

MULTILAYERED GRIDS AND DUTCH TOWN PLANNING.
FLEXIBILITY AND TEMPORALITY IN THE DESIGN OF SETTLEMENTS IN THE
LOW COUNTRIES AND OVERSEAS

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**A Historiography of Morphological Approaches of the Grid and
Dutch Town planning**

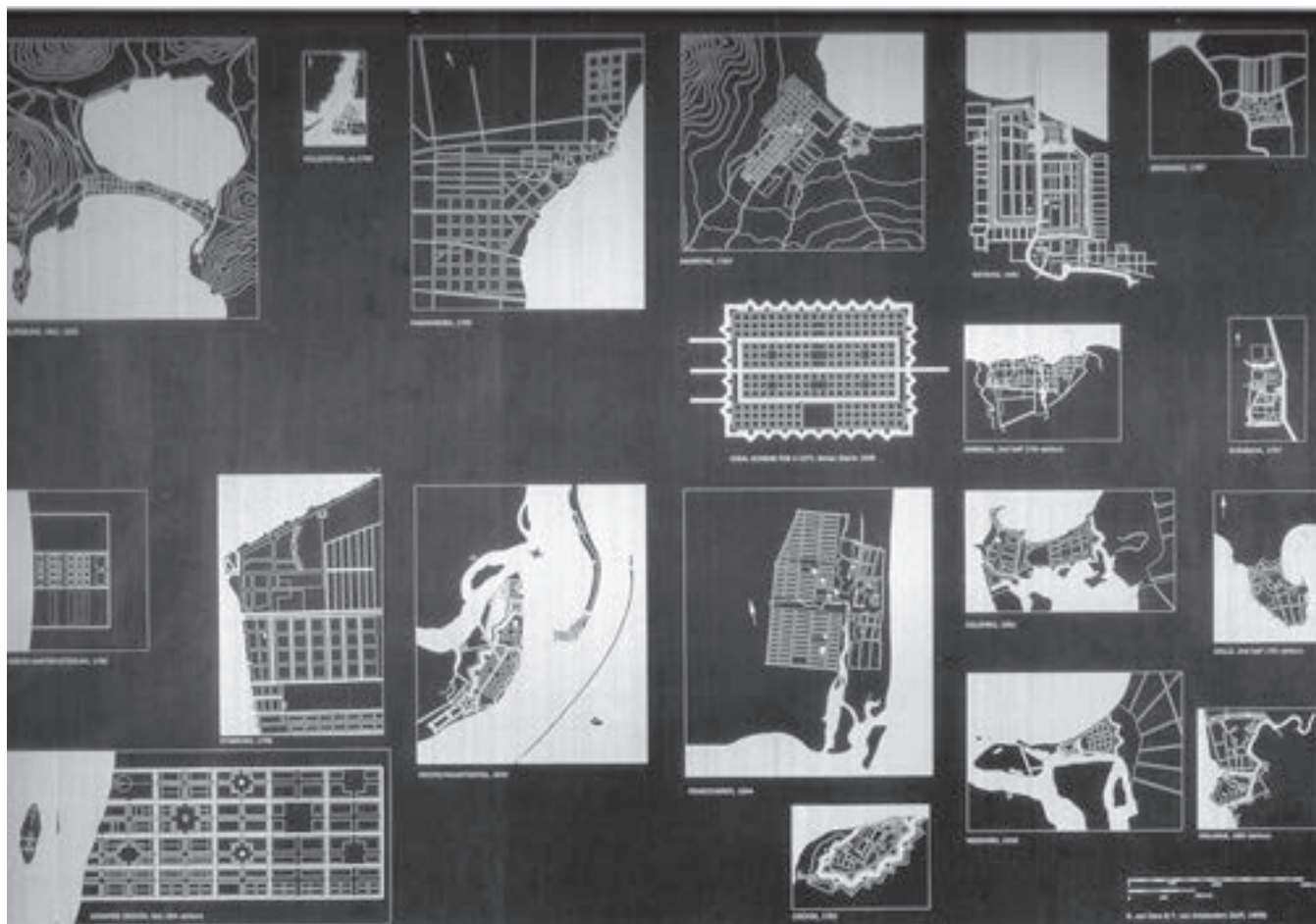
The grid is probably the most recurrent settlement form in historical morphological studies standing in a late nineteenth century tradition, such as in the works of Sitte and Stübgen. All sorts of expressions of existing and non existing settlement forms: cities, colonial towns, fortress towns, military camps, and divisions of land were reduced to their grid form to enable comparison. This risk of reductionism is also apparent in historical studies that include Dutch town planning. Dutch examples figured in such morphological approaches in Lavedan's *Histoire de l'urbanisme* (1941) until long after the World War in Gutkind's series *International History of City Development* (1964–72).¹ In the sixties and seventies of the twentieth century this formal approach was challenged. Taverne in his *In 't land van Belofte: in de nieuwe stad* (1978) refuted the myth of a singular design for a canal plan of Amsterdam by introducing political, economical, social and military-technical factors that conditioned processes of Dutch town planning in the sixteenth and seventeenth centuries.² Moreover, inspired by Eimer's study on Swedish town planning in the Early Modern Period, he explored descriptions and visualizations of the ideal city to explain characteristics of Dutch new towns and urban extensions.³ Similar to Eimer, Taverne used the writings of Simon Stevin on architecture and town planning to link the practice of the layout of new towns and city extensions in these Northern European countries with the concept of "la città ideale" of the Italian renaissance. This genuine attempt to go beyond formalism by combining political and economical factors with intellectual history was successful only to certain extent. As the title "the ideal of the right line" of the first part of his book suggests, also Taverne could not completely escape from this formalism. Fortresses, new towns, city extensions towns were all compared with each other at the basis of geometrical form and formulations about symmetry described in the education material of the seventeenth century Dutch training school for engineers, The Duytsche Mathematique, and legitimized by the writings and visualizations of Simon Stevin. Taverne's work remained very influential for historical studies of Dutch town planning in the Early Modern Period. That is hardly surprising given its for that time exceptional heuristic approach, albeit that his reading of seventeenth town planning practice in the Low Countries as partial or unsuccessful realizations of the concept of the ideal city was criticized.⁴ The combination of the morphological

¹ For an historiographical analysis of morphological studies and the concept of the ideal city in Dutch town planning and fortification see, C. van den Heuvel, "Papiere Bolwercken". *De introductie van de Italiaanse stede- en vestingbouw in de Nederlanden (1540–1609) en het gebruik van tekeningen*, (PhD, University of Groningen) (Alphen aan den Rijn 1991), pp. 4–6 and 14–20.

² E. Taverne, *In 't land van belofte: in de nieuwe stad. Ideaal en werkelijkheid van de stadsuitleg in de Republiek 1580–1680*, (Maarssen 1978).

³ G. Eimer, *Die Stadtplanung im Schwedischen Ostseereich 1600–1715. Mit Beiträgen zur Geschichte der Idealstadt*, (Stockholm 1967).

⁴ B. Kempers and K.. Schmidt, 'In 't land van belofte: kunstgeschiedenis en sociologie', *Amsterdams sociologisch tijdschrift* 1979/80, nr 2, pp. 340–352. C. van den Heuvel, *o.c.*, 1991, pp. 19–20.



