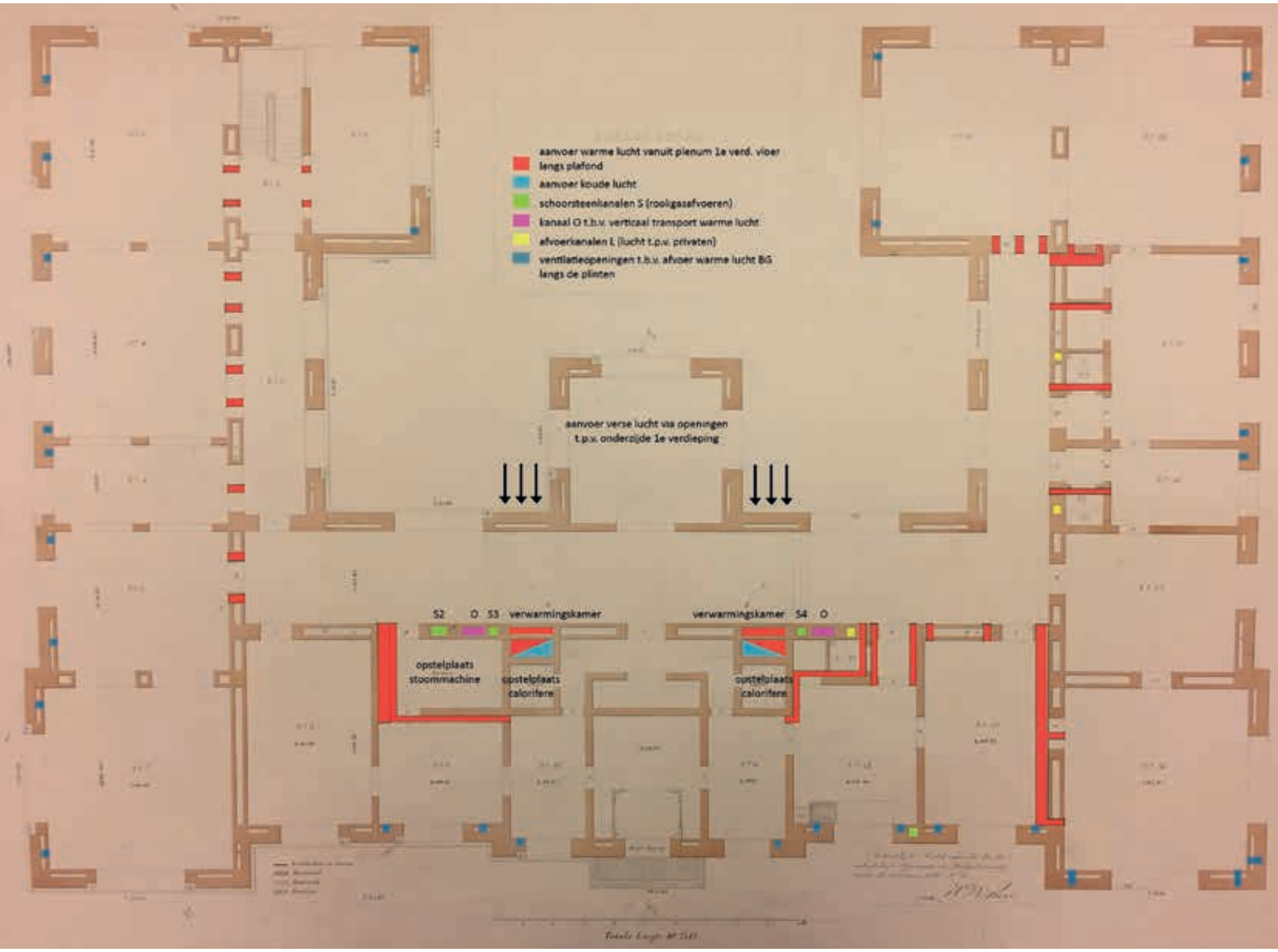
Although Rose's sketch design for the Colonial Office was still based on the use of stoves, he eventually opted for hot-air heating and mechanical ventilation by means of the Van Hecke system.[18] Two ventilators, installed beneath the ground-level floor in brick fresh-air supply ducts, were powered by a small steam engine. This was located in a machine room on the ground floor, next to a storage space for the coal needed to fuel it.[19] Fresh outside air was channelled into the building via the rear elevation. Either side of the extension for the main staircase, at a height of around 3.5 metres above ground level, were eight ventilation openings (fig. 3).[20] There was a general belief that the air at this height was purer, and less contaminated by dirt and dust. The fresh air entered via a cavity in the rear elevation, whereupon the ventilators drove it to the main duct below the ground floor slab and hence into two heating chambers where the air was heated to the desired temperature in a *calorifère* (heater) (fig.4). The generally agreed optimal temperature for offices at this time was between 18 and 20 degrees Celsius. To compensate the loss of heat during distribution, the air needed to exit the heating chambers at a relatively high temperature. Depending on the hot-air heating system involved, the temperature in the heating chamber ranged from 40 to 65 degrees.[21] The top of each heating chamber terminated in a feed to an air duct leading to the space between the ceiling and the floor above (the plenum). Between the heating chamber and this duct was an iron valve with which to regulate the volume of air. With the help of *compteurs* (meters) and *indicateurs* (gauges) the speed and temperature of the heated air could be measured. When the flap above the heating chamber was opened, fresh, heated air flowed into the plenum below the first floor and from there into the rooms on the ground and first



4. Detail from contract drawing 1859, ground-floor plan, showing the supply of fresh air to the heating chamber (Central Government Real Estate Agency, adapted by the author)

floors. From this point the air was also transported via a vertical duct to the second and third floors and then via a ceiling plenum to the various rooms on those floors.[22] Both wings of the building were heated in this way via a dedicated circuit.

