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PART I

THE BUILDINGS AT BRYGGEN
THEIR TOPOGRAPHICAL AND CHRONOLOGICAL DEVELOPMENT

Asbjørn E. Herteig

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Foreword

The archaeological excavations at Bryggen in Bergen, which took place between 1955 and 1969, covered approximately 5,700 square metres in the northern part of Bryggen. This area had been affected on several occasions in the past both by catastrophic fires and by fires of a more localized nature. As a result the area had gone through many phases of total reconstruction, in addition to which properties and buildings had been renovated or rebuilt as required, depending on the length of time since the area had last been subject to major reconstruction after a fire.

As the original shore-line lay at the back of the site, it was possible to follow the development stage by stage as the settlement expanded seawards from the original coastal strip over the wide gently-sloping beach and finally over backfilled deposits in the deeper waters of the harbour basin. The various structures which were excavated included therefore all the elements of a medieval harbour settlement: wharfs and quays and features on the sea-bed itself, streets and passageways, wells, privies, houses and out-buildings, and hearths and ovens of various kinds and for various purposes.

In addition to the approximately 500 buildings which were recorded and described, a considerable number of other features were recorded. It has therefore been necessary to divide this volume of *The Bryggen Papers* into two. This first part covers the three tenements of Bugården, Engelgården and Søstergården occupying the southern half of the site and comprising six rows of buildings in all. The second part, which is to be published in 1991, covers the tenement of Gullskoen to the north, an area which consisted of six rows of buildings in the Middle Ages, and even one or two more rows at an early stage in its history.

In both parts of the volume an account is given of the field documentation of the various features, which are described in detail layer by layer beginning with the most recent at the top. The historical development of each tenement is then summarized in chronological order from the earliest traces of settlement in the seventh and eighth centuries right up to the final destruction in the 1955 fire.

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The Editorial Committee responsible for the series consists of Professor Knut Helle, Institute of History, University of Bergen, Senior Curator Asbjørn E Herteig, Historical Museum, University of Bergen, and Senior Curator, dr philos Svein Indrelid, Historical Museum, University of Bergen.

The Norwegian text has been translated into English by Clifford D Long.

Bergen, June 1989
Asbjørn E Herteig
Chief Editor

The buildings at Bryggen: their topographical and chronological development

Introduction

In the fire which broke out in Bryggen on 4 July 1955 half of the old wooden buildings along the waterfront were destroyed. In all, nine rows of buildings from four tenements, whose names can be traced back to the High Middle Ages, were reduced to ashes. These were the tenements, from south to north, of Bugården, Engelgården, Søstergården and Gullskoen. Over the following thirteen years, the central and rear parts of these properties were excavated archaeologically.

As an account has already been given of the organisation, aims and methods of the excavation (Herteig 1985, 9–47), the present work will deal solely with the stratigraphical and chronological analysis of the structures within the area excavated.

The excavation of the Bryggen site began with the tenement of Bugården, and the work during the first two years was concentrated on this tenement's two rows of buildings, Bugården South and Bugården North, which were totally excavated within the area that was accessible. This part of the excavation covered an area 14.50–15.00m wide and 48.00m from front to back, stretching from 80.50x to 96.00x on the N–S axis of the site grid and from 40.00y to 88.00y on the E–W axis. The excavated area of Bugården corresponded to grid-squares 11 and 12 in rows F, G, H, I, K and L, each grid-square being 8.00m x 8.00m (fig 1).

The archaeological deposits in the Bugården tenement containing structural remains varied in thickness from 4m to 6.2m and overlay a 3–5m thick deposit of organic matter, which was relatively well preserved. For the most part the upper metre of this underlying layer was excavated, but under the northern half of Bugården North the deposits were investigated to a greater depth, continuing well below sea level, in the hope of establishing the height of natural. The attempt, however, had to be abandoned, since the pressure of water from the harbour became so great that there was a serious risk of the deposits being

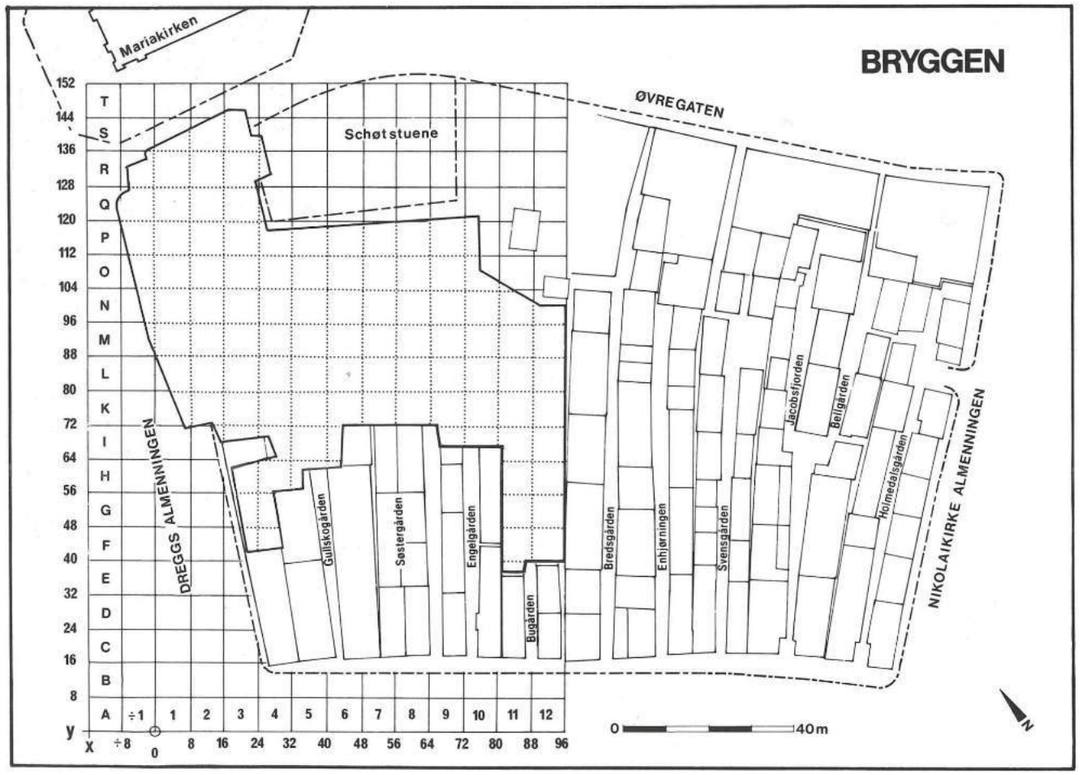


Fig. 1. After the southern part of Bryggen was totally rebuilt around 1900, only the ten northernmost properties were left with the traditional Bryggen layout of long parallel rows of wooden buildings. Of the eighteen rows which remained standing, nine were destroyed when fire swept through the northern part of Bryggen on 4 July 1955. The solid line marks the area of the excavations. Grid north is to the left, grid east at the top.

literally forced up into the air. At that point, a depth of 5.80m below mean sea level or 8.50m below the present ground surface had been reached. This was at 69.00y on the site grid. The top of natural here has since been recorded at -6.30m below site datum and the natural deposits consist of a thick layer of finely sorted sand or fine mud from 4m to 8m thick overlying the uneven bedrock.

The only structural remains which were not fully excavated comprised an unusually well-preserved wharf in the rear part of the site (fig 2). It was left standing in the hope that the excavation could be continued further back. This eventually became possible in 1979 and then only in the bottom layers. In the meantime, the remains of the wharf had become so damaged with uncontrolled backfilling that it was only feasible to record the more obvious features. The results of this later excavation will be incorporated in the presentation here of the structural phases of the Bugården tenement.