1. Morphological comparison of Stevin's city with Dutch colonial Cities. (Zutphen, ©Wallburg Press).

approach and Stevin's writings and visualizations returned in the studies of Van der Hoeven and Louwe who compared Stevin's "ideal merchant city", with Specklin's "ideal fortress city" and the canal plan of the Amsterdam.⁵ The latter inspired Ron van Oers in his PhD on *Dutch Town Planning Overseas during VOC and WIC Rule (1600–1800)* of 2000.⁶

Several authors claimed that Stevin was responsible for the layout for the urban pattern of the Dutch colonial town of Batavia.⁷ However, the only known reference to Stevin's involvement in Batavia concerns his designs for its castle. Stevin's plan for the town was not used. Therefore it is quite challenging that Van Oers generalizes the layout of Dutch colonial cities by linking them all to Stevin's writings and visualizations of town planning (see Fig. 1).⁸

⁵ C. van der Hoeven and J. Louwe, *Amsterdam als stedelijk bouwwerk. Een morfologische analyse*, (Amsterdam 1985).

⁶ R. van Oers, *Dutch Town Planning Overseas during VOC and WIC Rule (1600–1800)*, (Zutphen 2000).

⁷ B. Brommer, 'Oud Batavia gecarteerd. De eerste grote stadplattegronden in de 17de eeuw', in: H. M. van den Berg (ed.), *De stenen droom. Opstellen over bouwkunst en monumentenzorg opgedragen aan Coenraad Liebrecht Temminck Groll*, (Zutphen 1988), pp. 86–93 and B. Brommer, *Historische stadplattegronden van*

Nederlandse steden 4, Batavia [m.m.v. Dirk de Vries], (Alphen aan den Rijn 1992). For a critical note on this interpretation: R. Raben, 'Klein Holland in Azië. Ideologie en pragmatisme in de Nederlandse koloniale stedenbouw, 1600–1800', *Leidschrift, Historisch Tijdschrift (De vierde dimensie. Stedenbouw in historisch perspectief)*, (1992/93), no. 2, p. 48 and note 12. K. Zandvliet, 'Historische plattegronden van Nederlandse steden, vol. 4, Batavia' [review], *Caert Thresoor*, 1994, no. 4, pp. 116–117.

⁸ R. van Oers, *o.c.*, 2000.

One of the three major hypotheses of Van Oers in his PhD is that :”Simon Stevin had a profound influence on the design and planning of overseas settlements.”⁹ Van Oers bases this claim on an indirect influence of the dissemination of his ideas “through his numerous pupils and followers” and states that they were “conveyed in print.”¹⁰ This statement needs some reconsideration. Although Stevin formulated the curriculum of the *Duytsche Mathematique* there is no evidence that he was teaching at this practical crash course for engineers. In fact, this seems very unlikely given Stevin’s position of private tutor of Prince Maurice. Although Stevin’s writings certainly circulated in manuscript form in influential circles in and around the court of Prince Maurice, the text on town planning and the illustrations did not see the light in printed form before 1649, when it was published by Hendrick Stevin in his *Materiae Politicae*.¹¹ This is not only rather late to explain an impact of Stevin ideas “in print”, but even from the moment of publication, the text and figures were not just available to every engineer overseas.

Moreover, also from a methodological point of view one can question whether an illustration in a book on architecture and town planning and representations of settlements overseas from various countries and maps of overseas settlements, made for various purposes and with different levels of accuracy are just interchangeable to explain “the design” of the colonial city.

Finally it is important not to lose sight of the original context in which Stevin wrote his texts on town planning and architecture. During my reconstruction of Simon Stevin’s *The Huysbou*, it became clear to me that the texts on town planning and architecture must be read within his role of private tutor to Prince Maurice. For instance, Stevin did not try to integrate military functions, as described in his work on fortification, *De Sterctenbouwing* (1594), with civil functions in his town plan. Also within the *Huysbou* not all variants of square and rectangular building blocks that Stevin presented to optimize the lightning of the inner courts for houses would fit in the grid of his urban plan presented in the chapter *Van de oirdeningh der steden*. Stevin’s plans have a didactic function, rather than offering formulas for an ideal town in which ideal public facilities and ideal private houses are fully integrated. They were intended to illustrate systematically certain problems of architecture and town planning to Maurice step by step. Logical and lucid models were for Stevin a more appropriate means of achieving that goal than a complete reproduction of reality which, with all its contradictions, might obscure the problem, or in his own words, “because the teaching should not be complicated by arguments”.¹² In short, Stevin discusses fortifications, than houses, than the grid with its public building as separate layers. Such a multilayered approach is also followed in the morphological interpretations of Stevin’s work by Van der Hoeven & Louwe (1985) and Van Oers (2000). However, for Stevin these layers did not necessarily fit, as long each layer separately was the best representation to illustrate a certain problem or solution.

Since Stevin is so explicit about his didactical, instructional reasons, I have emphasized these in my reconstruction of the *Huysbou* to explain why his various grids did not always correspond with each other. However, perhaps there is more to Stevin’s multi layered grids. Perhaps they can be seen as representative for Dutch planning practises but in a different way than described in the above mentioned morphological studies. Therefore Stevin’s city will here not be read as a blue print design model to be implemented, but as kind of contemporary codification of methods which are also reflected in other theories and practices

⁹ Ibid., p. 166.

¹⁰ Ibid., p. 167.

¹¹ C. van den Heuvel, “‘Wisconstighe Ghedachtenisen”, Maurits over de kunsten en wetenschappen in het werk van Simon Stevin”, in: K. Zandvliet (ed.), *Maurits. Prins van Oranje*, (Amsterdam/Zwolle 2000),

pp. 106–21 and C. van den Heuvel, ‘*De Huysbou*’, *A reconstruction of an unfinished treatise on architecture, town planning and civil engineering by Simon Stevin, History of science and scholarship in the Netherlands volume 7* (Amsterdam 2005).

¹² C. van den Heuvel, o.c., 2005 , p. 68.

of land use that together might lead to a better understanding of the Dutch grid. Later the impact of the various layers for the layout of Dutch colonial cities will be explained in more detail. However, first their main characteristics will be explored.

Remco Raben explained that Dutch overseas settlements cannot be explained in the same way as the colonial cities laid out by the Spanish Empire according to the strict guidelines of the famous *Ordenanzas* stipulated by the administration of Philip II.¹³ The instruction given to Crijn Fredricksz. Van Lobberecht by the West India Company used in setting up the trading post of New Amsterdam, nowadays New York, reveals a less detailed approach resulting in an abstract scheme.¹⁴ Given the mercantile character of the Dutch expansion the Dutch overseas settlements was foremost a trading post, reinforced by a fort if necessary. Only in those places where special jurisdiction allowed for the housing of Dutch free-burghers (that is non-personnel members of the East or West India Company) the trading posts settlements could develop into urban settlements next to the forts. The layout of these settlements followed a more pragmatic pattern with the following more or less generic features¹⁵:

1. All cities are situated at a river mouth or bay.
2. Political, military and economical power is situated in a quadrangular or pentagonal castle or fort
3. The town, with or without walls, was separated from the fort by an open space (esplanade)
4. The settlements have an oblong form with a main street or main canal in the length
5. Towns are planned and separated from unplanned areas or extensions.
6. Rectangular, but not necessarily regular. Flexibility and no wish for completion in a detailed way.
7. Often irregular and narrow building lots, compared to those in the Republic.

This mapping of general features of Dutch overseas settlements still does not explain, why these differ from for instance Portuguese or Spanish colonial cities. Remco Raben mentioned correctly the lack of rules superimposed by a central authority and the lack of incitement for completion.¹⁶ The planning of the Dutch colonial grid was indeed characterized by flexibility and temporality. It will be argued that these characteristics are deeply embedded in Dutch planning culture and that grids can be seen, as hybrid expressions of planned, but negotiated spaces. After explaining the historical polder model as a metaphor of the “planned-negotiated space”, some historical layers of grids will be discussed for a better understanding of Dutch town planning in the Low Countries and overseas.