From the plenums below the first, second and third storey floors fresh air, heated or otherwise, flowed via horizontal ducts and grilles into the offices. The amount of inflow could be adjusted using a *regulateur* below a hatch in the floor.[23] Rose opted for an upward air flow, which was regarded as the healthiest by nineteenth-century hygienists and engineers: blowing air

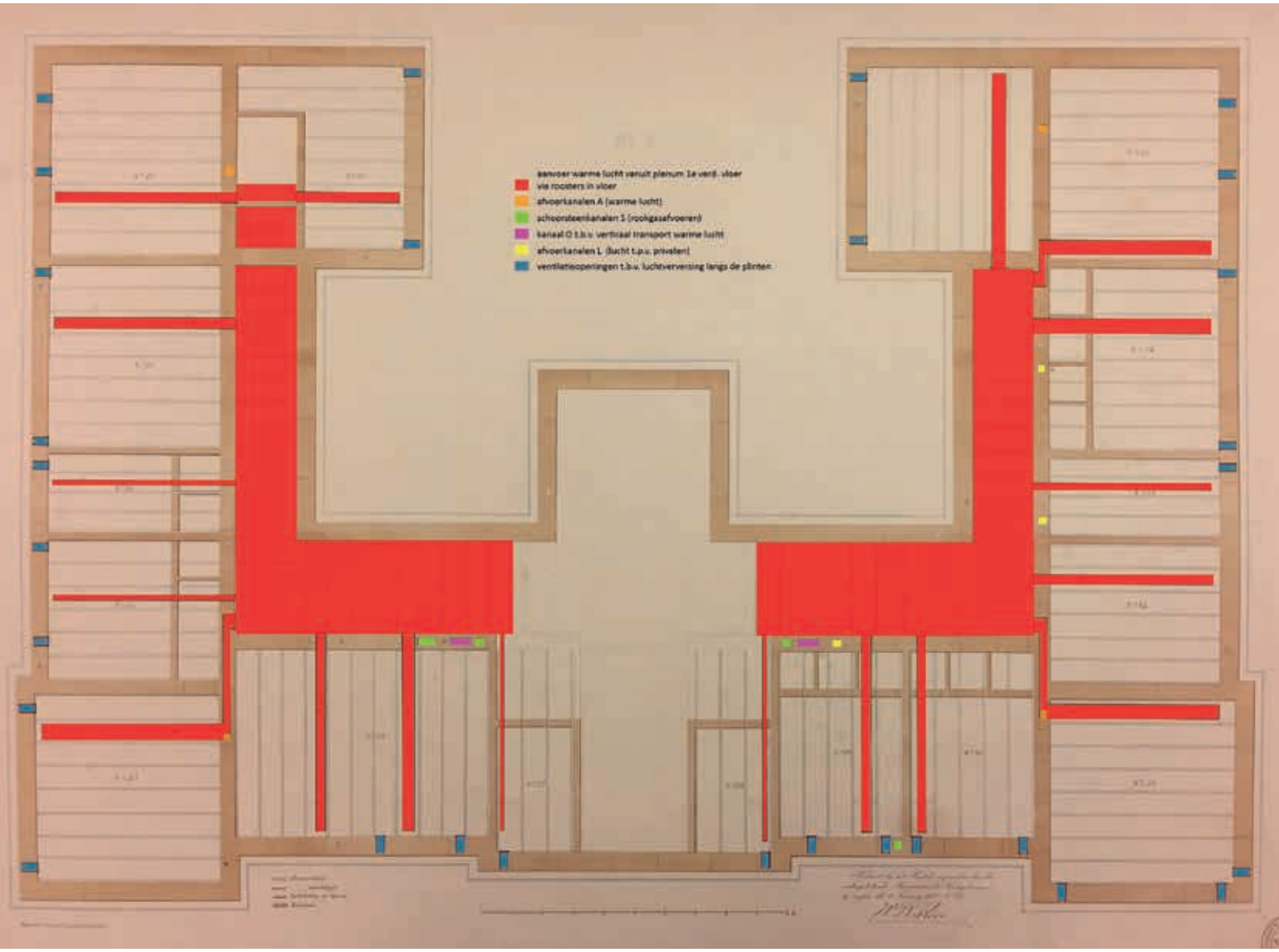


5. Contract drawing 1859, ground floor, showing various components of the heating and ventilation system (Central Government Real Estate Agency, adapted by the author)

in at floor height and expelling it via the ceiling prevented stale air from being breathed in again (figs. 5-8).[24]

