The Contractors' Intellectual Profile: Knowledge and Training of Nineteenth-Century Public Works' Contractors in Nineteenth Century Antwerp, Belgium

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> Is it still sufficient today to practise a profession following the common tradition? Does one not have to take into account the evolution of science too? Is it still adequate to say because our forefathers did things that way, so we'll do it in the same fashion? More efforts are required, and in the neighbouring countries, industrialization expands enormously and training in all grades and fields is stimulated still further. World exhibitions and annual fairs are proving it. If we don't want to fall behind, we have to stimulate technical education. We have to invest in knowledge!
>
> (SAA, MA 237_18)

In his submission entitled "Technique, Profession and Practice", one of numerous articles included within the reference work *Technique in the Netherlands*. *The Rise of a Modern Society 1800-1900*, J.P. Verbong stated emphatically that "one of the most striking elements in the discussions about technical education [in nineteenth century Europe] is the recurrent proposition that high quality technical training was an absolute precondition for subsequent industrial progress" (Verbong 1994, p. 301). Originally inspired in part by the cult of rationality and modernity implicit in the values of the Enlightenment, such a view was subsequently reinforced by the functional dictates of industrialism: many societies wished not only to get rid of social deprivation but also to remain competitive with neighbouring countries. Such sentiments were clearly implicit in the aforementioned quotation by Hendrik Altenrath (1832-1892). Dating from 1881, this quote formed part of his proclamation speech as the first governor of the Antwerp Industrial School ("Nijverheidsschool"), which was established in 1862. Like many others, Altenrath believed that the "emancipation of the active employee, and their promotion from unskilled labourers to intellectuals" (Altenrath 1881) was an important measure for confronting contemporary social problems and, moreover, of stimulating the development of industrial design.

Within the approach of the aforementioned "Nijverheidsschool", this paper is dedicated to clarifying the role and importance of one group of students in particular, namely public works contractors or *entrepreneurs de travaux.* During the nineteenth century, these *practici* experienced a radical shift in organisation and saw their essentially craft structure undergo a process of rapid professionalization. Within this broad process, the establishment of structures to govern their own professional organization was an important element, and one which will be briefly discussed in the first part of this paper. Furthermore, the provision of appropriate training for contractors became

increasingly important for two reasons. One the one hand, innovations in new products and processes operative within the construction industry required better familiarity and training. In addition, the changing relationship between customers, architects and engineers, with regard to such issues as the delineation of legal responsibility for design, construction and even for appropriate professional indemnification, had become more important by this time.

As one of Belgium's leading cities, Antwerp provides an especially interesting context for a number of reasons for the study of public works contractors during this period. Possessing its own specialized training facility for building contractors, a significant increase in public building activity was, moreover, apparent in Antwerp during the second half of the nineteenth century. Whilst there was a rising demand for contractors to carry out such work, the volume of training actually undertaken on site became less prevalent. This suggests a structural change in the delivery of such training. Secondly, the city enjoyed an extensive educational infrastructure, including architectural training at the Royal Academy of Fine Arts, Belgium's first academy. The links operative between such 'sister' institutions allowed a clearer specialisation of function to be achieved. It should also be noted, finally, that the Association of Building Contractors within Antwerp played a leading role and inspired the foundation of similar associations in other cities elsewhere in Belgium. In order to better clarify the function and importance of the Antwerp Industrial School, and its impact on the educational profile of building contractors, one can identify the following elements of study: the composition of the curriculum, the introduction of new types of provision, and, finally by means of conclusion, the situation of the industrial school in the existing educational provision elsewhere in other institutions.

THE CHANGING ROLE OF BUILDING CONTRACTORS IN THE NINETEENTH CENTURY

As Auke van der Woud proposed in his article "Professionalization and integration":

> The study of the history of the 19th century construction industry demonstrated the increasing aspirations of architects and engineers to obtain recognition and power, their growing education and professional organization, their growing remuneration, and their enhanced social position and specialization… Equally, these developments must have had important consequences for related professional groups. It cannot but be that contractors underwent a similar professionalization process … but about these contractors virtually nothing is known.
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> (Van der Woud 1992, p. 165-6)

Recent studies of building contractors during this period have demonstrated that within different geographical, social and industrial contexts, the professionalization of the contractors and their subsequent legal status was not entirely the result of independent initiatives *per se*. Rather it was

more the outcome of a dialectical process. It was undoubtedly the product of the growing functional interdependence with other professions, such as architects and the engineers (Cooney 1956, pp. 167-76, Colvin 1978, pp. 38-40, Powell 1980, Epron, 1981, pp. 27-9, Van Leeuwen 1993, pp. 8-25, Bertels 2005). As a result, this period provides a suitable backdrop for examining the transition of the traditional building contractor from its roots in artisan organisation to more modern forms of commercial professional association.