With the 1979 excavations the length of the site from front to back was increased by 12m to a total of 60m, yet even this rearwards extension was not sufficient to establish contact with the original shore-line and dry land beyond. This was only achieved in a 25m wide strip in the far

Fig.2. The excavated remains of the wharf in Bugården South, destroyed in Fire VI (1198).

north of the site, north of 24.00x in the Gullskoen tenement. In the intervening area, which encompassed the tenements of Engelgården and Søstergården, most of the approximately 30m wide beach area was excavated in 1974 and these results are also included here. Even this area, however, is not usually regarded as part of the originally settled land, even though it was taken into use and developed relatively early.

The primary stages in the development of the Bugården tenement can therefore only be extrapolated from the general pattern of events which has been documented from the other parts of the site and which are common to them. Nevertheless, to judge from the situation in the northern part of the excavations, ie in Gullskoen, it seems that the developmental sequence which has been documented for Bugården is fairly representative for the general development of the built-up area as it expanded out into the harbour basin in the course of the Middle Ages.

The following descriptive account takes as its starting-point the excavation which began in the autumn of 1955 under the burnt-out southern row of buildings in Bugården. As the account proceeds phase by phase downwards, information is continually drawn from the northern half of the tenement and from the contemporary levels in both the tenement's central passage and the eaves-drip gaps between Bugården and the properties on either side. The rows of buildings in the adjacent tenements of Engelgården, Søstergården and Gullskoen are dealt with in a similar way, covering in all twelve rows and part of a thirteenth row of medieval and late medieval buildings. The presentation is mainly limited to the data which is essential for understanding the stratigraphic and chronological development. Technical details regarding the different structures are therefore only occasionally included.

For various reasons, it would have been sensible in this account to have kept to the grid-system and to have followed the course of the excavation chronologically. This would have made the presentation of the material easier, but at the same time it would have broken up natural contexts and thus created problems. It has therefore been found best to describe each contemporary level in full throughout the length of the house-row, proceeding tenement by tenement, even though this has its drawbacks.

As the site conditions at times were exceptionally complicated, it has not always been possible to arrive at a definite conclusion, especially when analysing the bottom layers where the respective wharfs presented great problems in interpretation. Moreover, as the system which has been chosen for presenting the results deviates from the recording system used in the field, lengthy explanations and argumentation must occasionally be introduced. The documentation, however, has been systematized through the field note-books, photographs, plans and section drawings, so that any conclusion can be defended *a posteriori*. The results will speak for themselves.

The Bryggen chronology

In *The Bryggen Papers, Main Series*, **1**, 21–33, there is an account of the absolute and relative dating systems on which the excavations were based. The starting-point was the series of fires which, according to documentary evidence, affected the Bryggen area and which therefore could be expected to be reflected in the deposits. For practical reasons these were recorded numerically from the top, starting with the fire in 1955 as 0, 1702 as I, 1476 as II, and so on (fig 3). The documentary sources include a fire in 1393 which, according to the traditional interpretation, should have been restricted to the southern part of Bryggen outside the excavated area. Chronologically, this comes between Fires III and IV in our sequence. Evidence for this fire, however, was also found within the area of the excavations, but it was identified only after work had been going on for some time, and it has therefore been given the designation Fire IIIb.

During excavation, samples of timber were collected for dendrochronological analysis. In the course of the last few years, almost 1,600 samples have been analysed at the University of Trondheim and on the basis of the figures obtained from 267 of these, it has been possible to establish a floating chronology of 433 years (see Appendix I). Moreover, radiocarbon dating has now provided a fixed point for this sequence, which had hitherto defied synchronization with the archaeologically derived chronological sequence (see Appendix II). As Gulliksen and Thun state in Appendix II, nearly all the samples come from fire layers whose dates according to the archaeological chronology are significantly later than the year in which the trees apparently were felled. Such a situation could only have come about if almost all the timber had already been used not just once, but several times. Even though it is clear that there was a considerable re-using of timber at Bryggen, just as there was in other medieval towns, the suggestion of a 90–100% rate of re-use is unacceptable. Gulliksen and Thun add (Appendix II, p 149) that «good agreement can be obtained by shifting the fire chronology back one step, ie by equating each fire layer with the fire date preceding the one usually assumed». Estimated re-use would then be reduced to a more acceptable 30–50%.

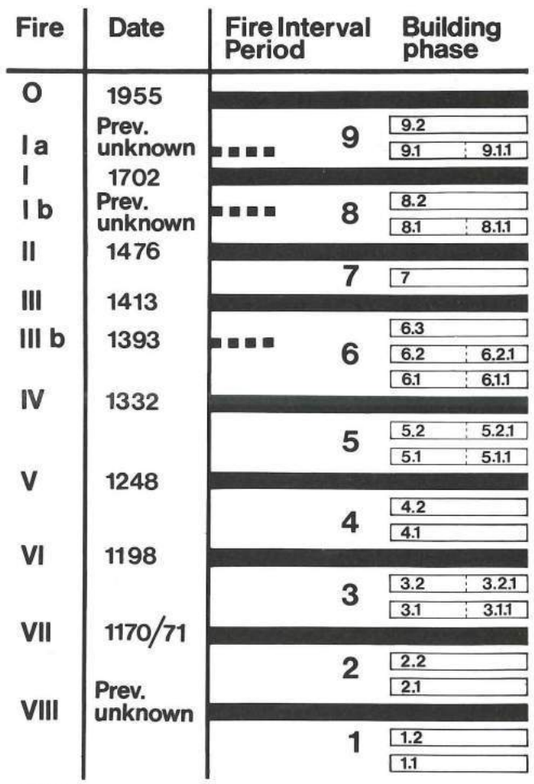


Fig. 3.

Presented with these results, it has been necessary to go through the basis of our chronology again, including the documentation and interpretation of the stratigraphy, the historical source material, and the correlation of the excavated fire levels with the historically recorded fires. This work has been supplemented with dates obtained from the analysis of imported German and English pottery.

Our stratigraphical analysis is based primarily on the documentation of the sequence of the layers and the overlapping of structures in the horizontal plane, and secondarily on the relevant data recorded in an unusually rich system of standing sections crossing the whole excavation area in both directions and linking it all together (fig 4). The reader is referred in particular to *The Bryggen Papers, Main Series*, **1**, 18–21, with regard to the use of sections on the site. The analysis of the sections provides the very backbone in the interpretations, which have led to the establishing of an internal relative chronology. Moreover, the differential system which we employed provides the best guarantee that this must be essentially correct.

Taking the individual fire layers, these are all from total fires, with the exception of Fire IIIb (1393). There is little or no reason to doubt the correlation of our fire layers with the fires in 1702, 1476 and 1413, but Fire IIIb is rather different in that we were not expecting to find evidence of the 1393 fire within the area of the excavations and it was not identified until the excavations were in their second year. With the assistance of radiocarbon dating it has later been confirmed that it really spread further north than expected, into the area covered by the excavation of Rosenkrantzgate 4 (Krzywinski & Gulliksen 1984).

With regard to the earlier fires in 1332, 1248, 1198 and 1170/71, there can only be doubt attached to the actual extent of the fire associated by documentary evidence to the year 1332. Apart from a fragment of the Icelandic Annals from Skálholt where it says under the year 1332 that «German men burned a great part of the merchant town of Bergen», the extent of this fire is not known. Compared with the earlier fires in 1198 and 1248, it has only attracted a modest amount of attention in the local historical and archaeological literature. Koren-Wiberg ignored it entirely in his attempt to date the fire layers in his excavation of the Town Wine Cellar on the street known as Breida-almenning (Koren-Wiberg 1908, 4–5; idem 1921, 82; Helle 1979, 16). On the basis of an agreement dated 16 September 1334 dealing with the erection on the Skjeggen tenement of «2 fireproof cellars with iron doors and iron shutters and all other houses both above and below» (DN II, No.207), Lorentzen associated this building activity with reconstruction work following the 1332 fire, and Helle agrees with this (Lorentzen 1952, 91; Helle 1979, 15). Since this fire, according to Lorentzen, probably affected the northern part of Bryggen, and since Helle locates the tenement of Skjeggen as the neighbouring property to Gullskoen, which is the most northerly of the tenements covered by our excavations from 1955 onwards, it is certainly not unreasonable to associate the 1332 fire with our site.