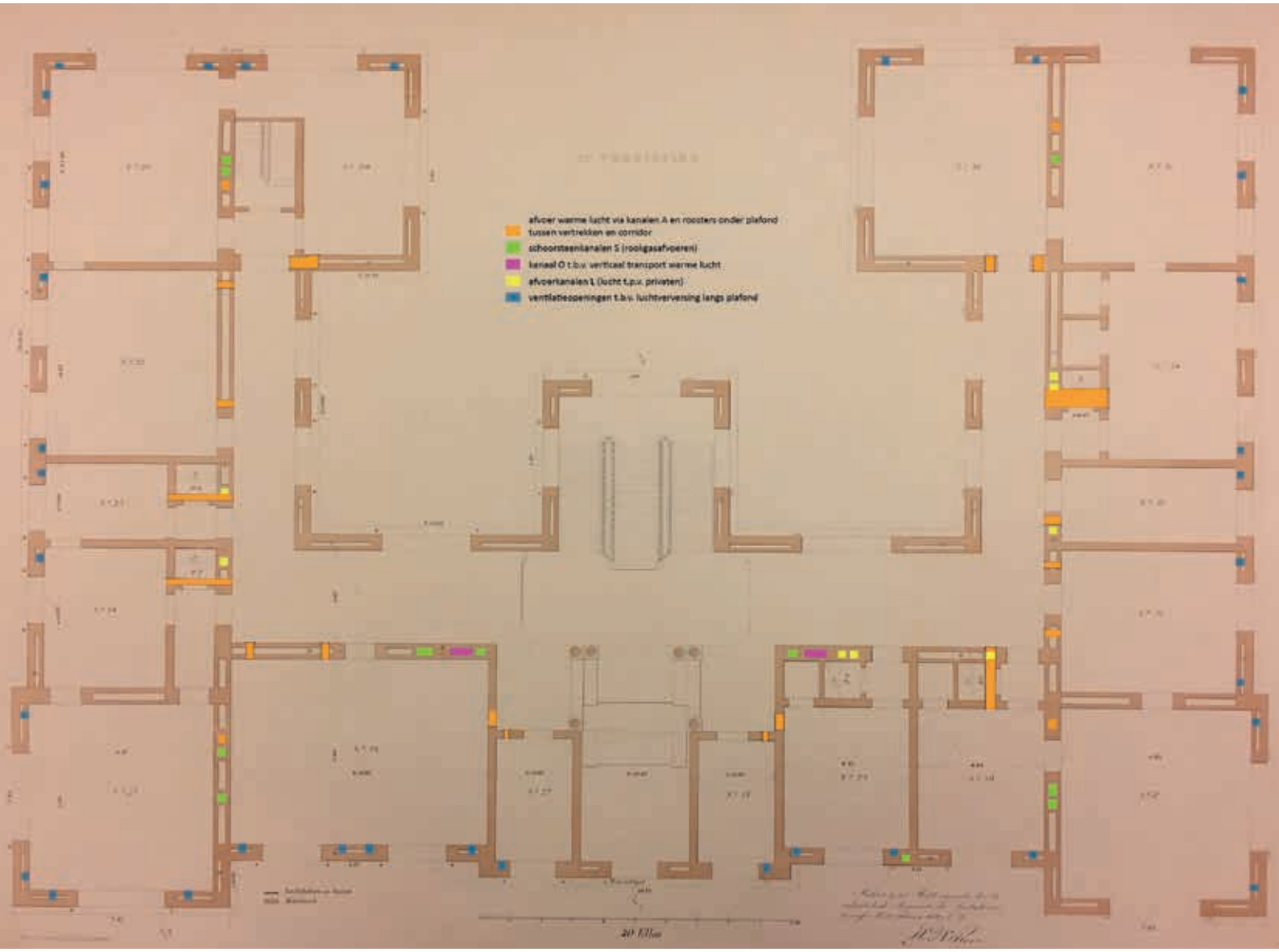
The extraction of stale air occurred partly at the level of the ground floor via ducts bricked into the external wall and fitted with grilles.[25] On the upper floors excess warm air from the offices was extracted to the corridors via horizontal ducts or pipes with outlets and grilles below the ceiling. In the winter months this allowed the corridors to be heated as well.[26] Stale air exited the building via extraction ducts above the toilets and a few ducts in those corner rooms that did not adjoin the corridor. These air ducts did not exit above the roof: the warm air flowed into the ceiling space and was discharged outside via the attic windows.[27]

In the winter months ventilation occurred in principle in tandem with air heating. In the summer months it was also possible to use the ventilators to bring in air through the rear elevation without channelling it through the *calorifère.* If necessary, air could be humidified using *refraichirants* (water basins), incorporated into the air ducts at the level of the heating chambers.[28] For additional ventilation Rose incorporated a system of air vents and air valves in the external walls where they were concealed in cast-iron cordons that were hollow on the inner side and functioned as ventilation ducts. In the rooms themselves there were grilles in the skirting boards and flaps below the ceiling, which users could open and close as needed. One exception were the vents below the third floor ceiling: instead of discharging into the external walls, the air was discharged into the attic via U-shaped air ducts (figs. 9 and 10).[29] Of course, it was also possible to open the windows.