Flexibility, temporality and the constant factor of water

The Dutch Republic lacked a strong central government and depended strongly on the consensus of various administrative institutions. Military decisions needed the approval of the States General and Provinces; Dutch cities, especially harbour cities became more and more powerful and could not be ignored for their financial support. Moreover, there

¹³ R. Raben, *l.c.*, 1993, p. 46. See further, K. Zandvliet, *Mapping for Money. Maps, plans and topographic paintings and their role in Dutch overseas expansion during the 16th and 17th centuries*. (PhD Leiden University), (Amsterdam 1998).

¹⁴ F. C. Wieder, ‘De Stichting New York in juli 1625: Reconstructies en nieuwe gegevens ontleend aan de

Van Rapparddocumenten’, *Linschoten Vereeniging* 26, The Hague (1925), plate 26, pp. 152–153. F. Westra, ‘Lost and Found: Crijn Fredericx-A New York’, *De Halve Maen*, LXXI, 1998, pp. 7–16. See further, the contribution by Christopher Heuer in this book.

¹⁵ R. Raben, *l.c.*, 1993, p. 54.

¹⁶ R. Raben, *l.c.*, 1993, p. 47 and pp. 57–59.

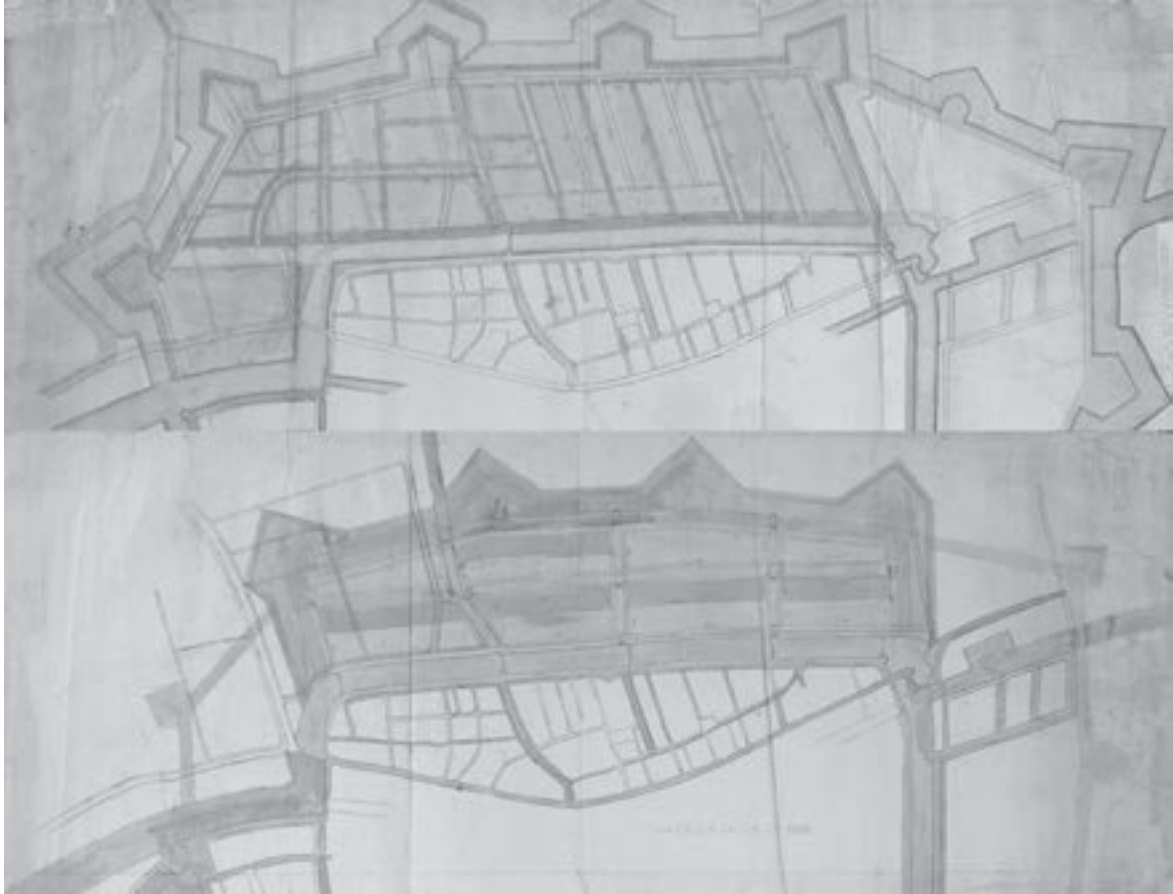
were the “hoogheemraadschappen” and “waterschappen” to reckon with. These collective water administration boards were since the Middle Ages in charge of the regulation of the water household in the Low Countries. Especially water management required both control and space for negotiation. For instance in a period of wartime a decision on inundation had not only military consequences, but also financial implications for the cities that became isolated from supply and market. Each party had to find each other's support and sometimes set mutual differences (temporarily) apart. Therefore the involved administrations had to negotiate and to work together in ad hoc situations at the basis of flexible and often temporal agreements. Also the creation of new land in time of peace by huge land drainage projects, in so-called polders involved lengthy negotiations. The “Dutch polder model” is nowadays still used in a metaphorical sense to describe the consensus building in decision making in political and economic affairs. This process of consensus building is also reflected in the history of urban planning. The “canal plan” of Amsterdam is a patchwork of various grids that in some cases followed the narrow agricultural land divisions between the ditches outside the city walls, (visible for instance in the oblong, narrow lots of the Jordaan area), and in other cases ignored the existing structure to allow the layout of large, more regular rectangular building blocks to accommodate the princely houses of potentially wealthy investors (the successive extensions in the canals zone of the Heren-, Keizers-, and Prinsengracht). This patchwork resulting from successive urban extensions, reflects to a certain extent changes in power from time to time. In other places with even more limited space for urban growth urban extensions were far more depending on a more implicit consensus building. The process of negotiation leading to that consensus can often only be retraced by comparing the various design variants for a specific area before the final implementation. A good example is the urban extension of the city of Leiden of 1611, where the university as land owner, the city of Leiden and the water management boards had to come to an agreement on the compensation for lost properties, the creation of suitable building block for investment of future house owners and the discharge of water polluted by urine and other solutions used in the dying of textiles. The grid pattern of the extension, as in several other Dutch cities of that period, seems at first sight an implementation of a blue print model of a grid convenient for housing. However, the various designs of the land surveyor Jan Pietersz. Dou commissioned by the city of Leiden reveal that sometimes the water system of the surrounding polders were followed and in other cases various solutions for a parcelling in rectangular building blocks were proposed, before an adapted form of a grid was accepted (see Fig. 2).¹⁷ A comparative computer-analysis of the accuracy of the various parts in these drawings of fortifications, building block and water ways made clear that Dou re-used his designs and continuously changed the sizes and forms of the defence works and the building blocks for housing, but that the waterways remained a constant factor (see Fig. 3).¹⁸

These continuous processes of negotiating various possible grids for housing and other urban functions and their adjustment to water infrastructures stand in a long historical tradition. Here below some historical layers of non-urban grids in practice and theory are discussed. This is followed by an exploration of the impact of the flexibility and temporality of these non-urban grids on town planning in the Low Countries and overseas.

¹⁷ Leiden Regional Center, PV 330.1 and 330.2.

¹⁸ J. Benavides and C. van den Heuvel, ‘The function and accuracy of old Dutch urban designs and maps. A computer assisted analysis of the extension of Leiden

(1611)’, in: *Digital Humanities 2008 Conference Book of Abstracts*, University of Oulu, 24–29 June 2008, pp. 55–57



2. J. P. Dou. Designs for extension of Leiden of 1611.

Historical Layers of Grids

Land reclaim: polders and divisions of natural accretion

To get a better understanding of the layout of Dutch settlements overseas formal aspects of “inland colonialization” need to be analyzed in more detail. Above administrative aspects of the polder model were discussed. Here the focus is on the development of various grids within the polder of De Beemster. Furthermore another form of land reclaim will be analysed, that is dealing with the mud flats outside the dikes.