In the documentary sources this fire is poorly represented, yet it has provided better archaeological evidence than the other fires, since in Søstergården North an object inscribed with runes was found overlying fire layer IV. It must have been deposited in the course of the construction period following the fire. The runic inscription has been read as: «*Síra* Jon sends God's and his own greetings to Gunnar Kvit, Håkon...», and the late Aslak Liestøl associated it with *Gunnar Kvit* who was the King's Treasurer (*fehirde*) in Bergen between 1340 and 1343 (Liestøl 1963, 10–11). The inscription confirms the correlation of fire layer IV with the 1332 fire and it has been regarded as the best piece of evidence for confirming our absolute chronology. On the basis of the radiocarbon dating of the dendrochronological samples, however, the fire layer should be associated with the previous fire in 1248. Now it is not impossible that there could have been an important person living at that time who happened to have the same name as the royal treasurer 85–90 years later, but it is a hypothetical possibility to which little weight can be attached.

If, on the other hand, the previously unsuspected Fire IIIb (1393), which was actually the fourth fire in the series counting downwards from the present ground surface, was really Fire IV in our chronological sequence, ie the 1332 fire, there would be complete agreement between the earlier fire layers and the radiocarbon dating, according to Gulliksen (Appendix II, p 149), but it would also mean abandoning the dating provided by the runic inscription. Moreover, it would also involve a radical re-evaluation of the historical development of the area. It would, for example, imply a much earlier and considerably more intense expansion out into the water than that suggested by the established chronology, which seems reasonable in the light of the known historical development. Admittedly, the documentary sources give the definite impression that the town developed rapidly in the period from 1100 onwards and this seems clearly reflected in the recorded rate of expansion. Already in the course of the first decade of the twelfth century the land in front of the area later occupied by St Mary's was completely developed right down to the high water mark, and the expansion out over the beach began at the latest around 1125–1130. By the middle of the twelfth century it had reached the edge of the underwater shelf 25–30m from dry land, where the seabed dipped steeply into the deeper waters of the bay. Some 150 years later, around 1300, the actual waterfront lay 45–46m even further out, in the deeper waters of the harbour basin itself. To interpret Fire IIIb as Fire IV would mean that this stage in the development covering 5–6 different building phases would already have been reached around 1200 or 1225–1230 at the latest, and such an enormous rate of expansion at such an early stage is quite impossible to accept. It would have involved an almost continuous construction and demolition of buildings and wharfs. Moreover, the amount of traffic and the need for storage facilities implied by such a rate of development would have passed congestion point. To adjust the established fire chronology by moving it one stage back would quite simply be incompatible with the potential which was available.

Knut Helle keeps the possibility open that the fire which laid waste both the royal and the episcopal buildings in 1429 could have affected part of the Bryggen area (Helle 1979, 23–26, 45). It would then come in as the third in our fire sequence, counting downwards, displacing the

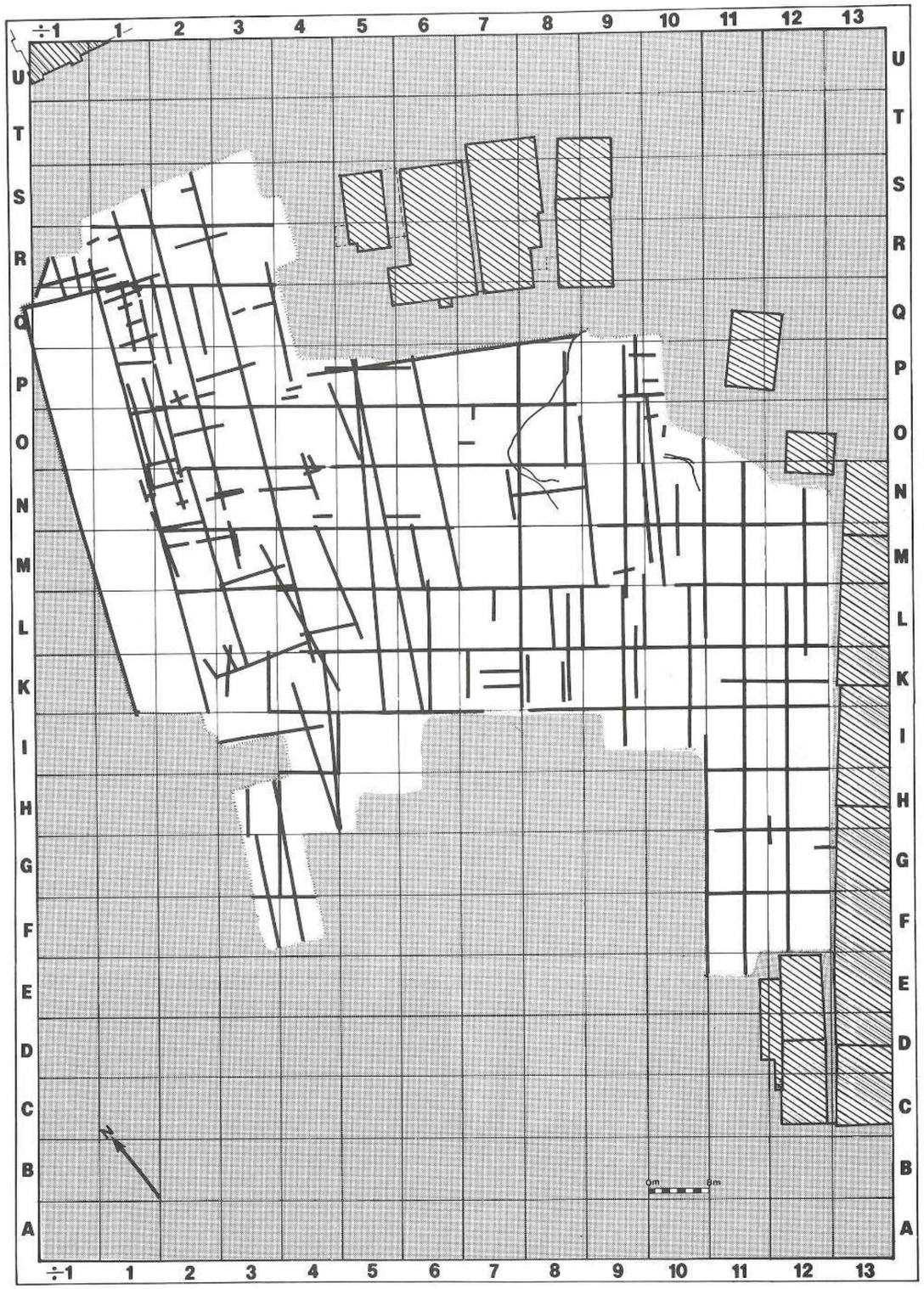


Fig. 4. Plan of the site showing the location of the sections which were recorded. Grid east at the top.

total fire in 1413. The 1413 fire would then be associated with the fire layer which we have assumed to be from the more limited fire described as Fire IIIb. With the adjustment to our fire chronology which the inclusion of the 1429 fire would involve, the cultural-historical consequences would clearly be even greater than those implied by our established chronology.

This argumentation, which is based on a stratigraphical and cultural-historical interpretation of the site data, could be developed even further by a more detailed analysis of the consequences of dating the fires earlier, but it will be sufficiently understood from the description of the building activity which is given in the present volume, especially for the period up to c 1250. The picture which has been obtained of this activity seems to strengthen the counterarguments for any adjustment of the fire chronology. As was said at the beginning, an analysis of the pottery has recently been carried out whose results all point in the direction of a *status quo*. Moreover, the following account will show that an adjustment of the chronology by moving the dated fire sequence one fire layer back in time will not solve any problems.