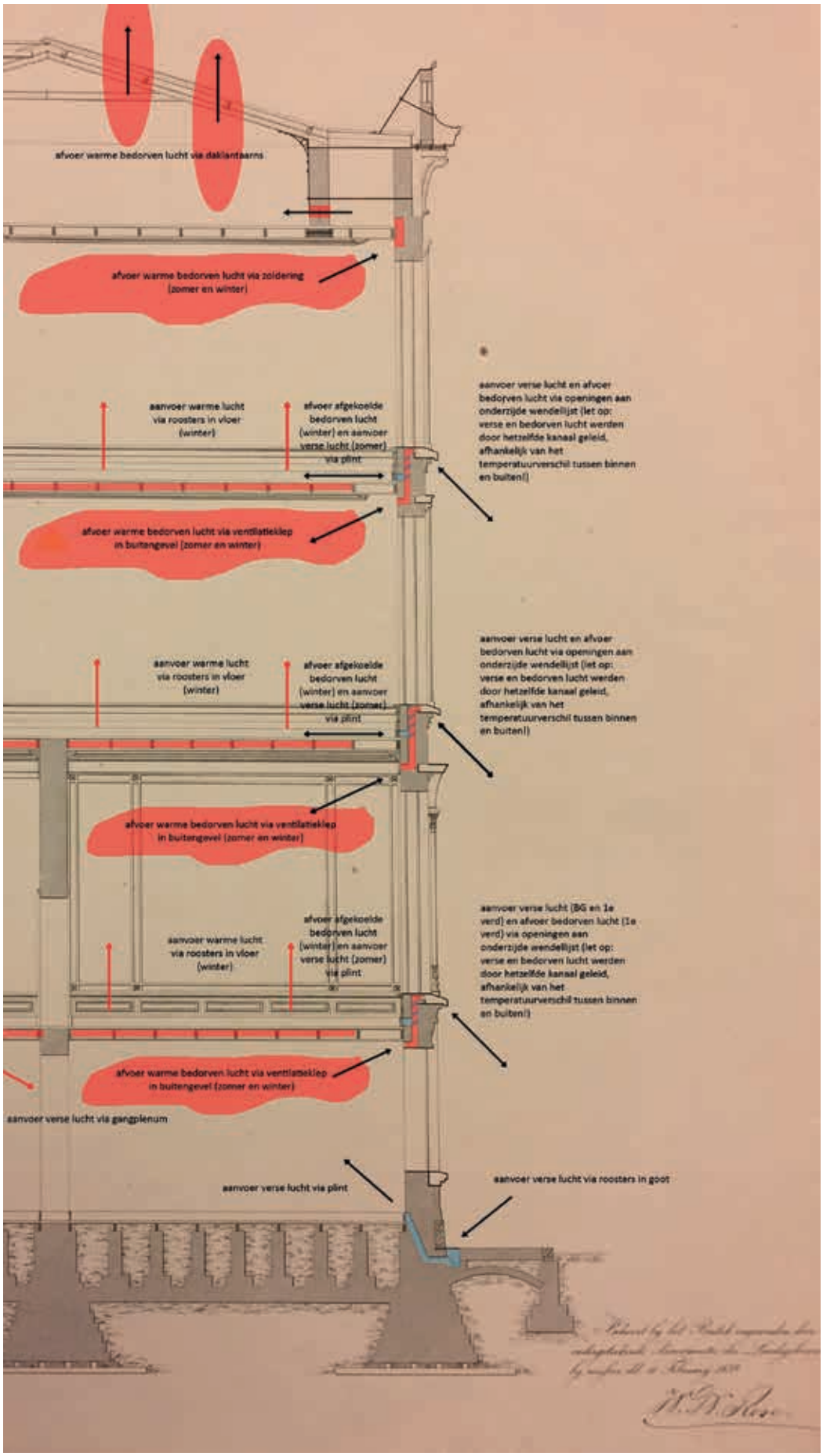
6. Contract drawing 1859, floor plan of the first floor, showing the various components of the heating and ventilation system (Central Government Real Estate Agency, adapted by the author)

7. Inflow grille for warm air integrated into the floor (photo Matthijs de Kraker, WDJArchitecten)



7. Contract drawing 1859, first floor, showing the various components of the heating and ventilation system (Central Government Real Estate Agency, adapted by the author)

9. Open flap below the ceiling in K.117 for the extraction of warm air or supply of fresh air, depending on the difference between the indoor and outdoor temperature (author's photo)



10. Detail from contract drawing 1859, section C-D, showing the supply of fresh air to the rooms on the third floor and the extraction of stale air to the attic or directly outside (Central Government Real Estate Agency, adapted by the author)

Although the Van Hecke system was based entirely on hot-air heating, during construction supplementary chimney flues were incorporated into the walls of the corner rooms because it was suspected that they would be more difficult to heat owing to the long distance the air had to travel with a corresponding loss of heat, and an even greater loss of heat through the outer walls. Whether stoves were installed in the corner rooms immediately upon completion in 1861 is unclear.[30]