Hendrick Stevin, son of Simon describes in 1667 in his *Wisconstich Filosofisch Bedryf* (Mathematical-Philosophical Activity) the first plan to reclaim the Zuyderzee as land by connecting the Wadden Islands with dikes.¹⁹ His motives were the creation of fertile land to provide the city of Amsterdam with sufficient food also in times of wars and to create a pleasant area to live avoiding the pollution of the city. It was impossible at that time to drain the Zuyderzee, since it was not before the nineteenth century with the invention of the steam pumping engine that projects of that scale could be executed. And it was not before the 1930-s that the Zuyderzee was turned into a large inland lake the IJsselmeer, and that successively

¹⁹ W.H. van Zutphen, ‘Hendrick Stevin’, *Historia* 10 (1944) pp. 55–60 and ‘Hendric Stevin als Zuiderzeepionier’, *Historia* 11 (1946), pp. 16–23.



3. J. Benavides. Computer assisted analysis of drawings for extension of Leiden.

large polder areas could be created in the second half of the twentieth century. However, from the sixteenth century vast areas of Holland were reclaimed for similar reasons.

The Beemster on the World Heritage List of Unesco is probably the most famous Dutch polder of the seventeenth century. The initiative to make the Beemster dry came from Dirk van Oss, one of the governors/trustees of the East India Company, who founded on 14 April 1607: “de compagnie der bedijkers van de Beemster”.²⁰ This Company of Dikers of the Beemster consisted of fifteen wealthy investors, foremost burgher masters, aldermen of Amsterdam or other Dutch Cities that often and the same time were shareholders of the West and East Dutch India Companies. The company received the patent to reclaim and to develop the Beemster on the 21st of May 1607 and started with the construction of the dikes and the drainage. In the same year they commissioned the sworn land surveyor Pieter Cornelisz Cort of Alkmaar to measure and map the area of the lake and the properties of its surroundings. This was followed by negotiations with the chief land owners and resulted between 1608 and 1612 in more detailed designs for the parcellation by the land surveyor

²⁰ C. van den Heuvel, ‘Nieuwe steden, stadsuitbreidingen en de inrichting van het platteland’, in: K. Bosma, A Mekking, K. Ottenheym and A. van der Woud (eds.),

Bouwen in Nederland 600–2000, (Amsterdam/Zwolle 2007), pp. 294–95.



4. J. Switzer, Manuscript map of the Beemster, 1769.

Lucas Jansz Sinck of the area for future landowners.²¹ The lots were allocated to the buyers that had subscribed in a lottery in the same year. The final grid consisted of 10 roads and 8 ditches intersecting at distances of 250 Rhineland rods, approximately 938 meters, resulting in blocks with a surface of 100 “morgen.” Each block was subdivided in five oblong lots of 50 by 250 Rhineland rods; each lot of 20 morgen was adjoining a street in the front and a ditch in the back. The so-called Middenweg, the central road divided the Beemster in two parts. On the intersections at the borders of and between the six central squares of main grid, with sides of 500 Rhineland rods (1872 by 1872 meters) were in total 13 open spaces. Eight of those space were allocated for markets, the remaining five for villages. In the center of this main grid, the designers planned the village Midden Beemster. At the irregular borders of the polder the widths of the lots were just adjusted in a flexible way to allow for the standard size of lots of 20 morgen (see Fig. 4).²²

Not the whole polder would be developed according to the initial plan. Eight of the thirteen open spaces were not filled in and the heirs of the Beemster Company and other rich merchants investors of Amsterdam created over fifty estates with large houses and gardens

²¹ Although this description reveals that the creation of the Beemster was a gradual process for which many successive designs were created, also this grid has been explained from the concept of the ideal city, with references to Palladio and Scamozzi. See for instance, P. de Zeeuw et al., ‘De Beemster. Een arena van natuur,

kunst en techniek’, in: T. Lauwen (ed.), *Nederland als kunstwerk. Vijf eeuwen bouwen door ingenieurs*, (Rotterdam 1995), pp. 154–67, esp., pp. 157–61.

²² The Hague, National Archives, 4.VTH – 2601A: Jan Switzer, Manuscript map of De Beemster (1769).

to escape the pollution of the growing metropolis. Although there were regulations about the alignments of the building lots, the grid system allowed for some sort of flexibility and variety resulting in a hierarchy of grids.

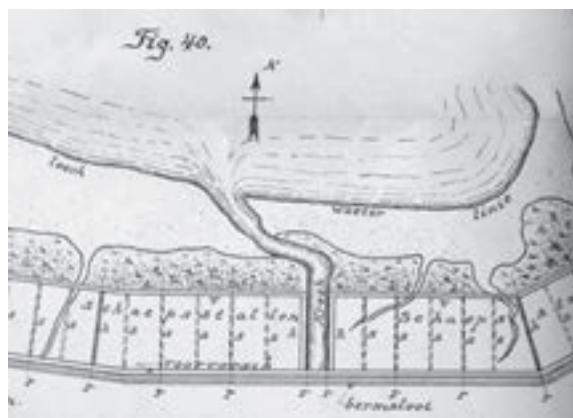
Different from the land reclaim to create polders, such as the Beemster, the land accretion of mud flats was a natural process, albeit that nature was often helped a hand by man-made structures to hold sand. Despite the more natural character of this form of land reclaim the cultivation of these new grounds areas was hardly less regulated. Negotiations between landowners and tenant farmers did not only result in agreements on existing lease hold properties, but also regulated the possible future increase of land outside the dikes. From the *Tractaet van Dyckagie* (Treatise of Diking) written between 1576 and 1579 by the civil engineer Andries Vierlingh, appointed by Jan the Elder of Nassau in 1537 as bailiff of Steenberghe belonging to the Nassau domains, it becomes clear that these regulations also contained stipulations about the layout of land in grid like patterns for private and common use (see Fig. 5).²³

At the beginning of the seventeenth century Simon Stevin explained his intention to include a section on natural aspects of land accretion in a chapter entitled “Eertclootschrift” on geography a part of his *Wisconstighe Ghedachtenissen* (Mathematical Memoirs) and on man-made aspects of land reclaim in his treatise on town planning and architecture, the *Huysbou*.²⁴ This part of the *Huysbou* remained unfinished and only exists in fragment of manuscripts. However, in the chapter of the *Huysbou* related to town planning Stevin includes a related topic, in which he explicitly refers to the selection of sites in “newly discovered lands”.²⁵ Herein, Stevin argues that that one should look for fertile land at the mouth of a great navigable river, preferably coming from different countries, to create good opportunities of two way traffic overseas and inland. The statement is of interest for the above mentioned selection of sites on river mouths and bays as one of the characteristics of Dutch settlements overseas.

When discussing the inland colonization in the form of polders the overlap in the networks of investors between trustees of the East and West India Companies and City Magistrates was mentioned. Moreover we mentioned its implications for the grid of the polder. Also the land accretions were structured in grid patterns once they were diked.

Urban settlements in the form of grids were created to consolidate these new areas.

The combination of such historical layers of grids and their possible impact on Dutch overseas settlements will be discussed at the end of this chapter. However, first practical methods that reveal the application of multilayered grids in temporal settlements will be analyzed.