In Belgium at this time, the legal and socio-economic position of the contractor was undoubtedly weak. Most building contractors were self-employed and little real distinction was made in practice between architects and contractors. This legal situation in fact dated from the end of the eighteenth century. The French Le Chapelier Law of 1791, extended to Belgium in 1795, aimed to dispense with the socio-economic organization of the Ancien Régime (Flamme 1966, pp. 121-45). This legislation resulted in the prohibition of guilds and trade associations. With the creation of Belgian independence in 1830, however, these associations became legal once again, with the exception of trade unions which remained prohibited until 1866. Much as a consequence of this inheritance, the first professional organizations of this period were inhibited from focusing on formal professional organisation and structures, but instead developed charitable activities, health provision and devoted time to providing services for the education and recreation of their membership (Dambruyne 1992, pp. 218-9; Brion 1995, pp. 14-8; Van de Vijver 2000, pp. 57-8, Heyrman 2001, p. 828).

In the course of the nineteenth century, the construction industry developed apace, perhaps most visibly in the organization of municipal public works. At the beginning of the century, these bodies not only regulated design and building control, but were increasingly in charge of the detailed execution of such works too. The construction work itself was done either in-house by craftsmen employed directly by the public works service itself, or alternatively, outsourced to the private sector by putting the work out to tender. Interestingly, city councils were not legally obliged to proceed by this latter method of service procurement, but as time progressed, they tended in practice to follow the precedent of the bigger local authorities. The larger bodies and authorities invariably utilised tendering prior to the final award of contracts.

The procedure for the usage of tenders was well understood by all parties. The specification for the entire job was itself subdivided in several smaller tenders, each covering dedicated labour and material requirements. These often followed sequentially the different functional stages of the project: demolition works, foundation works, brick, timber, plaster works, etc. Later on, however, city architects and engineers would have to produce a workable formula to deal with larger infrastructure projects within the public domain. The growing need for public buildings and infrastructure covered a range of applications, such as local schools, police and fire stations, hospitals, transport, water and power supply (eg. Bertels 2004, pp. 401-37). In addition, the fiscal requirement of government to minimise the cost of such provision carried with it the accompanying

need to standardize the process of work organization. Needless to say, this would have consequences for hierarchies within the construction industry too. For public building projects, much as a result, the entire gamut of work and supply of materials was to be put up for tender. Thus the actual organization of construction on site was transferred from public works to the contractor, stimulating the creation of the so-called *general construction firms* or *entrepreneur general*. Henceforth, building contractors had an enhanced opportunity to participate in decision-making on site (Bertels 2005). At the end of the nineteenth century, the *Pandectes Belges*, an encyclopaedia of Belgian legislation, clarified the evolution of the changing role of building contractors (Picard 1891, col. 137, 5th article). Whereas the architect remained the initiator of design, and, moreover, in ultimate authority for the work done, the contractor was increasingly seen to be responsible for the organization and execution of work. Apart from national legislation, additional regulations were also developed by various municipal administrations and found their way into the *conditions générales* of the building specifications (Bertels 2005).

Even under such improved conditions, nevertheless, contractors still faced profound difficulties. Cooperation between local government officers, city architects and engineers was still far from ideal. They were still shackled, moreover, by the bureaucracy generated from previous legal requirements. One of the direct results of this growing polarization between architects and supervisors, on the one hand, and contractors and craftsmen, on the other, was the growing need for a proper professional organization to defend the common interests of the latter group. Founded in Antwerp on the 1st of September 1874, a pioneering role was to be played by "*Le Cercle des Entrepreneus de Travaux Public*" or "*Maatschappij van de verschillige ambachten en bouwstielen"* (ABC, Statute 1874). In 1881, this Antwerp union, together with the equivalent unions in Brussels and Liège, decided to establish a Belgian-wide confederation of contractors. The formation of this umbrella organization, covering each regional association, was a process in which the Antwerp union undoubtedly played an important, if not decisive, role (Venstermans 1954, p. 44, Bertels 2005). The original goals of the Antwerp union were threefold. These consisted of aims such as the creation of professional code and standards, the clarification of legal responsibility between clients and contractors, and an attempt to create specimen contracts and fixed tariffs. Last but no means least, they also aimed to *"propager les perfectionnements apportés dans l'art du constructeur*", in other words, to facilitate the education and training of contractors too (ABC, Statute 1874).