INTEGRATION OF ARCHITECTURE AND TECHNOLOGY

Technical installations were only a small part of the total climate system of buildings in the nineteenth century. The building design played a key supporting role, with various architectural and structural aspects being integrated into the system, beginning with logistics: the distribution of fresh, heated or unheated air to the rooms, and then the extraction of stale air. In the Colonial Office the ducts were partially integrated with fabric of the building and were aligned with the main structure of the building. The vertical supply and return ducts were brickwork and embedded in the internal walls. Horizontal ducts ran between floor and ceiling: the space above the ceilings in the corridors functioned as a plenum for channelling the air to the rooms. The presence of an attic was essential because it acted as a vacuum space for the extraction of stale air. Air heating was highly susceptible to any disruptions to the airflow. Cold air downdraughts around windows could seriously impede the air circulation, while chinks and cracks around windows and doors created draughts. This was why the choice of this heating system was coupled with the installation of a double window system in the elevations. The double cast iron window frames largely prevented this kind of problem and in the summer months additional ventilation could easily be obtained by opening both the outer outward-opening window and the inner sash window.[31] Cavity walls helped reduce heat loss via the outer walls, while the glass portal in the vestibule at the main entrance prevented any disturbance of the air flow when the entrance doors were opened.[32]

CRITICISM FROM CONTEMPORARIES

It was not long after completion that the first critical reports about the building's indoor climate started to appear in the press. In 1861 *De Nederlandsche Spectator* printed a highly critical article on 'the latest work by the Government Architect' penned by an anonymous author X. Recounting his visit to the building, probably at the moment when the hot-air heating system had just been put into operation, X wrote: 'Without noticing, busy talking, we have returned to the ground floor and would now, cautiously descending the front steps, have left the fine building had the doorman not then offered us the opportunity to view one final curiosity: the steam engine driving the heating and ventilation system. Where do you think that machine was located? In all good factories, if at all feasible, the steam engine is located as far as possible from the workplaces, at least from the offices, because the oppressive heat combined with the endless pounding of the piston in the cylinder is extremely irksome for any but purely physical work. Many factories even have a separate engine shed, thereby avoiding all the bother and discomfort for ordinary workers as well. And here is the architect of the Colonial Office putting his steam engine in the middle of his palace and right below his finest rooms! – We have had more than enough of it and leave the building – in indignation.'[33]

This was just one of the aspects of the building that irritated the writer. He was also offended by the architectural design, with its modern formal idiom and large expanses of glass. One way or another, the building had many critics.[34]

A DISASTROUS PERFORMANCE

Even before the first winter it was clear that the system was not capable of heating and ventilating the building adequately. One reason for that may well have been the considerable economies that Rose had been obliged to make.[35] It stands to reason that the cost-cutting would have affected the building services as well. When installing the Van Hecke system it was not unusual to use two sets of ventilators: one in the basement to suck in fresh air, and one in the attic to expel stale air. It is possible that Rose had initially wanted to use a second set of ventilators but was unable to find sufficient money in the budget to finance it. Whatever the case, it is clear that the attic vacuum space was barely capable of generating sufficient draught in the building. It was for this reason that ventilation was accomplished chiefly with the help of the hollow cordons in the elevation via grilles along the ceilings and skirting boards. However, in certain weather conditions the cordons channelled not just fresh air from outdoors, but also stale air from the rooms below. This certainly did not improve the air quality. What is more, the diameters of the main fresh air supply ducts were probably not large enough. The corner rooms could only be heated to between 15 and 15.6 degrees, whereas on the top floor the temperature reached more than 21 degrees. According to a critic writing in the *Dagblad voor Zuid-Holland en 's-Gravenhage* in November 1861, an estimated fifty thousand guilders would be needed to 'bring the building into a habitable state'.[36] The physician and hygienist W. Logeman, writing about the heating and ventilation of schools in 1864 even referred to 'a magnificent "fiasco" – as e.g. in a certain public

building in 's-Gravenhage'. He was referring to the Colonial Office.[37]

Owing to all the problems, one of the two *calorifères* had already been turned off in November 1861 and 'old-fashioned' stoves had been installed in several rooms. By March 1862 the steam engine was only being used for forcing water upwards.[38] The steam engine, ventilators and *calorifères* were relocated to the Tehuis voor Oud-Militairen Bronbeek near Arnhem (1860-1862), also designed by Rose. Here the system worked properly; Rose had learned from his mistakes in the meantime.[39] But back in 1860 Rose had also suggested installing the Van Hecke system in the new Supreme Court building to his client, the Ministry of the Interior. Given its 'disastrous' performance in the Colonial Office, the Supreme Court insisted that before moving into the building it wanted a guarantee, in the form of a trial set-up, that the system would indeed work properly here. One of Rose's arguments in favour of hot-air heating was that the installation of old-fashioned stoves would mar the large courtrooms. The Supreme Court endorsed that view. Nevertheless, the client's lack of confidence in Rose culminated in the cancellation of the Van Hecke system even though construction had already begun. Stoves were installed instead.[40] From around 1870, all new buildings around the Binnenhof were fitted with central, mechanical systems. One example is the Department of Justice, built between 1876 and 1883 to a design by the government architect Cornelis Hendrik Peters (1847-1932). The system installed there was also based on hot-air heating, but it was a different type from the one in the Colonial Office. Apart from hot-air heating, the technical development of steam and hot water heating systems had progressed to the extent that they were now more efficient and economical to run.[41] By the final quarter of the nineteenth century central mechanical systems were becoming increasingly common in public buildings all over the Netherlands.