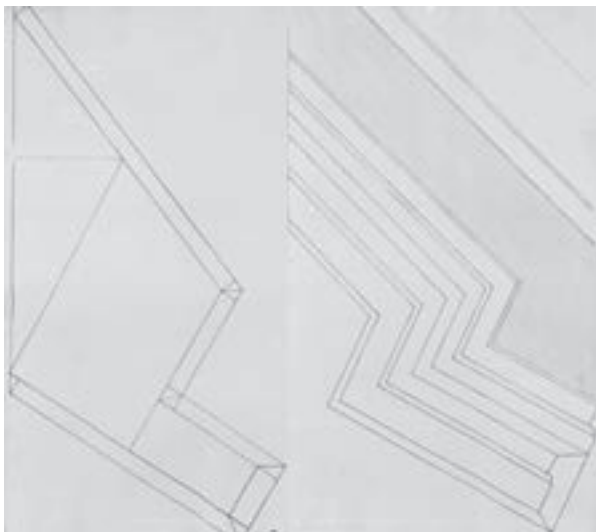


5. A. Vierlingh *Tractaet van Dyckagie*, (c. 1576–79) fig. nr. 40 detail. Grid in land accretion.

²³ Andries Vierlingh, *Tractaet van Dyckagie*, (ed. J. de Hull and A. G. Verhoeven), (R.P.G., Kleine Serie no. 20 and no 20A), The Hague, 1920. Image in volume 20A is an early 20 century copy of original in Vierling's manuscript.

²⁴ C. van den Heuvel, *o.c.*, 2005, p. 79–85.

²⁵ *Ibid*, p. 351.



6. F. van Schooten, Educational material *Duytsche Mathematique*. Leiden University Library, BPL 1013 fols. 219v– 220r.

Nor in the program of Stevin, nor in all the teaching material and notes of students kept in the Leiden University Library there is a reference to, or an image of a city that shows more than the fortification perimeter. In his younger years Prince Maurice had received lessons on warfare by Justus Lipsius and Josephus Scaliger. However, these lessons had been very theoretical, with much emphasis of philological and historical aspects.²⁶ The war against the Spanish with many movements required a different approach that perhaps responded less to the rules of the art of fortification, but that at least resulted in quick and cheap defense constructions. In short it required practical, the most essential knowledge of attack and defense in the field. For that reason, Prince Maurice had invited Simon Stevin in the year 1600 to write a training course in arithmetic, practical geometry and land surveying where students were not to be taught in Latin, but in Dutch and: “only so much as is needed directly for an engineer in general”.²⁷ The students followed the lessons in the buildings of the University of Leiden (in a room under the library) but it was a separate course and made no part of the official curriculum of Leiden University. The training consisted of a selection of Euclid’s *Elements*, basic constructions with ruler and compass, transformations of figures, trigonometry as applied to the “practice of surveying”, the geometry of solids (to calculate volumes of walls and other fortification elements) and finally a section about the art of fortification. Besides learning the correct terms, the training in fortification consisted of very practical exercises to set out with stakes a line drawing in the terrain and to measure and map regular and irregular lots and defence works on paper (see Fig. 6).²⁸

Practical land-surveying techniques and Dynamic Army camps

The administrators that were responsible for the layout of settlements overseas did not work with a fixed model. The training of practical land-surveying techniques and the codification of practises in the layout of temporarily army camps are far more important for urban plans overseas.

Duytsche Mathematique: land surveying and fortification in practice

Above we put Stevin’s role in the *Duytsche Mathematique* into perspective. A second more important myth around the *Duytsche Mathematique* to correct is that it was a training school for urban planning.

²⁶ Maurits expresses in a letter of 29 August 1584 Lipsius his regret not be able anymore to follow lessons after the death of his father William of Orange. J. De Landtsheer, *Lieveling van de Latijnse taal. Justus Lipsius herdacht bij zijn vierhonderdste sterfdag*. [red. André Bouwman and Anton van der Lem] Catalogue Universiteitsbibliotheek Leiden, (Leiden 2006), p. 64.

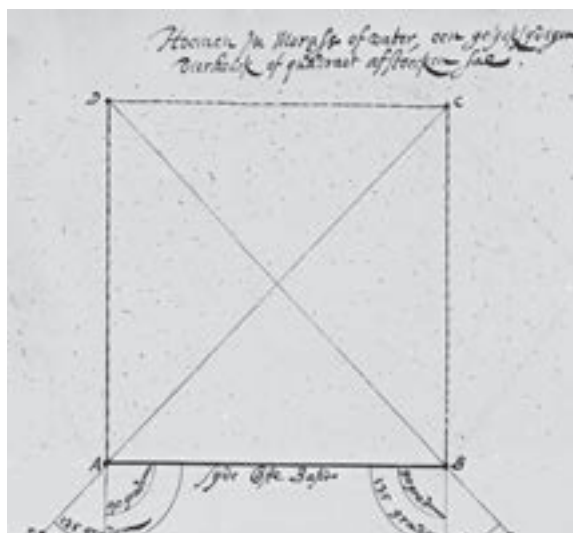
²⁷ For the *Duytsche Mathematique* in general: J.A. van Maanen, *Facets of seventeenth century mathematics in the Netherlands*, (Utrecht 1987); P. J. van Winter, *Hoger beroepsonderwijs avant-la-lettre: Bemoeiingen*

met de vorming van landmeters en ingenieurs bij de Nederlandse universiteiten van de 17^e en 18^e eeuw, (Amsterdam, Oxford, New York 1988), pp. 14–36; C. van den Heuvel, ‘Le traité incomplet de l’Art Militaire et l’instruction pour une école des ingénieurs de Simon Stevin’, in: *Simon Stevin (1548–1620) L’emergence de la nouvelle science*, (exh. catalogue, Bibliothèque Royale Albert I, Brussels, 17-09-2004/30-10-2004), (Brussels 2004), pp. 109–13.

²⁸ C. van den Heuvel, ‘Les ingénieurs dans la boue. Adapter les styles internationaux aux pratiques

Several examples deal with specific terrain conditions of the Low Countries, such as how to lay out a quadrangular fort in marshy land (see Fig. 7).

It was this sort of practical knowledge that became very useful for the lay-out of settlements overseas as well, that, as we already noticed, for the greater part were realized at the mouthings of rivers, in river deltas and in coastal areas with similar conditions. Furthermore, the training material included practical exercises for making estimates of the materials and labor needed to build fortifications. The manuscripts of the Van Schooten family who were for almost half a century in charge of the training school hardly contain text. Most emphasis is on the methods of representing ramparts and bastions step by step from line drawings to three-dimensional profiles on paper or as model. The training in the winter was indoors. However, in the summers the aspirant engineers exercised in the field by setting out regular and irregular figures in the land, by constructing earthen models of bastions, but also made excursions to warfare in practice, observing sieges and army camps. The *Duytsche Mathematique* did not provide an extensive theoretical background. The many foreigners from Scandinavian and east European countries that attended the training school also were not handed models of the shelf for implementation. What they foremost learned was practical methods for measuring, calculating, mapping and drawing fortifications and terrains for application under various circumstances. This might explain the great variety in grid patterns in urban and new town in Scandinavian and the Baltic countries that were inspired by the “Dutch system.”²⁹