During the summer of 1987, Alan Vince and Lyn Blackmore from the Museum of London analysed the groups of London Brown and London Shelly Wares. The dating of these groups at Bryggen was based mainly on information from the southern area of the site commented on in this volume, and this has led to the conclusion that «the importation of pottery from London had almost ceased by 1250 (a date established by coin and dendrochronological evidence from London). The south-western French Saintonge pottery was examined to see if it would give any clue as to the date of these later deposits (since there is a recognizable mid-to-late 13th century type of Saintonge Ware and another phase of extremely late 13th to early 14th century date). The mid-to-late 13th century Saintonge Wares were present in small quantities on the site, but few came from the southern part of the excavation. A sherd of polychrome Saintonge Ware was found in the fire level which marked the destruction of the subsequent reclamation phase (Phase 5.2 = 1332)». This is referring to Fire IV. A radiocarbon date from this fire layer equates it with the 1248 fire, which thus disturbs the accepted dating. Alan Vince does point out that he has not personally «examined the evidence for the correlation of phases from south to north». However, I feel convinced that stratigraphically the results are correct. In a personal communication, Vince states that «in view of the nature of the stratigraphic correlations» (from south to north), he is «reluctant to state anything about the likely correctness of the C14 calibration of the dendro sequence except in the Bugården tenement». According to Vince, the pottery from the London area, when compared for example with the Saintonge pottery, does not lend any support to an adjustment of the fire chronology, as is required by the results of the C14 analyses. On the contrary, it supports the established chronology.

In *The Bryggen Papers, Supplementary Series,* **4**, Dr Hartwig Lüdtke maintains (p 23) that the picture he has built up on the basis of the pottery «fits hand in glove with what historians have derived from written sources: a temporary orientation towards England prior to the absolute dominance by the German Hanse (Helle 1982, 388)... For Trondheim, a similar picture of the changing import frequency is described by Reed (1983)».

«This clear contact with England in the 13th century was pointed out by Dunning (1968, 52) in his investigation of the ceramic trade in the North Sea area: 'Due to an increase in evidence, it is possible to go further than just the recognition of the fact that there was contact between Norway and England. It is also possible to quantify the contact and to present it as a part of a chronological development.'» (Lüdtke, op cit, 25).

After comparing the Paffrath, London Shelly, Andenne and Pingsdorf Wares from the «Mindets Tomt» excavation in Oslo, Lüdtke comes to the conclusion that the pottery from Oslo, Bergen and Trondheim indicates «that a stream of ceramic import during the Middle Ages reached Norway with chronological consistency and without strong regional differences» (ibid, 31). Lüdtke also finds it noteworthy «that Pingsdorf, Andenne and Paffrath Wares all cease at about the same time, namely the first half of the 13th century. The same parallel development of the three wares can also be observed at Bergen... The fire layer in which all three wares appear for the last time may therefore be dated to the middle of the 13th century. Indeed, we are dealing with Fire 5 which Herteig identifies as the fire catastrophe of 1248. In the light of this agreement, the dating 'c 1250' should be included next to Fire 5 in the column 'Traditional ceramic dating' in [Lüdtke's] vertical diagram tables. Both London Shelly and London Brown Wares are found in England in small amounts in the second half of the 13th century. At Bergen – parallel to England – they are just barely represented in the following Fire 4. That, combined with the presence (in a small quantity) of Siegburg Stoneware in the same fire layer, allows for the tentative dating of 'c 1300' for Fire 4. This dating would agree with Herteig's assignment of this layer to the fire of 1332. Fire layer 2 may be dated 'c 1500' because the Raeren Stoneware is here for the most part missing, whereas it comprises a significant part of the pottery in the level above the fire. Again, Herteig's dating of 1476 for Fire 2 should be included within the range of tolerance» (ibid, 33–34).

This absolute dating of Fires II, IV and V is further supported by a comparison of ten ceramic reference groups (Andenne, Pingsdorf, Paffrath, London Shelly, London Brown, Scarborough, Rouen, Langerwehe, Siegburg and Raeren) which have been dated either by dendrochronological or by numismatic evidence.

As it does not seem possible for the time being to bridge the gap between our previously established chronology and the dendrochronological time-scale based on C14 dates, we have compared some of the C14-based dendrochronological dates given in Thun & Hafsten's fig 1 (p 135) with our own chronological system. From the 25 groups of samples, the following have been selected (reading the columns in fig 1 from right to left):

1 All 16 samples from columns 1–5, ie all the latest groups, covering the period 1269–1319.

2 Samples 1, 6, 11, 16, 21 and 24 in column 8 (counting from the top), dated to 1239–1249.

3 Samples 1, 6, 11 and 16 in columns 12 and 13, dated to 1189–1209.

4 Samples 1, 6, 11, 16, 21, 26, 31, 36 and 39 in column 16, dated to 1159–1169.

5 All the samples in the three earliest columns, covering the period 1039–1089.

From what has been said above, it is clear that there is no single trend in the relationship between the previously

established chronology and the C14-based dendrochronological time-scale, apart from a general tendency towards a later dating of the material by our chronology.

Within the latest group of samples covering the three decades before and two after 1300, sample 0443 fits perfectly with the archaeological dating. Of the rest, samples 0218, 1037, 0881 and 0555 all have an earlier archaeological date than the felling date provided by the dendrochronological analysis (in italics in table 1).

In column 8, which is dated by C14 to the decade preceding the fire in 1248, the selected samples are significantly later according to our chronology, coming from between two and five construction phases later. This gives a time lapse of up to 165 years from the suggested felling date to the period of final use.

Of the samples selected from columns 12 and 13, which are dated to the two decades 1189–1209, in other words just before and after Fire VI in 1198, sample 0944 has an archaeological date earlier than its proposed felling date, while the rest are later with differences of up to six construction phases, giving a time lapse of over two centuries between felling and the period of final use.

In column 16, which covers the decade 1159–1169 and which should therefore be just prior to Fire VII in 1170/71, the relationship between the archaeological dating and the C14-based dendrochronological dating is relatively stable, but with a difference generally of 1–2 construction phases. However, it must be remembered that the phases in this period are very short, scarcely more than 10–15 years. It is difficult to see whether the time lapse between the proposed felling date and the period of final use in Phase 3.2 around 1180 represents one or two construction phases. In the latter case the timber must also have been used before Fire VII in 1170/71.

The earliest three samples dated dendrochronologically to the period 1039–1089 (fig 1, p 135) all demonstrate a significant deviation from their archeological date, corresponding to at least 4–5 and as many as 8–9 construction phases, giving a time lapse of as much as 280 years between their proposed felling date and their final use.

This survey of 42 random samples shows that when dated archaeologically five of them are *earlier* than the felling date derived from the C14-based dendrochronological time-scale, in one sample (0443) the dates correspond, and in three samples (0576, 0394 and 1202) the dates can be made to correspond by placing the material in the preceding construction phase. For most of the samples, however, there is a considerable and varying divergence between the date given by the established chronology and that derived from the C14-based dendrochronology, in some cases well over a hundred years. This would mean that the timber was being re-used 3–5 times and possibly as much as 8 or 9 times.

Regardless of whether the samples presented here are representative or not, it would appear that there is so much uncertainty associated with the dendrochronological analysis that it is difficult to base a re-evaluation of our established chronology on it. The very fact that only 267 of the approximately 1,600 samples could be used strengthens this impression. Consequently, there is no basis for expecting a synchronization of the dates «by shifting the fire chronology back one step, ie by equating each fire layer with the dated fire preceding the one usually assumed» (Appendix II, p 149). There would seem therefore to be good grounds for concluding with Lüdtke that «the northwest European ceramic chronology and the fire chronology at Bergen stand in agreement to one another. This should not be understood as meaning that the ceramic finds prove the Herteig chronology down to the very year. Strictly speaking, it is only maintained that the traditional ceramic dating and the Bryggen fire chronology do not contradict one another. Nevertheless, looking at it from the standpoint of this ceramic study, one must conclude that the suggested fire chronology may in the future – as in the past – be used as the basis for the analysis of the various finds.» (Lüdtke 1989, 34).