RENEWED APPRECIATION

The cultural-historical survey of the building was able to trace the operation of the original climate system in the Colonial Office based on surviving parts of the building, specifications, archival records and contemporary articles in newspapers and journals. The task was certainly much easier compared with many other nineteenth-century buildings. The critical articles on the functioning of the system proved to be an especially good source of information about how this modern technology was received in the mid-nineteenth century, and about the degree to which it was possible to achieve a comfortable and healthy indoor climate at that time. Rose's career as government architect was adversely affected by the various negative experiences with and critical reactions to his work. But the criticism that was so fierce in the nineteenth century has since subsided. Whereas it was jestingly compared to an aviary upon its completion in 1861, nowadays the building is praised for being light and airy.[42]

That renewed appreciation might also be extended to the original climate system. Researching the indoor climate design of historical buildings is important for understanding the development of air-conditioning technology in the nineteenth century and for a better appreciation of its design. Knowledge about historical systems may also prove useful when attempting to make historical buildings more sustainable; in this case the research into the original technical installations in the Colonial Office was closely connected with the renovation of the building. Moreover, although the system in the Colonial Office did not work as intended, the design was of great importance for the development of air-conditioning technology in the nineteenth century. In the absence of relevant scientific knowledge and calculation models, the acquisition of new knowhow depended heavily on practical experiments, which were few and far between in the Netherlands in the middle of the nineteenth century. As such, the Colonial Office was an early and important example of climate design that attempted to truly integrate technical systems for heating and ventilation into the design of the building.[43]

NOTES

1 J. de Graauw and N. Hogen, *Cultuurhistorisch onderzoek naar gebouw K (voormalig Ministerie van Koloniën), Plein 1 Den Haag*, [Delft] 2021, 12.

2 R. Banham, *The architecture of the well-tempered environment*, London 1984, 10; R. Bruegmann, 'Central Heating and Forced Ventilation. Origins and Effects on Architectural Design', *The Journal of the Society of Architectural Historians* 37 (1978), 143-160; G. Cooper, *Air-conditioning America. Engineers and the controlled environment, 1900-1960*, Baltimore 1998, 15. More information about the development of comfortable and healthy public buildings can be found in N. Hogen, 'A healthy and comfortable indoor climate as nineteenth-century design task', *Bulletin KNOB* 118 (2019) 1, 18-32.

3 De Graauw and Hogen 2021 (note 1).

4 H. Berens, *W.N. Rose 1801-1877. Stedenbouw, civiele techniek en architectuur*, Rotterdam 2001, 229-230.

5 Berens 2001 (note 4), 225-227, 239, 258; K. Bosma et al. (eds.), *Bouwen in Nederland, 600-2000*, Zwolle 2007, 428-429; C.J. van der Peet and G. Steenmeijer, *De rijksbouwmeesters. Twee eeuwen architectuur van de Rijksgebouwendienst en zijn voorlopers*, Rotterdam 1995, 107-113, 129-144. Rose remained government architect until his retirement in 1867 (an honourable discharge against his will) and was not succeeded by an architect because of the negative reactions to his work on the Colonial Office, the Supreme Court and the Knights' Hall. In fact, owing to that criticism his activities in The Hague had been quite limited from 1862 onwards. From

around 1870, under Victor de Stuers and Pierre Cuypers, neo-Renaissance became the more or less official building style for government buildings; Berens 2001 (note 4), 240; Van der Peet and Steenmeijer 1995 (note 5), 267.

6 De Graauw and Hogen 2021 (note 1), 34. At the request of the Minister for the Interior, Rose produced plans for the demolition and reconstruction of the entire Binnenhof, with the exception of the Knights' Hall and the Provincial States building (the palace of stadholder Willem V), 'on account of their historical value'. This caused such consternation in the House of Representatives that the minister directed Rose to come up with a less drastic plan; Berens 2001 (note 4), 236.

7 De Graauw and Hogen 2021 (note 1), 21-22.

8 Berens 2001 (note 4), 228; De Graauw and Hogen 2021 (note 1), 34-35.

9 'Report of the activities of the seventh general meeting of the Maatschappij tot Bevordering der Bouwkunst, held in Amsterdam on 4 July 1862: What are the means of preventing an accumulation of hot air, arising from gas lighting in chambers or rooms of whatever kind, without adverse or disagreeable effects on individuals present, while retaining the integrity of the internal and external structure and on the assumption that the local circumstances do not permit air vents in the ceiling?', *Bouwkundige Bijdragen* 12 (1862), 128-132; A.N. Godefroy, 'Luchtverversching in gebouwen en woonhuizen', *Bouwkundige Bijdragen* 11 (1860), 222; 'Over verwarming en luchtverversching volgens het stelsel van Van Hecke', *Algemeen verslag der werkzaamheden van het Koninklijk Instituut van Ingenieurs over het instituutsjaar 1857-1858*, 's-Gravenhage 1858, 96-97.