7. F. van Schooten, Educational material *Duytsche Mathematique*. Leiden University Library, BPL 1013-fol. 255r.

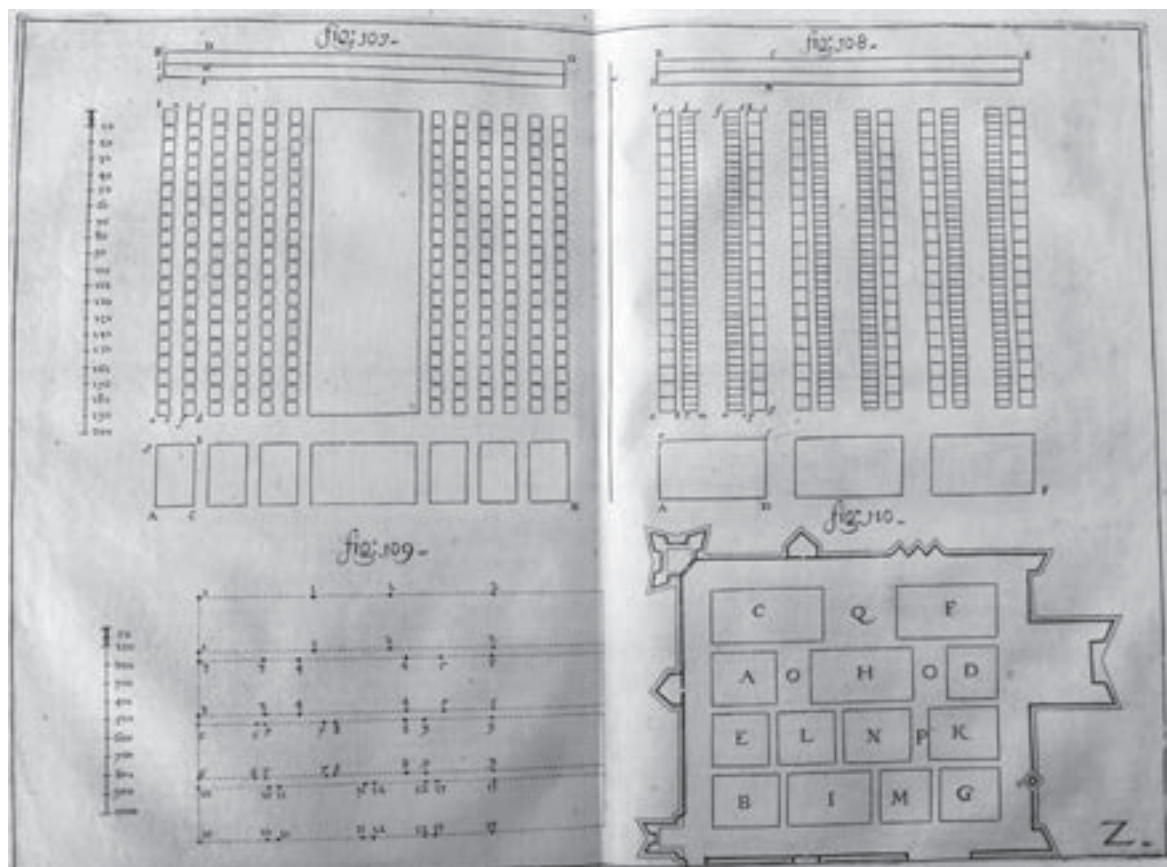
Army Camps: flexibility and temporality in design

Above we already questioned the impact of Stevin's writings on architecture on town planning on the design and planning of overseas settlement. Here, we argue that Stevin's text on military camps, the *Castrametatio*, *Dat is Legermeting*, published during his lifetime in 1617 and translated directly in various languages has been far more influential in a wider circle. Stevin was not only the private tutor of Prince Maurice, but also quarter master of his army. In short Stevin made not only part of the court of Prince Maurice in The Hague but also accompanied him on his many military campaigns. Stevin would combine the *Castrametatio*, as one of the military arts that stood in a long philological tradition going back to Antiquity, with practical experiences of the layout of army

néerlandaises en matière de fortifications', in: *Vauban, bâtisseur du Roi-Soleil. Fortifications, urbanisme, architecture*, (Paris 2007), pp. 42–47.

²⁹ N. Ahlberg, *Stadtsgrundningar och planförändringar. Svensk stadsplanering 1521–1721*, (Acta Universitatis

Agriculturae Suerciae Agriaria 2005: 94), (Doctoral thesis Swedish University of Agricultural Sciences), (Uppsala 2005) and further his chapter in this book.



8. A. Freitag, *Architectura Militaris Nova et Aucta*. (Leiden 1635): Temporary and semi-permanent army camps.

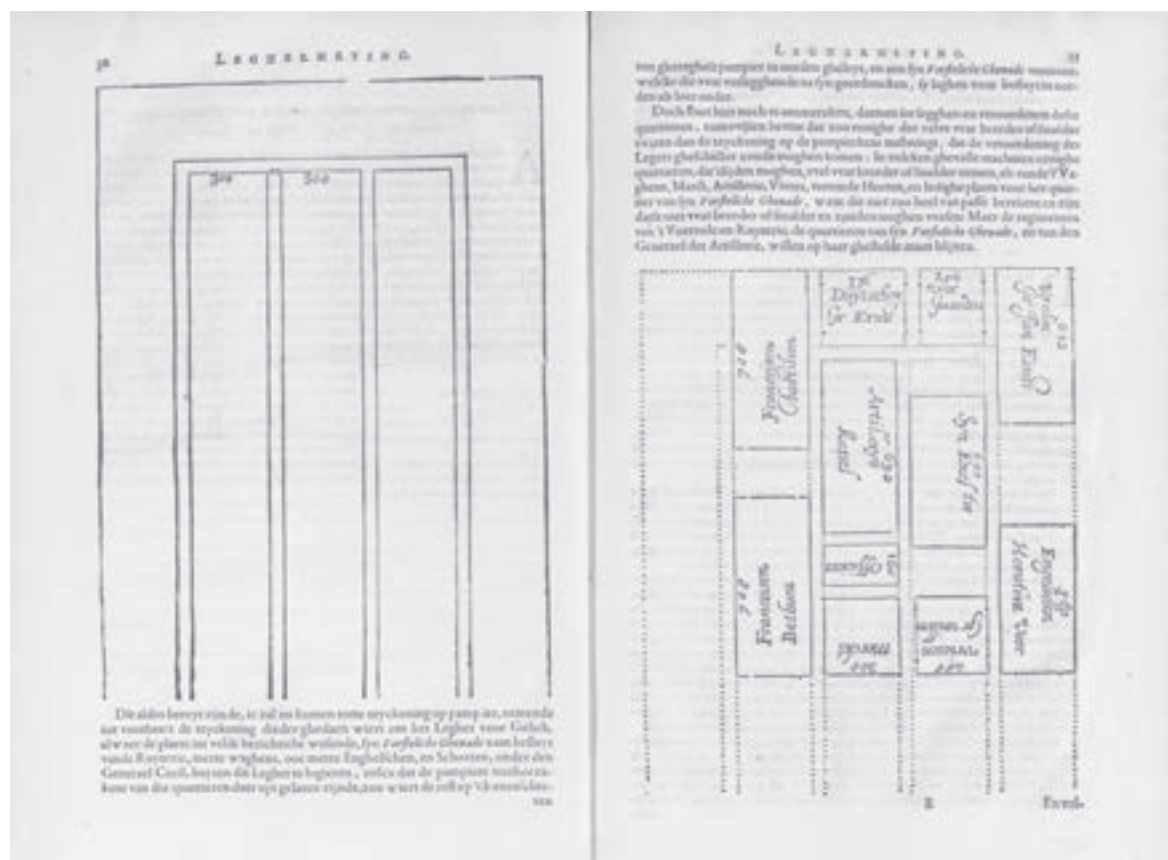
camps during his various military campaigns.³⁰ Stevin's work influenced other writers on army camps, such as the Polish engineer Adam Freitag, who with his various editions of the *Architectura Militaris* disseminated this more practical approach all over Europe.