It may admittedly be thought misleading or irrelevant to concern oneself with details in the lack of agreement between the information provided by the radiocarbon-dated felling years and the use of the timber as dated stratigraphically in the field, but this is surely not so if the deviations are treated in groups and the groups then related to the clusters of dendrodata and their possible connections with fire-dated phases. Such an attempt at synchronization will probably only be successful when more detailed absolute data are available, which will enable the various alternatives to be tested more fully.

The present volume will therefore continue to be based on the established chronology, just like the earlier publications of *The Bryggen Papers*. The final answer must be left to future scholars.

Periods and Phases

Our relating of the traces of fire found in the deposits to absolute years seemed at times to be rather inflexible, but it could nevertheless be applied without any particular disadvantages over most of the site. Work in the field soon showed, however, that the deposits concealed more than just buildings which had been destroyed by fire. At times there could be one or more layers of structural remains which had not been burnt or traces of partial rebuilding in between the various fire levels. These intermediate layers or traces of structures have been called *Phases,* while the term *Period* is reserved for the time span between one fire and the next.

As the Phases, and to a certain extent also the fire intervals (Periods), could only be fully defined during the post-excavation analysis, both the Phases and the Periods are recorded and numbered parallel with the documented development, with Period 1, Phase 1, (abbreviated to 1.1) as the earliest level, and Perod 9, Phase 2, (ie 9.2) as the latest (cf fig 3). Partial rebuilding or improvement has been recorded as a *Sub-phase* within the respective phase. This means that in practice a Period may have several Phases, within some of which there may be one or two Subphases. Taken all together, these present a reasonable picture of the total building activity of that Period.

In the presentation of the different building phases, the phase designation has in some instances been supplemented with a colour code, as this essentially simplifies the documentation of related features and at the same time emphasizes the main longitudinal and transverse relationships, as well as the general expansion of the built-up area. For economic reasons, it has been necessary to restrict the use of colour in this publication to the main sections in the first part of the text.

The recording of phases is exclusively a means of establishing the internal relationships within the building pattern in each period. Phases with identical designations will only indicate approximate contemporaneity, even within the same property.

Table 1. A selection of dendrochronological samples, showing their radiocarbon dates, their dates using the present chronological fire sequence, the approximate date on stratigraphical grounds of the structure to which they belonged, and the new date obtained by moving the fire sequence one stage backwards in time. Samples in italics are stratigraphically *older* than their proposed felling date.

Sample No.	Calendar Age AD	Date according to fire chronology	Approx date of erection	New date if fire chronology is moved back one stage	Difference in Phases
0086	1315	1413	1395	c 1335	3
0218	*1307*	c 1280–90	*1255*	*1200–10*	
1037	*1303*	c 1180	*1171–72*	*1145–55*	
0410	sample not acceptable				
0416	1297	1413	1370–80	1335	2
0443	1297	1332	1300	1255	0
0881	*1295*	c 1280–90	*1255*	*1220–30*	
0166	sample not acceptable				
0555	*1287*	1198	*1180*	*1172*	
0414	1283	1476	1420–30		3
0420	1282	1413	1395	1360–70	3
0317	1277	1393	1350–60	1335	3
0316	1275	1393	1350–60	1335	3
0425	1275	1393	1350–60	1335	3
0309	1272	sample not acceptable			
0153	1270	1393	1350–60	1335	2
0405	1249	1413	1370–80	1335	3
0461	1248	1360–70	1335	1290–1300	2
0302	1248	1476	1413	1290–1300	5
0375	1247	1360–70	1335		2+
0130	1248	1360–70	1335	1280–90	2
0998	1240	1413	1370–80	1335	4
0441	1208	1370–80	1335	1290–1300	3+
0336	1203	c 1476	1420–25	1370–80	6+
0944	*1200*	1180	*1172–73*	*1145–55*	
0576	1200	1280–90	1255	1220–30	2
0394	1199	1280–90	1255	1220–30	2
1202	1198	1220–30	1220–30	1200	1
0593	1195	1280–90	1255	1220–30	3+
0293	1193	1280–90	1255	1200–10	3+
0938	1169	1198	1180	c 1171	1
0900	1169	1198	1180	c 1171	1
0802	1168	c 1220–30	1200	c 1180	2–3
0700	1167	1198	1180	c 1171	1–2
0639	1167	1198	1180	c 1171	1–2
0680	1165	1198	1180	c 1171	1–2
0995	1165	1198	1180	c 1171	1–2
1365	1162	1198	1180	c 1171	1–2
1289	1160	1198	1180	c 1171	1–2
0054	1080	1393	1350–60	(c 280 yrs)	8–9
1191	1052	1198	1180	(125–130 yrs)	4–5
0663	1044	1198	1180	(130–140 yrs)	4–5

Buildings, foundations and substructures

The purpose of this work is to establish a relative and – as far as possible – absolute chronology for the site. In reality this means documenting the relationships between the building phases. The primary concept here is the fire-layer, the more or less continuous deposit of burnt detritus which occurred at frequent intervals in the horizontal record, either quite distinct or else apparently intermingled.

As the remains of buildings, foundations, passages, quays, etc, traditionally form the main elements in the stratigraphy, the detailed recording of these features was

Fig. 5. Large earth-filled foundation substructures in use after c 1200.

also important with regard to the final synthesis. In this connection the term «building» has been given a rather wide connotation, embracing everything from the clearly defined surviving remains of a complete structure to the foundations within a definitely limited area, even though no above-ground remains of a building had survived. In certain cases, it may apply to a continuous arrangement of beams or joists over some distance, forming the foundation substructure for buildings, but lacking any clear division into individual structures. In other cases, it may be a number of standing posts within a specific context. In cases such as these, a separate Building No. has not been allocated, except where a single building has obviously been involved and not even then if it seems likely that no building was erected. Such instances, however, occurred very rarely. In a chronological context it is nevertheless the level, or horizon, which is the most essential unit, whether there are remains of buildings on it or not.

The foundations included scattered stone layers, continuous ground-walls, posts, and stakes set in groups, as well as horizontal timbering. The latter often consisted of beams laid lengthwise and crosswise on top of timber substructures of varying shapes and sizes linking them together. The underlying substructures ranged from small, square, log-built caissons measuring c 2m x 2m, through relatively narrow, rectangular arrangements, to more complex systems, whose size to some extent was adapted to the width of the buildings they supported. Whatever their size and function, they were all constructed on the same principle: the timbers were laid with their ends overlapping each other at right angles to form rectangular units, sometimes strengthened with internal tie-beams going in one direction or the other. The smallest structures might be further strengthened by the addition of an external pair of timbers placed vertically against opposite sides and locked at the top with a tie-beam. These structures were usually filled with stones. The larger cellular substructures were almost without exception filled with organic matter, mostly earth with occasional deposits of sand, gravel, etc. (figs 5 and 6).

Conventions used

For the larger units the term *bolverk* has been used in Norwegian (cf Engl «bulwark» which originally meant a revetting with large logs), while the smaller unit was called a *kar* (literally: a container, a vat). Since the basic construction was the same, using horizontal logs, it was subsequently found expedient to refer to all kinds of timber cellular foundations as *kar* in Norwegian, regardless of size. This term will also be found on the illustrations when individual substructures are numbered. In the English text

the term «caisson» is generally used for the small, usually stone-filled, square foundation units, while variations of the term «foundation substructure» are used for the components of the larger, often continuous, foundation systems. When referring to a specific substructure, the Norwegian term *Kar* is used together with its number, in order to make reference to the illustrations simpler.