SEARCHING FOR A SPECIALIZED CONTRACTORS' TRAINING

During the second half of the nineteenth century, it is clear the work of contractors was characterised by an increasing complexity of work. The new context required both the coordination of work on site, as well as an enhanced diversity of required tasks. In order to thrive, the transition of artisan builders into general contactors or subcontractors required contractors to entertain an increased familiarity with a range of skills. They had to perform many functions and wear many

hats: craftsman, supplier, organizer, coordinator, negotiator, etc. Gradually, the need for an upgraded and indeed more focused process of training became more of a priority. The training of public works contractors has not been studied as thoroughly as the education of architects and engineers. The latter were often trained at specialised departments within universities, drawing schools or academies, a feature covered extensively in recent historical scholarship (Verpoest 1980; Verpoest 1989, pp. 25-51 and 383-97; Verpoest 1990, p. 112-29; De Keyzer 1997, pp. 15-8; Van de Vijver 2000, pp. 56-8, 60-2, 299-306). It can, however, be taken for granted that many contractors continued to be trained on-the-job as craftsmen (Westerhout 1954, pp. 31-2; van Leeuwen 1993, pp. 8-25, Willemen 1966, p. 266). Their training would have remained quite similar to that undertaken under the auspices of the Ancien Régime, where apprentices were trained under the guidance of an experienced master craftsman. This training would normally have a fixed duration. After successfully completing and passing a final practical test (*"proeve"*), the pupil became a "mate" and after the master test ("*meesterproef*") possibly a master (De Munck 2002, pp. 94-109).

A closer look at the training of contractors in Antwerp demonstrates that many experienced a variety of training regimes. Some of them were formally trained as architects or engineers. Others had been craft trained but had completed their training with the assistance of evening classes at local design schools. This was the case for Joseph Lefèvbre (1818-1891), Antwerp Alderman of Public Works from 1872-1890. After finishing his grammar school education at the Antwerp Royal Atheneum, he began work in the building firm of his godfather Eugène Riche. In order to attain promotion, Lefèvbre had in fact attended evening classes at the Antwerp Royal Academy and by 1850, he had set up his own construction firm (Van de Venne 1895). From 1851 onwards, the training programme offered by the Antwerp Academy was revised, and a course in applied industrial design was thereafter organized. Nevertheless, despite the growth of technical education, the well-established programme of formal design education was still considered to be the broadest and strongest element in the Academy's portfolio (Verpoest 2005).

Far from simply broaden the content of existing training provision, the economic and social transformation of nineteenth century Europe also provoked more radical experiments in the delivery of vocational training. A new type of education, entitled *technical education*, was one case in point. This term covered a variety of educational programmes which trained manual workers in a range of sectors, such as agriculture, the domestic trades and industry (D'hoker 1988, p. 127). The evolution of this technical education in Belgium has been studied by several authors (Dezutter 1979, D'hoker 1980, Vandewijngaert 1986, De Vroede 1988, D'hoker 1988, Grootaers 1993, Grootaers 1994) primarily from a pedagogical point of view and there are several interesting contributions to the surrounding debate. One such contribution is the pioneering study undertaken by Mark D'Hoker, covering the development of technical and vocational training from 1830 to 1914 (D'hoker 1980). Another key contribution is the study undertaken by Dominique Grootaers, which gives a more global perspective over the period 1860-1960 (Grootaers 1994).

Both these studies have clearly demonstrated the connection between accelerating industrial development and the subsequent rise of the technical schools. Such faculties were first developed in rapidly developing and industrialized areas, such as Liège (1838), Ghent (1838), Huy (1838), Verviers (1841) and Charlerloi (1845). They were also allied to specialized regional industries, such as the textile industry in Ghent or the mining industry in Mons (Rapport 1867). By the end of the nineteenth century, 40 such industrial schools existed in Belgium. Almost half of them were situated in the Hainaut province (18 out of 40) and the others were mostly spread out over the leading cities of the different Belgian provinces (Rapport 1897).