The *Castrametatio. Dat is Legermeting* reveals a flexibility and temporality in design methods, that is far more important for an understanding of the lay-out of settlements overseas than Stevin's views of the ideal city. We already noticed that the settlements overseas at the beginning very often were just forts protecting trade that only in some places developed eventually into urban structures. This notion of growth and temporality is visible in the work of Adam Freitag, who makes in his treatise a distinction between temporary camps for the night, camps for a longer stays at a distance of the enemy and camps to besiege the enemy, which could get the character and scale of a town (see Fig. 8).³¹

Although these constructions were temporal, they were codified in paintings and in especially in print. However, it is not only this notion of temporality and growth, but also the description of the use of grids that makes it worthwhile to analyze these studies

³⁰ S. Boffa, 'Le plan idéal d'un campement militaire selon la Castrametatio de Simon Stevin 1617', in: *Simon Stevin (1548-1620) L'émergence de la nouvelle science*, (exh. catalogue Bibliothèque Royale Albert I, Brussels) (Brussels 2004), pp. 114–21.

³¹ A. Freitag, *Architectura militaris nova et aucta* [...], (Leiden 1635), p. 130



9. S. Stevin, *Castrametatio. Dat is Legermeting*, (Rotterdam 1617): Design method for army camps.

in relation to urban settlements overseas. Stevin and Freitag describe the lay out army camps as a process in which two grids are used on top of each other. First a general outline is drawn on paper and then the various military quarters are cut out on card pieces and moved over this grid to find in a process of trial and error the most practical solution (see Fig. 9).

However, this flexible method does not imply an unstructured planning, with no hierarchy. The point of departure is the location of the governor or military leader and those of the most important guests around him. Once they are positioned, the other officials and the army itself had to be fit in by moving the other pieces. This layout starting with the housing of the governor or military leaders is comparable to the way grids of urban settlements overseas followed the location of the site of the fort.

Bringing it all together: experiments with multilayered grids

Various traditions of the grid in the Low Countries were discussed: the hierarchy in the grid patterns of polders, the various grids of land reclaim outside dikes, the practical methods for the land surveying, mapping and drawing land taught at the Duytsche Mathematique and finally the use of multilayered grids and aspects of temporality in the lay-out of army camps. We end with laboratories of urban planning, in which various traditions of historical grids were coming together. The extension of the city of Antwerp the “Nieustadt” or some of the plans for the reuse of the Esplanade and the former citadel might be seen as sixteenth century experiments with grids in a urban laboratory setting.³² Here, a well known experiment of regular



10. J. Symonsz. Manuscript map of the polder of Ruigenhil of 1564.



11. S. Damass van Dueren, Manuscript map of Willemstad 6 January 1586.

planning in the Netherlands will be revisited, the fortress city of Willemstad.³³ This fortified settlement has often been discussed as a new town or even ideal city, but in reality stands in a long tradition and was developed over time.³⁴ Willemstad was a new name for an existing settlement called Ruigenhil, similar to the name of the polder in which it was situated. Shortly after the polder was created in 1564 the landsurveyor J. Symonsz mapped the area (see Fig. 10).³⁵

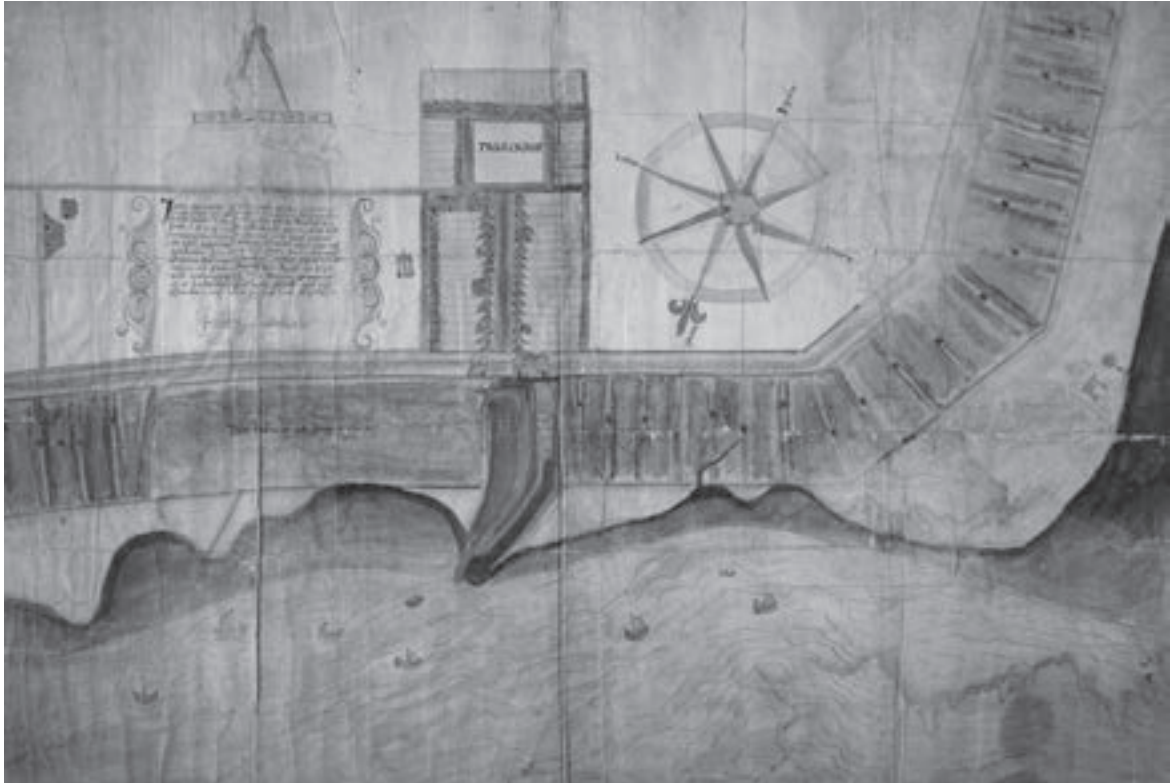
³² C. van den Heuvel, 'Cutting and Pasting Fortifications. Vredeman de Vries and the plans for the insertion of the partial dismantled citadel of Antwerp', in: P. Lombaerde [ed.], *Hans Vredeman de Vries and the Artes Mechanicae revisited*, [Architectura Moderna 3] (Turnhout 2005), pp. 83–99.

³³ T. Lauwen, 'De vesting Willemstad als rationeel stadsonwerp', in: T. Lauwen (ed.), *Nederland als kunstwerk. Vijf eeuwen bouwen door ingenieurs*, (Rotterdam 1995), pp. 25–30. C. van den Heuvel, 'Willemstad (werkboekheid 1) Tekst en suggesties voor opdrachten', in: *Werkboek bij cursus Stedebouw. De geschiedenis van de stad in de Nederlanden van 1500 tot beden*,