10 Berens 2001 (note 4), 15-16; H.W. Lintsen, *Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving 1800-1890 deel III*, Zutphen 1993, 202.

11 'Since very different methods of heating are currently used for various buildings, both private and public, such as with air heated by steam or hot water, the question is which of these systems can be considered the least dangerous, the least costly and the most efficient?', *Bouwkundige Bijdragen* 9 (1856), 42-43.

12 Berens 2001 (note 4), 181-183; Godefroy 1860 (note 9), 222; C. Krabbe, *Ambacht, kunst, wetenschap. Bevordering van de bouwkunst (1775-1880)*, Zwolle 1998, 146; M. van Lieburg, *Het Coolsingelziekenhuis te Rotterdam (1839-1900). De ontwikkeling van een stedelijk ziekenhuis in de 19e eeuw*, Amsterdam 1986, 134-135; A. Mekking and F. Sleeboom, *Het stadsziekenhuis aan de Coolsingel te Rotterdam van W.N. Rose*, s.l. 1972, 25, 27; Van der Peet and Steenmeijer 1995 (note 5), 131; Stadsarchief Rotterdam, dossier no. LSG1, *Afbeeldingen van het Nieuwe Ziekenhuis te Rotterdam*, 1840.

13 T. Hermans, J. Kamphuis and C. van der Peet, *Bouwhistorische documentatie en waardebepaling Koninklijk Tehuis voor Oud-Militairen 'Bronbeek' Velperweg 147 Arnhem*, Rijkvastgoedbedrijf/Atelier Rijksbouwmeester, The Hague 1991, 13. See also: L. de Clercq, 'De internationale context van de Belgische 19de-eeuwse verwarmingstechnologie in haar relatie met de architectuur', *Gentse bijdragen tot de interieurgeschiedenis* 32 (2003), 77-112. Although De Clercq provides a detailed overview of Belgian practice in this period, he does not mention the Van Hecke system.

14 M. Stokroos, *Verwarmen en verlichten in de negentiende eeuw*, Zutphen 2001, 43. In France the Van Hecke system was also often used in ships. See Godefroy 1860 (note 9), 221; 'Over verwarming en luchtverversching volgens het stelsel van Van Hecke' 1858 (note 9).

15 M. Daniel, *Haustechnik im 19. Jahrhundert. Das Beispiel der Heizungs- und Ventilationstechnik im Krankenhausbau*, ETH Zurich 2015 (thesis), 266.

16 Godefroy 1860 (note 9), 222; J.J.C. de Wijs, 'Beschrijving van den nieuwen toestel voor ventilatie en verwarming, geplaatst in het hospitaal "Necker" in Parijs, naar het systeem van dr. Van Hecke', *Bouwkundige Bijdragen* 13 (1863), 22.

17 Godefroy 1860 (note 9), 219-222; J.J.C. de Wijs, 'Levensschets van Willem Nicolaas Rose', *Bouwkundige Bijdragen* 24 (1878), 161-174, 13-22.

18 Berens 2001 (note 4), 251.

19 National Archives, specifications 1859, 6; Central Government Real Estate Agency archives, contract drawings 1859.

20 Specifications 1859 (note 19), 39.

21 T. Tredgold, *Principles of warming and ventilating public buildings, dwelling-houses, manufactories, hospitals, hot-houses, conservatories etc.; and of constructing fire-places, boilers, steam apparatus, grates, and drying rooms*, London 1824, 14. No details are known regarding the design temperatures for the Colonial Office.

22 Specifications 1859 (note 19), 39.

23 Specifications 1859 (note 19), 4, 14-15, 26-28, 52, 54 and associated plans. Horizontal ducts in the floors were usually made of iron in a timber conduit. The horizontal ducts lay in the floor on two timber crossbeams, between the floor joists. Vertical ducts were made of iron, as were all the grilles and flaps.

24 W. de Waal, 'Over ventilatie of luchtverversching. Gevolgd naar het engelsch van Morill Wyman', *Bouwkundige Bijdragen* 7 (1852), 150, 362.

25 Specifications 1859 (note 19), 4, 52 and associated plans.

26 Specifications 1859 (note 19), 54-55 and associated plans.

27 Specifications 1859 (note 19), 4, 42-45, 54-55, and associated plans.

28 Although cooler air could be pushed through the building and this air could be humidified, the building itself could not, or only to a limited degree, be cooled in this way. The outdoor temperature always affected the temperature inside the building.

29 Specifications 1859 (note 19), 4, 52, 54-55 and associated plans.

30 Specifications 1859 (note 19), 54-56 and associated plans; A friend of truth, 'Letters to the editor', *Dagblad van Zuid-Holland en 's-Gravenhage*, 13 November 1861. On page 32 of the 1859 specifications mention is made of '3 finely polished white or coloured marble panels with mouldings and fittings in accordance with specification for the chimney flues. It is not clear however whether and if so where these were installed; there are no other indications as to the presence of fireplaces and/or mantlepieces from the construction period.