When giving the dimensions of these substructures, the following terms are used:
– **width** indicates the distance from one side to the other measured along the waterfront,
– **length** indicates the distance from the front seaward edge to the rear of the structure at the landward end,
– **height** indicates the distance from the top of the structure to its base as recorded in the Phase being excavated,
– **depth** indicates the distance from the present zero datum down to the base of the structure.

In the text, **transverse** is used to describe features running across the width of the property, and **longitudinal** is used to describe features aligned along the length of a property.

It is estimated that the land has risen 16–18cm relative to the sea level since the date of the town's foundation (Herteig 1969, 100) and that in the course of time there has also been a significant compression of the deposits and a settling of the structural remains. On the basis of these two factors an attempt has been made to calculate the original depth of the waterfront structures, ie the distance from the base of the structure to the mean water-level at that time. Where it has been possible to check the subsidence, it seems to have varied between 40–50cm and c 70cm, occasionally more. This *«corrected figure»* for **depth** is therefore only a subjective evaluation to provide some indication of the original situation at the front of the quays.

All measurements referred to in the text have been limited to the two basic units, centimetre and metre. They are based on measurements taken in the field.
– Measurements less than 1m are given in cms; all others are in m.

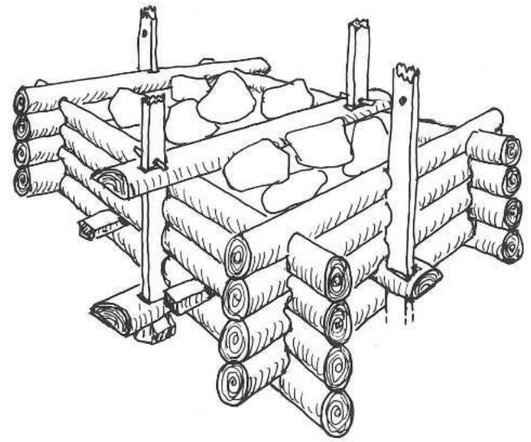


Fig. 6. Sketch showing the construction of the small log-built foundation structures, or caissons (Norw Kar), in use prior to Fire VII (1170–71).

– Where a measurement is estimated, the range is given in cm, eg «98–105cm».
– Actual measurements are given to the nearest cm with a maximum deviation of ±5cm.
– Approximate or estimated measurements where there is some degree of uncertainty are either given as whole figures: «c 4m», «around 15m», «about 25m», or with one place of decimals, such as: «c 4.3m», «around 8.7m», «11.3–11.4m», etc. In the case of measurements given in cms, any uncertainty is expressed verbally, eg «c 30cm».
– All dimensions of buildings are external measurements, unless stated otherwise.

The same conventions have been used to denote exactitude when referring to co-ordinates (eg 87.00y indicates a more precise localization than 87y).

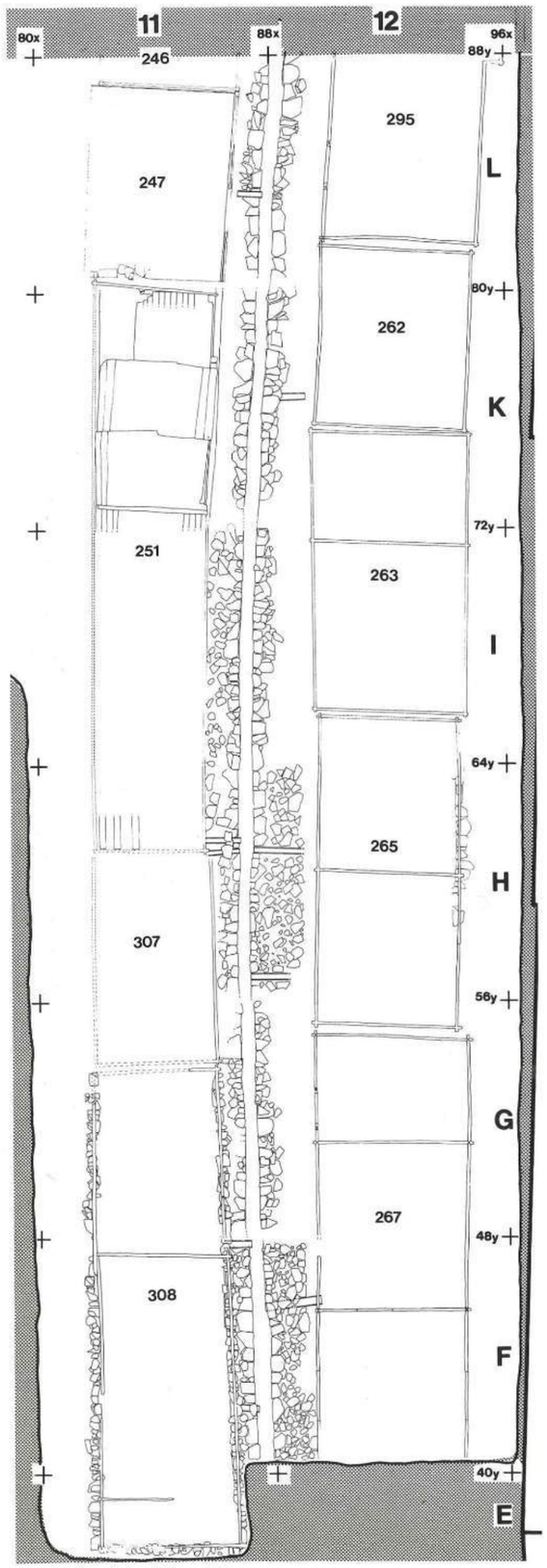
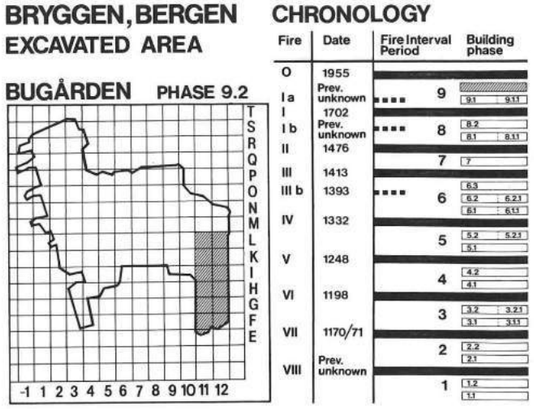


Fig. 7. Bugården Phase 9.2.



Bugården

Period 9

Phase 9.2, burnt 1955 (light orange) (fig 7)

South Row

Between the two tenements of Bugården and Bredsgården there was an unusually wide gap which varied from 2.20m at the eastern end of the site, to 2.60m in the centre, narrowing to 1.80m at the western end. This irregularity is due mainly to variations in the alignment of the south wall of Bugården's southern row of buildings.

After the deposits resulting from the 1955 fire had been removed, the wooden-paved surfaces and the wooden-paved floors were in many places found to be intact (cf Herteig 1985, fig 6), and this provided a clear and simple starting-point for the understanding and documentation of the changes in the length and breadth of structures which had taken place in the course of time.

Within the original area of excavations five buildings were recorded in Bugården South, the westernmost one of which had three distinct levels of flooring. The situation was recorded photographically, and the sill-beams were also planned and drawn, in order to document the limits of the buildings. These have been included here for comparative reasons. This level consisted of the following buildings: (from east to west) 295, 262, 263, 265 and 267.

Building 295 (L12.I) Length 6.35m, width 5.30m. Owing to a deviation in the alignment of the south wall, the east end of the building was 58cm wider than the west end.

Building 262 (K12,I; L12,I) Length 6.1m; width 5.10m.

Building 263 (L12,I; K12,I) Length 9.5m; width 5.30m.