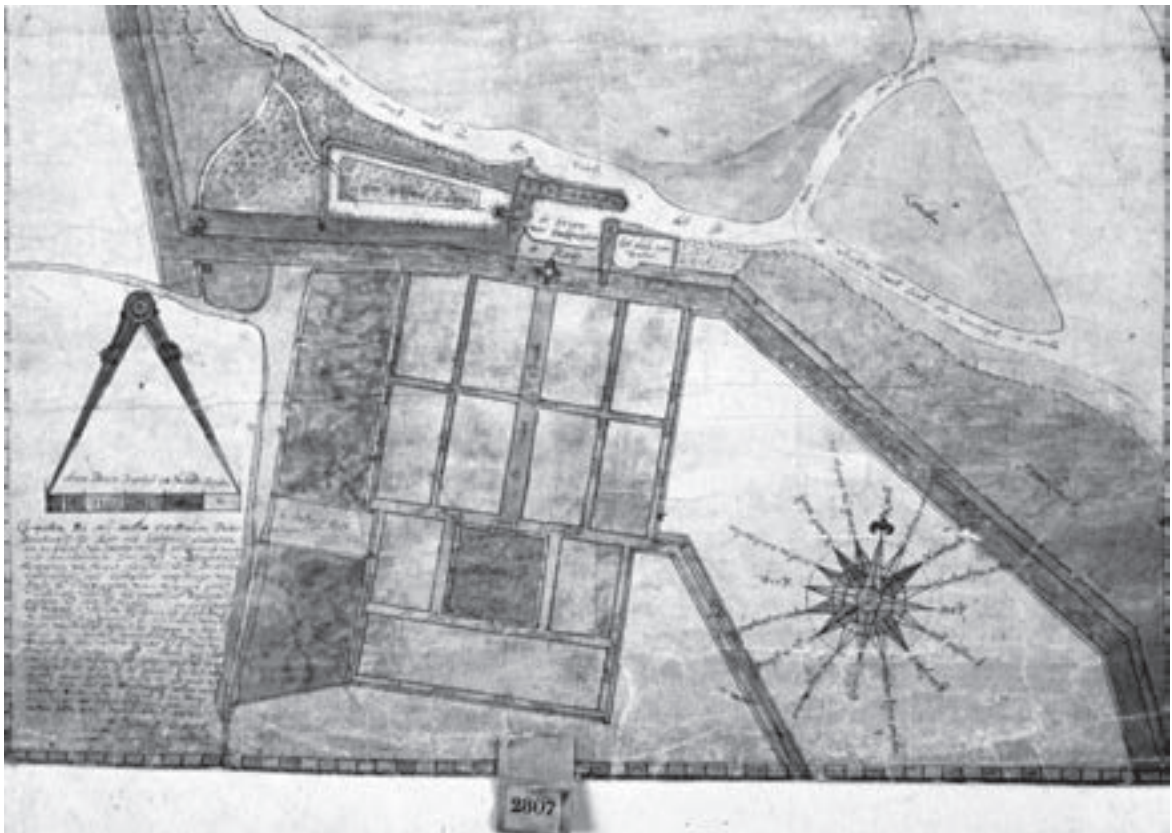
(Heerlen 1993), pp. 55–69 and pp. 84–88. A. De Vos, [with K. Ottenheym and C. van den Heuvel], 'Bouwen voor nut en vermaak', in: K. Zandvliet, *Maurits. Prins van Oranje*, (Amsterdam - Zwolle 2000), pp. 123–37.

³⁴ Several authors have explained Willemstad as an ideal city referring to the names of the seven provinces of the Dutch Republic used for seven bastions of Willemstad to express its symbolical function. However, the bastions received these names later. The various designs for the fortifications illustrate a debate on practical rather than symbolical issues.

³⁵ Polder of Ruigenhil: Den Bosch BHIC, 343 Kaarten, prenten, tekeningen 289–138.



12. J. Symonsz. Manuscript map of Ruigenhil 1570.



13. P. Bouwensz. De Raet, Manuscript map of Colijnsplaat (1625) - detail.

Prince Maurice gave it its new name in the year in which his father William of Orange was murdered. William had started the fortification of the existing village of Ruigenhil in 1583, once he had received the marquisate of Bergen of Zoom of the States of Brabant in exchange for lost properties in the Spanish War. A map of Willemstad on commission of Prince Maurice by the land surveyor Symen Damass van Dueren on 6 January 1586 shows the new fortifications and the parcels for housing, which partially were still not given out (see Fig. 11).³⁶



14. A. Andriessens, Fortification design for Willemstad 1 juli 1583.

Although the property map also showed future constructions – the depicted church for instance was never realized in that form – the layout of the building blocks and lots followed the existing structure of Ruigenhil (see Fig. 12).³⁷

Given its strategical importance bordering with Holland and Zeeland, the two provinces of which William of Orange was stadtholder, the polder needed strongholds. For that reason Ruigenhil was fortified, but also Klundert got fortifications around a similar grid pattern of plots, that were the result of cultivating the land accretions of the north-west part of the province of Brabant.³⁸ It was the same area in which Andries Vierlingh, in his official role of bailiff, had put contracts between William and the tenant farmers of plotted lands of existing polders and new land accretions into writing and let collect the money on behalf of prince.

The regular grids of Ruigenhil and Klundert were not uncommon in Zeeland and Holland, but stand in a tradition of settlement forms known as the church-ring type (“kerk-ring type”), in which sometimes a circular, but more often a quadrangular road or ditch surrounds a church that is connected by a wider street or water inlet to the harbor and dike, such as in the case of Colijnsplaat (see Fig. 13).³⁹

From designs for the fortification of Ruigenhil it becomes clear that the grid would less or more extended, but that its character, originating from its agricultural setting would be respected. In 1583, Abraham Andriessens, who had been involved in projects of connecting of the dismantled citadel and its esplanade with the rest of Antwerp was commissioned to fortify Ruigenhil. The first design with his signature shows a perimeter with 8 inland bastions and two half bastions outside the dike (see Fig. 14).⁴⁰

The street plan of Ruigenhil is incorporated and extended in the design, but does not completely match the fortifications, in that sense that the streets do not lead to bastions.

³⁶ Willemstad: Den Bosch, BHIC 343 Kaarten, prenten, tekeningen 280–126.

³⁷ Ruigenhil settlement: Bergen op Zoom – Historisch Centrum ARR D 379.

³⁸ A contemporary manuscript map in the Dutch National Archiving depicts the grid patterns of both polders: National Archives-VTHR -440: J. Symonsz. Manuscript map Polders in Westbrabant – Ruigenhil and Klundert 1590.

³⁹ W.A. Ham, ‘Westbrabantse dorpsplattgronden’, *Brabantia*, 16, 1967, 4, pp. 125–133. National Archives, 4.VTH – 2807: Pieter Bouwensz. De Raet, Manuscript map of Colijnsplaat (1625).

⁴⁰ National Archives, Archief van de Nassause Domeinraad – 1.08.11 – 13016 – No IX Folio 881vo, no number, For role Andriessens see further: 1.08.11-13017 – No VII – fol. 882 - letter 21 October 1585.



15. Measurements and cost estimate of fortifications of Willemstad - detail.

In a later design, containing measurements of the fortification for a cost estimate, only five inland and two half bastions are planned corresponding more or less with the realized fortification.⁴¹ The design, which might be attributed to Andriessens as well, also shows the internal plan, of which the existing crossing street in front of the church [compare figure 12] is extended to a gateway in the middle of the curtain (see Fig. 15). This implies that both designs for a completely different fortification perimeter for Willemstad, respected the old pattern of the Ruigenhil settlement. Once fortified, new build-

ings gave Willemstad a special status, the first for a Lutheran liturgy-purpose built church in the Netherlands on a central plan, a Town hall and finally Prince Maurice's hunting seat, the Princenhof. Willemstad was not a planned ideal city; the ideal was added rather than planned from the start.

The case of Willemstad learned that its layout was not dictated by a single design, but emerged from an adaptation of an rural settlement with a specific regional grid form, within a landscape with other historical grids those of the polders and of the divisions of land accretions. It is the multilayered model of grids, that is important both for the understanding of Dutch theories on urban planning and military camps and for the development of instructions for the layout of settlements overseas. Stevin codified flexible and temporal planning practices and applications of multilayered grids used in various historical contexts in his *Castrametatio* and *Huysbou*. The morphological studies that were using Stevin's text and images to explain the "urban form" of Dutch cities and overseas settlements were too much focused on a pre-supposed ideal. We conclude that grids did not fit, because it was not necessarily the intention to make them fit with a blue print of an urban form. The surveyors that set out the settlements overseas were instead building on centuries of experience with the application of various, temporary and flexible types of grids that could be adapted easily to local circumstances.

⁴¹ National Archives, Archief van de Nassaue Domeinraad – 1.08.11 – 13016 – No IX Folio 881v°, no

number. The cost estimate is not signed nor dated, but might be related to the plans of Andriessens of 1583.