31 Although the cast iron window frames had already been replaced by wooden frames in 1873, the principle of double windows continued to be employed; C.H. Peters, *De Landsgebouwen te 's-Gravenhage*, 's-Gravenhage 1891, 125.

32 Specifications 1859 (note 19), 16 and associated plan.

33 X., 'De jongste werken den Rijksbouwmeester', reprinted from *De Nederlandsche Spectator* (1861), 10-12.

34 'Binnenlandsche berichten', *Dagblad voor Zuid-Holland en 's-Gravenhage*, 2 November 1861; A friend of truth 1861 (note 30); De Graauw and Hogen 2021 (note 1), 36-37.

35 Hermans, Kamphuis and Van der Peet 1991 (note 13), 13; De Wijs 1878 (note 17), 170. See also Berens 2001 (noot 4), 249.

36 A friend of the truth 1861 (note 30).

37 W. Logeman, 'Ventilatie van schoollokalen', *Schat der Gezondheid* 7 (1864), 212-213.

38 ARA Min BZ dept. Waterstaat inv. no. 2936, 2934 (letter from Rose to the Minister of the Interior, d.d. 23 November 1861), inv. no. 2935 (letter from min. for Col. to min. of BiZa, d.d. 17 March 1862). There are no construction drawings for these modifications in the archives.

39 Hermans, Kamphuis and Van der Peet 1991 (note 13), 13-14. According to Berens 2001 (note 4) the system was not relocated from the Colonial Office to Bronbeek until 1867, but this is at odds with the correspondence on this matter in 1861-1862 between the two ministries involved.

40 Berens 2001 (note 4), 251, 261. Rose also quite often used A. Longbottom's hot water-based system, which was in fact an improved version of the Perkins hot-water heating system. Trials with the Longbottom system were carried out in a few Landsgebouwen rooms. Rose experimented with the Perkins system in the State Archives building, which was not a success because the

system's water pipes burst. It also prompted a critical article in the *Nederlandsche Spectator*: 'Speaking of heating appliances pay a visit to the State Archives in winter and see whether you can stand it in some rooms between the alternative of heat and draught without ending up with either a headache or earache. That device was installed at great cost by Mr Rose. And there are now plans to install such a beauty in a very small space (the telegraph office)' (x 1861 [note 33], 12).

41 *Bureau Vlaardingerbroek, Het vm. Departement van Justitie te 's-Gravenhage. Bouwhistorische opname, waardenstelling en advisering*, Utrecht 2019, 15-16.

42 De Graauw and Hogen 2021 (note 1), 36-37.

43 These statements are based on research that Natasja Hogen carried out for her thesis on the heating and ventilation of buildings in the Netherlands in the period 1840-1920. She successfully defended her thesis on 18 May 2022 at the University of Amsterdam.

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'A MAGNIFICENT FIASCO'

WILLEM NICOLAAS ROSE'S INNOVATIVE CLIMATE CONTROL DESIGN FOR THE DUTCH COLONIAL OFFICE

NATASJA HOGEN

The new premises of the Dutch Colonial Office (Departement van Koloniën) on the Plein in The Hague, built between 1859 and 1861 to a design by the Chief National Architect, Willem Nicolaas Rose (1801-1877), is an early and important attempt to deal with thermal comfort and indoor climate in buildings in the Netherlands. The heating and ventilation of buildings garnered a lot of attention in the nineteenth century, sparked by new ideas about health and thermal comfort and related technical advances. Many public buildings had high occupancy levels, often resulting in deplorable air quality. Controlling the indoor temperature was another complex issue. In 1858, Rose was appointed Chief National Architect with responsibility for all government buildings. In his design for the Colonial Office he experimented with modern materials and techniques including iron, cavity walls, large glazed surfaces and mechanical installations for heating and ventilation. He also exerted considerable influence on Dutch architecture through his flexible approach to the spatial layout of buildings, the use of classical visual language and the introduction of the Rundbogenstil (round-arch style). His Colonial Office building consequently differed markedly from the existing buildings in and around the Binnenhof. However, his unbridled belief in progress and highly individual evaluation of historical buildings also attracted fierce criticism.

To heat and ventilate the Colonial Office Rose made use of the Van Hecke system. This entailed an extensive network of ducts through which fresh, warm air was dispersed throughout the building from the ground floor heating chambers with the help of ventilators. But the mechanical services were just a small part of the overall climate system: various architectural and structural strategies were an integral part of the system.

During the very first winter it became clear that the climate system was not up to the job of heating and ventilating the various rooms adequately. Owing to the many problems that arose, the mechanical systems were transferred in 1862 to the Tehuis voor Oud-Militairen Bronbeek near Arnhem, also designed by Rose. But although the system in the Colonial Office building did not operate as required, the design itself was very important for the development of climatic systems in the nineteenth century. In the absence of scientific knowledge and calculation models, the development of knowhow depended very much on real-life experiments, and there were very few of these in the middle of the nineteenth century in the Netherlands. As such, the Colonial Office building can be seen an early and important example of a climate control design that genuinely attempted to integrate mechanical systems for heating and ventilation with the design of the building.