Building 265 (G12,I; H12,I; L12,I) Length 10.4m; average width 4.8m.

Building 267 (F12,I; G12,I) continued westwards beyond the limit of excavation. Maximum recorded length 14.60m; average width 5.2m.

Building 267 was log-built like the others and contained three rooms (a–c), measuring 3.02m, 5.75m and 5.83m respectively in length. The floors were of tongue-and-groove boards laid longitudinally in room *a* and transversely in rooms *b* and *c*. In these two rooms, however, the floor was found to be directly overlying the original longitudinal floorboards, which were still intact. The longitudinal floor in room *a* also proved to be secondary, but had been laid on transverse joists placed on the original longitudinal flooring. These alterations may be interpreted either as the renewal of a relatively worn surface or as an adjustment of the height of the floor in relation to the level outside (pl 1).

Except for the easternmost building, 295, they all had on the whole very good foundations consisting of from two to four layers of horizontal logs, the enclosed area being partly filled with organic material, on which simple ground-walls had been laid using stones of various shapes and sizes. Almost everywhere, these foundations were lying more or less directly on the burnt remains from the previous fire in 1702 (Fire I in our chronological sequence), with only a relatively thin layer of fine sand in between in order to level up the surface.

North Row

Buildings 246, 247, 251, 307 and 308 belonged to this level.

Building 246 (L11,I) had floorboards laid longitudinally, which continued eastwards beyond the limit of the excavation. Maximum recorded length 1.25m; width 4.25m.

Building 247 (L11,I) had a flagstone floor, which was not built on until later. The east wall was marked by stones set on edge. Length 6.60m; width 5.00m.

Building 251 (H11,I; I11,I; K11,I; L11,I) was unusually long with a well- preserved floor laid longitudinally and with at least two large internal structures showing in plan. These measured internally 7.30m and 11.00m respectively. The total external length was c 18.8m. The width ranged from 3.85m to 4.30m.

Building 307 (G11,I; H11,I) had a wooden floor, well-preserved in places, with a transverse layer of boards overlying a lower tranverse layer, which in turn overlay a longitudinal layer of boards. Length c 7m; width 4.20m.

Building 308 (E11,I; F11,I; G11,I) was a long building with three, possibly four, internal divisions showing in plan, and two, occasionally three, layers of flooring. Total length 15.40m; width 4.40–4.70m.

Phase 9.1, unburnt under 1955 fire-level (pink) (fig 8)

South Row

In the eastern part, beneath Building 295 from Phase 9.2, the remains were found of Building 255, burnt in a local fire (designated Fire Ia), and beneath Building 263 were the remains of a separate building 270. All the other buildings lasted throughout Period 9 and are therefore included in both Phases 9.1 and 9.2 (figs 7 and 8).

Building 295 had a floor of relatively recent date. The preceding local fire must therefore have been relatively late, presumably closer to 1955 than to 1702.

Building 255 (L 12,I) had a floor with wide boards laid longitudinally. It continued eastwards beyond the limit of the excavation, and westwards to c 81.8y. Maximum recorded length c 6m; width 5.30m, the same as Building 295.

Beneath Building 263 the remains of two floors were recorded, clearly from one and the same Building 270. Their state of preservation varied from fairly good to poor.

Building 270 (I12,I,II; K12,I,II) comprised parts of a simple ground-wall on the south, east and north sides, as well as the ground-wall from an internal partition. The primary phase had a longitudinal floor with parts of a transverse repair to the east; the later phase had a transverse floor in the eastern part, but no trace of a floor to the west. Eastern limit at c 74.9y; western limit at c 66y. Length 8.9m; width c 5m.

In this sequence of buildings, 270–263, beginning after the 1702 fire, it had not just been a question of repairing the floors as time went by, but a more extensive reconstruction of the very structure. This in itself is an important point, as the surviving buildings of Bryggen are generally regarded as dating from the years immediately following the great fire in 1702. As the foundations beneath most of the buildings were in a good state of preservation and had a strongly homogeneous character, this may mean that some of the buildings which were destroyed in the 1955 fire (and also some of those which escaped the fire and are still standing) do not go back to just after the 1702 fire. There has in any case been an extensive renewing of the foundations in the course of time.

North Row

As can be seen from the account of Phase 9.2, the floors in Buildings 251 and 308 in the North Row were subject to much renewal. One cannot assume from this, however, that the buildings themselves were repaired at the same time. Neither does an apparent homogeneity in the foundations, such as can be seen in the long section, give any grounds for such an assumption. Nevertheless, there were aspects which suggested that relatively extensive structural alterations had been undertaken since the fire in 1702. Let us follow this development from the east.

The flagstone floor in Building 247 had been preceded by a corresponding stone floor. It was not just a question of repair, but of two distinctly separate buildings, since the primary floor (Building 305) continued to the west under the later neighbouring Building 251. At the same time, this detail indicated that the timber foundations under Building 251 were perhaps not so homogeneous as they appeared to be.

Building 305 (L11,I,II) had a relatively intact flagstone floor. Western limit at 80.10y. Length 6.70m; width 4.40–4.50m.

The flagstone floor in Building 305 showed that the timber courses 3–5 to the west under Building 251 must have belonged to a primary building after Fire I. Alternatively, the site later occupied by Building 251 lay open until the demolition of Building 305, but there is no evidence for this.

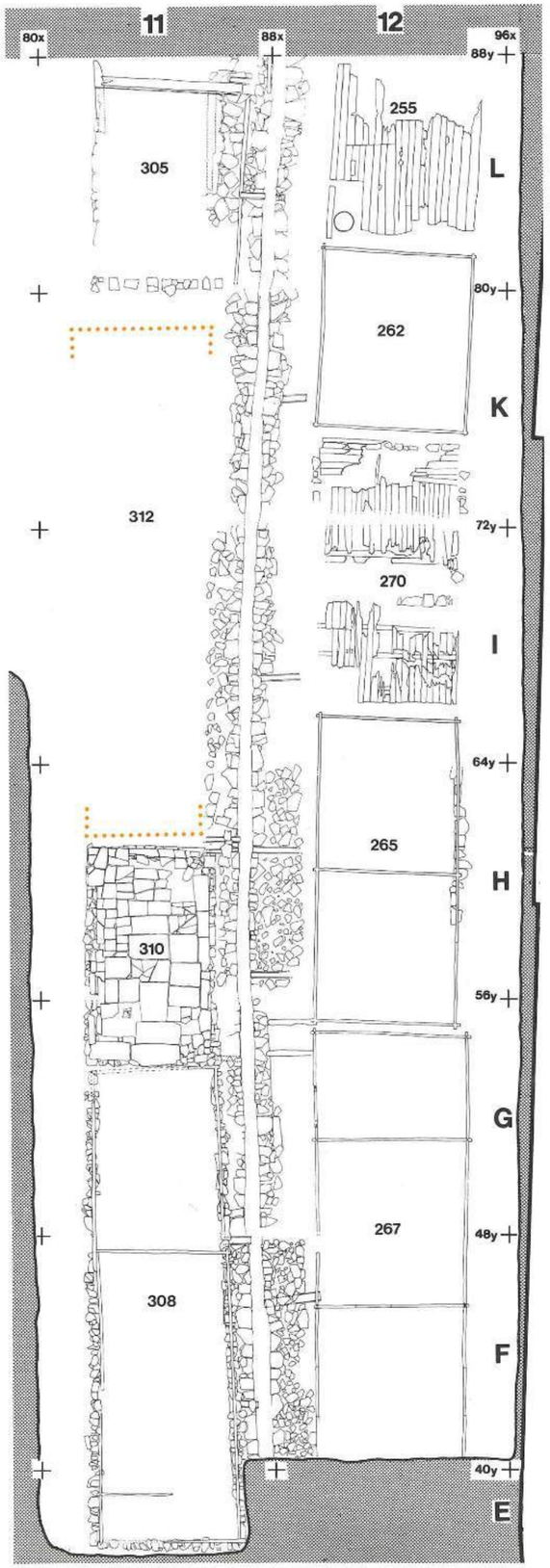
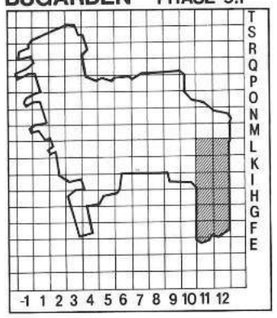


Fig. 8. Bugården Phase 9.1.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 9.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332	5	5.2, 5.2.1, 5.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.2.1, 3.1, 3.1.1
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

Building 312 (H11; I11; K11) comprised only from one to three courses of timber foundations. Eastern limit at 78.70y; western limit at 61.30y. Length 15.40m; width 4.00–4.15m. The situation was not drawn.