Judging by the rapid growth in the number of such industrial training schools, they had clearly served the needs of the majority in providing an affordable "non-classical" training. The industrial schools supplied a largely theoretical technical training for an essentially artisan clientelle. This training was seen to be a supplement to the practical experience of the individual worker or craftsman. Hence, such training was marketed as the means by which their students could rise upwards in the professional hierarchy, "to move up from workman to the status of master or contractor" (SAA MA 228/17 A), perhaps towards a position within "middle-management". In such a designation, their main responsibilities in the building industry became the practical organization of construction work and the translation of broader design concepts, whether they emanated from a patron, an architect or an engineer, into concrete and practical tasks for their workforce (D'hoker 1980, pp. 353-8).

THE RISE OF AN ANTWERP INDUSTRIAL SCHOOL

Formation of the Antwerp Industrial School, 1862

In Antwerp, a private industrial school was erected in 1862 and provided a predominantly theoretical education, which explicitly included the training of employees in the building industry. Founded between 1860 and 1861, the school developed from its original designation as an ornamental and architectural design school (SAA MA 237_18). It was opened under the private initiative of the Society of the Flemish Friends ("Maetschappij de Vlaemsche Vrienden") and located at the Antwerp Lange Winkelstraat. This inception of the institution was really an exception, as most of the other industrial schools were originated by initiatives undertaken by municipal government.

The driving force behind this private initiative was the aforementioned architect-surveyor Hendrik Altenrath (Antwerp, 1832-1892). His comprehensive scholarship and practical expertise can be deduced from his accompanying curriculum vitae and the associated letter of application, which he had submitted for the vacant post of Antwerp City Architect in 1862 (MA SAA 867/1). At the age of sixteen, he attended architectural classes between 1848 and 1853 at the Royal Academy of Antwerp, where he obtained several prizes. He was awarded first prize for industrial design in 1848, 1849 and 1850, the first prize for Gothic Architecture in 1852 and a creditable second place for the

Prize of Rome in 1858. In 1853, meanwhile, he had also become a chartered surveyor. In his later developed practice, he combined work as both architect and surveyor, for both private and public sectors. As a governor of the Antwerp Industrial School, from 1862 to 1892, he devoted much of his time to the institution, an initiative he supported for reasons of both personal pragmatism as well as ideological commitment. In his own practice, he had experienced a shortage of skilled workers and in particular the need for technically trained craftsmen. In order to fit in with the needs of local employers, the industrial school, as elsewhere, provided courses available in the evenings and at weekends too. Its remit was simple: "aiming at the diffusion of scientific and industrial knowledge and to create the opportunity for everyone to qualify oneself in his professional discipline" (SAA MA 237_18A). By giving supplementary technical training to eligible practising craftsmen, primarily male students, who were over the age of 15 and literate, the institute provided a broad technical education for many prospective students. Students could attend the courses on history, arithmetic, algebra and bookkeeping on weekday evenings, and on construction, mechanics and industrial design courses on Sunday. Much as a departure, the courses were exclusively taught in the students' mother tongue (Dutch or "Vlaamsch"). Altenrath's view was that for it to be effective, "training must be in Dutch. The mother tongue is the language that communicates with the powers of comprehension, the only one which is connected with clarifying notions, which is respectably educating, which can enlighten the peoples brain with clear concepts" (SAA MA 237_18, Van Daele 1969, pp. 171-8).

Antwerp's private institution not only successfully filled a gap in the market for skilled labour, but, moreover, reacted against the government sponsored training at the Antwerp Academy and Athenaeum, training which was always undertaken in French. The industrial school enjoyed popularity quite quickly. The Winter course undertaken between the years 1860-61 enrolled only 40 students, but by 1864-65, this had expanded to 310 pupils. The school, however, became the victim of its own success. Owing to such rapidly increasing enrolments and the consequent and escalating costs of provision, private investors were forced to bequest the school to the city of Antwerp in 1866 (SAA MA 237_18A). The institution became part of a larger pre-existing public educational network organized by the City of Antwerp, including nursery, primary and secondary schools, and including further and higher education too (City of Antwerp 1866, p.XXXXIV).

Association with the Antwerp Education Network

The transformation from a private to public institution, including the subsequent increase in financial support from local government, formed a pivotal juncture in the growth and development of the school. As a public institution, the school had to comply with the national requirements for state technical schools. Since 1852, following Ministerial Decree 25 in October 1852, this lay under the responsibility of the Ministry of Internal Affairs, Department of Industry. In fact, around two-thirds of the incumbent academic workforce followed the advice of Altenrath to integrate into public provision (SAA MA 273_18A). Following the official appointment of the "new" teaching staff at the school, the authorities were required to appoint a Directorate, consisting of members of

different stakeholding organisations, such as the local municipality, province and state. This Directorate controlled the day-to-day organization of the school, the appointment of Principal and lecturers, and the finances too (D'hoker 1980, p. 77). The development of an Education Program was the next important element and one which needed to be approved by the Directorate. As the impact of this committee was extensive, its composition became a major focus of discussions between the founders of the school and the municipal government. To retain as much institutional autonomy as possible, Hendrik Altenrath tried - unsuccessfully - to be included in the Directorate of the school. As prescribed by Ministerial Decree, in addition to the Mayor of Antwerp, two aldermen (Mathot and Matthyssens) and two members of the Provincial Council (De Clé and Baeckelmans) were appointed in 1866 (City of Antwerp 1867, pp. 95-6). Such appointments were not without criticism. The subsequent appointment in 1867 of Lodewijk Jean Louis Baeckelmans (1835-1871) (Verpoest 2003, p. 133), architect of the Province of Antwerp, for example, as professor at the Royal Academy, still very much a rival institution at this time, was highly criticised. As he had continued to maintain his place as member of the Directorate became an unacceptable situation to his peers (SAA MA 237-18).

Mutual distrust indeed continued to permeate the atmosphere of the new institution. One consequence of this underlying suspicion was that Altenrath was only appointed provisionally as School Principal in 1866. Indeed it would take more then a decade before he was permanently appointed. The full complement of staff included eight professors. There were two Professors of Design, and one in each of the following disciplines of Mathematics, Geometry, Physics, Chemistry and Construction. There was finally a Professor of Law and Economics too, in addition to a student supervisor and also a school porter. This staff needed not only to be well qualified professionally, but they were also required to speak Dutch fluently and, moreover, to be willing to teach in a state funded institution. Both these latter requirements proved to be problematic: after their eventual transfer to the state funded institution, some 40% of staff of the private forerunner had indeed left their position and it became a difficult task to find Dutch speaking professors.

Initially, the number of students fell sharply following the first years after the switchover. Some 310 pupils were enrolled during the winter courses of 1864 and 1865, compared to less then a third of this number, on average 99 per year only, for the equivalent courses between 1866-71. Later, however, the school became more successful, with an annual intake of some 600 students by the end of the nineteenth century. As a result, the school was gradually forced to search for new and dedicated premises. It moved in 1891 from the BlindenStraat, its location since 1871, to its current location at the Antwerp Paardenmarkt (City of Antwerp 1866-1900).

In the years after 1866, the design and delivery of the curriculum became a major point of interest. By 1867, the school's regulations had eventually been approved. The initial training was organized into a three-year cycle, subdivided into a winter course, running from October until March and a summer course, running from April until August. The three-year programme was subsequently

extended to four in 1872, with the introduction of a foundation or preparatory year, and eventually to five years in length by 1894. The first three years were obligatory for all students. The fourth and fifth year was divided into five branches: material sciences, construction sciences, shipbuilding, wood and marble painting and marble cutting (SAA MA 237_18, Van Daele 1969, pp.174-5). The courses initially took place on week days from six till eight in the evening, and were combined with the design courses on Sundays. From 1876 onwards, the weekend courses were abolished and design was reintroduced into the evening courses. As a result, courses were extended from six till nine in the evening (City of Antwerp 1877, pp. 95-6). In 1869 an elaborate school programme was adopted by the Directorate and was further adjusted on an annual basis. Altenrath had apparently been inspired by the programme of the Liège Industrial School. A travel report dating from 1873, moreover, bears witness to Altenrath's broader research into other industrial schools situated in Bavaria, Saxony, Coburg and Hessen-Darmstadt in Germany (MA 228_17B). Following their example, the Antwerp programme enhanced both its theoretical technical training and its structure, enabling improved practical expertise. Design, both artistic *and* scientific, was seen as "an alphabet that each worker or craftsmen needed to know" (D'hoker 1880, p. 79) and was obligatory for each student irrespective of their chosen specialization. Whereas design was conceived as the practical part of the training, the theoretical part consisted of a number of scientific disciplines, ranging from mathematics and physics, through related disciplines of algebra and geometry, mechanics and chemistry, to the domain of social science. Thus in addition to the study of architecture and construction, disciplines such as accountancy, politics and legislation were all included too. Furthermore, this holistic theoretical training was related specifically to the individual industry the students were currently working within. The emphasis of the course was on an applied and practical understanding, as illustrated in the following quotation on the practical use of arithmetic, accountancy and algebra:

> …it is not sufficient that calculation rules are studied, more particularly pupils need to be able to solve algebraic problems; they need to know which calculation they need to make to come to a positive balance of their enterprises, (…) the whole programme needs to be *practical*, it must be instructed with facts and practical examples!
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> (City of Antwerp 1870, p. VI-VIII)

For students working in the construction industry, Antwerp was seen to be at the cutting edge of applied technologies, as the ideal laboratory for experimentation and familiarisation. Students therefore not only studied the organisation of public works, but also the technology, even the scaffolding, building equipment and machines used to deliver such services. Even standardized building specifications, drafted by the City Architect and Engineers, were to be studied. Further, as in other training programmes, a yearly competition was organized, which rewarded the best students with books and instruments and later also with travelling scholarships. The idea, furthermore, to establish a joint industrial museum and library appeared soon after the establishment of the school and was inspired by the Brussels model (1826) (SAA MA 237_18, 1865). In order to

establish a collection of exhibits, support was often provided in the form of donations of models and instruments, as with the donation of optical instruments by the Plantijn-Moretus Museum in 1877 (SAA, MA 228_16, 1877). Despite strenuous efforts, the museum would only be opened at the beginning of the twentieth century (1910) (Van Daele 1969, p. 175). The library of the school was more easily developed. In 1866, the library contained some 175 items (Van Daele 1969, p. 176). By 1895, however, the library catalogue (SAA MA 228_18A) mentions 925 items. This catalogue included a broad variety of national and international manuals and publications, whether historical, practical or theoretical. Examples of manuals and publications are C. Schatslo's *De practische metselaar: handboek voor architecten, metselaars, opzichters en leerlingen* (Leiden), Eugen Gugel's *Geschiedenis van de bouwstijlen in de hoofdtijdperken der architektuur* and Armand Demanet's *Cours de constructions* or *Guide de construction: maçonnerie*. As well as a series of official periodicals published by the different authorities, such as the Antwerp *Bulletin Communal,* the *Moniteur belge,* the *Moniteur industriel belge* and the *Revue commercial* and several mostly British and German specialized journals, such as the *Journal of applied science: a monthly record of progression in the industrial arts, The Engineer,* the *Mittheilungen des Bayrischen Gewerbemuseums in Nurnberg Bleibatt zür Wochenschrift: Kunst und Gewerbe* and the *Gewerbehalle Organ, fûr den Fortschrift in allen Zweigen der Kunstindustrie.* In general literature on mechanical topics (12%), construction problems (9.73%) and physics (9.08%) tended to be the most prevalent.

SITUATION OF THE ANTWERP INDUSTRIAL SCHOOL

An analysis of the various programmes on offer demonstrated that the Antwerp industrial school, with its emphasis on *applied theoretical* training, was quite unique. Its chosen approach lay, on the one hand, between the primarily *artistic* architectural training on offer at the Royal Antwerp Academy and, on the other, the more general *scientific* training of the urban Atheneaum. Especially in the second half of the nineteenth century, the industrial school appears to have experienced a more competitive relationship with the Academy. This is well evidenced by the numerous discussions focused on school timetables and programmes. Lessons were organized at the same time across a similar timetable as equivalent courses elsewhere, such as at the Academy (SAA MA 237_18A). Indeed the initial programme of the Antwerp Industrial School evolved into *a fully fledged training programme*. The aforementioned attempts to focus part of the Academy's programme on industrial applications made the local government question the necessity of financing duplicate courses elsewhere. As a result, the Antwerp industrial school more and more developed a proper policy explicitly focused on a *scientific theoretical training for crafts- and workmen applied to the industry.*

Along with the industrial schools, another form of technical education was also developed: the vocational training. The vocational schools mainly or exclusively provided a practical training. In most cases, their programme was organized during the day, aiming at overcoming the shortness of

practical training on site. Further, unlike the vocational, the engineers' and architects' training, who most often directly gave access to a particular profession (Verbong 1994, p. 301). The programme at the industrial school however provided for craftsmen and contractors an additional theoretical training, as a tool for social and professional mobility. Together with the establishment of their proper professional organization, the provision of an appropriate training for contractors, as provided in the industrial school, strongly supported the contractor's professionalization in the course of the nineteenth century.

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