Building 310 (G11,I,II; H11,I,II) was the predecessor for Building 307. It had an intact flagstone floor and ground-walls standing up to 90cm high built with flat slabs. Eastern limit at 61.30y; western limit at 53.90y. Length 7.50m; width 4.40m.

In the great, apparently homogeneous, timber foundations beneath Building 308, the fifth course of timbering differed from the rest. It consisted generally of slender beams with some fire damage, while courses 1–4 were of relatively well-preserved logs of much greater dimensions. There is reason to regard course 5 as a levelling up, using timber selected from the level burnt in Fire I. Laid over or along the outer edge of this was a ground-wall with two to three courses of stone serving as the support for a further four courses of timbering. Over this came the sill-beams.

Tenement passage

The upper levels in the southern half of the tenement passage were not recorded in plan due to technical difficulties at the time of excavation. From the northern half, two distinct building phases were recorded after Fire I in 1702. But it must also be assumed that the wooden pavement was replaced at relatively short intervals.

This central passage had been maintained independently of the buildings on either side and consisted of homogeneous foundations laid on either side of a central drain. This was 40–50cm wide and had a solid plank bottom and stone sides consisting of three to four courses of thick trimmed slabs with occasional larger stones. The space between the drain and the adjacent building foundations was usually filled with small irregular stones, sometimes also with bits of beams or planking, covered with a layer of transverse joists holding longitudinal boards.

Neither the joists nor the boards were in contact with the adjacent buildings: there was always a gap varying in width from c 10cm to c 30cm. This means that the width of the wooden pavement was always less than the distance between the two rows of buildings, which varied between 3.20m and 3.50m, while the pavement was between 2.75m and 3.16m wide.

Sometimes the surface of the pavement was at the same height as the adjacent floor-level, but usually it was markedly lower, varying from 15–20cm to as much as 40cm below the level of the floor.

Eaves-drip gap between Bugården and Bredsgården

Between Bugården's South Row and Bredsgården there was a gap of varying width, being sometimes as much as 2.60m. After the fire in 1702, a drain had been laid here, at least at the front end of the property, with flat stones forming the sides and bottom. As far as could be seen, this was not only the widest, but also the only eaves-drip gap within the excavated area which had a specially laid drain.

The special character of this eaves-drip gap no doubt reflects its function in the Middle Ages. At that time the area between Bugården and Bredsgården was used as a thoroughfare leading from the sea up to *Stretet* («The Street» – today's Øvregaten, running along the back of Bryggen). The location of this thoroughfare – on the boundary between two properties – shows that it must have been open to the general public. It is therefore reasonable to regard it as *Bua-almenning* («Bua thoroughfare»), which is referred to in the medieval Town Laws (NgL, 2, chap VI,8) and which several scholars have already suggested lay in the vicinity of Bugården (Helle 1982, 196, with bibliography).

Even after the thoroughfare was closed in the fifteenth century, there was obviously some reluctance in taking this previously public area into use for building purposes.

Summary, Period 9

The period covered two phases, 9.1 and 9.2, with five of the buildings in the first phase (255 and 270 in the South Row, and 305, 312 and 310 in the North Row) being replaced. In one case, Building 255, this occurred after a local fire at the eastern end of the South Row. All the buildings in Phase 9.2 had wooden floors, sometimes more than one laid at right angles to each other. In Phase 9.1, Buildings 305 and 310 had flagstone floors. This may suggest that during the period following the fire in 1702, not only were the buildings completely replaced, but also their function changed. The average width of the North Row was 4.40m, as opposed to 5.15m in the South Row.

The main features of the tenement passage with its central stone-walled drain were established in Phase 9.1, but the wooden pavement must have been renewed at relatively frequent intervals. The width of the pavement varied from 2.75m to 3.16m, while the distance between the two rows of buildings varied from 3.20m to 3.50m.

Against Bredsgården to the south there was an unusually wide eaves-drip gap with a specially laid drain of the same type as the drain in the passage. The unusual width of this gap probably reflected its earlier function as a public thoroughfare, presumably identifiable as the medieval *Bua-almenning*. The maximum recorded width was 2.60m.

Period 8

Phase 8.2, burnt in Fire I (1702) (olive green) (fig 9)

South Row

Of the last total fire to affect Bryggen, the great fire in 1702, traces could be found over most of the row. At the eastern end, the detritus from the fire was up to 30cm thick, elsewhere it was of varying thickness and in grid-squares F12 and G12 to the west it was entirely absent, although this did not create any difficulty in the identification of the burnt-out buildings.

The remains of six buildings were recorded in this level: (from east to west) 256, 258, 266, 276, 283 and 289.

Building 256 (L12,II) continued, like 255/295, beyond the eastern limit of the excavation. The ground-wall on the north side was absent. The south wall ran c 75cm inside the corresponding alignment of Buildings 255/295, but this was compensated for by a half-metre extension on the north side. Recorded length 5.70m; estimated width c 5.2m.

Building 258 (K 12,II; L12,III) had a cobblestone floor and measured 7.10m x 5.00m. Eastern limit at 82.10y; western limit at 75.00y.

Building 266 (I12,III; K12,III) had wide floorboards laid longitudinally. Estimated length 8.8m; width c 5.7m. Eastern limit at 75.00y; western limit at c 66y.

Building 276 (H12,II; I12,V) had the poorly preserved remains of a longitudinal floor. Eastern limit at c 65.9y; western limit at c 59.2y, possibly at 58.80y. Estimated length 6.7m, possibly 7.1m; width c 5.7m.

Building 283 (F12,II; G12,II; H12,II) had poor-to-medium remains of a longitudinal floor. Estimated eastern limit at 58y; western limit at 43.20y. Length c 14.8m; width c 4m.

Building 289 (F12,II,III) had traces of floorboards laid longitudinally in the eastern part. Maximum recorded length 2.50m; width 4.75m. Eastern limit at 43.00y.

North Row

Fire I had left a thick layer of detritus with traces of buildings which proved difficult to distinguish. Buildings 248, 252, 311, 314 and 315 belonged to this level.

Building 248 (K11,II; L11,II) was indicated by a thick mass of burnt material, burnt wall posts and traces of planks, presumably from the floor. Estimated eastern limit at 87.4y; western limit at c 79y. Estimated length 8–8.5m; estimated width c 4m.

In the north-eastern corner of Building 248, partly in the eaves-drip gap adjacent to Engelgården, there was a large well, Well 35, lined essentially with unworked stone. Its internal diameter was c 2m and depth 1.3–1.4m. Well 35 was the continuation upwards of an earlier stone-lined well, Well 44, from Period 7 (cf p 28). Associated with the well was a covered wood-lined drain in a good state of preservation which ran diagonally beneath the assumed floor level. It was presumably an overflow channel from the well.

The situation immediately to the west was rather unclear, consisting on the whole of charred posts and stakes of various shapes and sizes following the alignment of the north and south walls.

Building 252 (I11,II; K11,II) had been a timber-frame construction with a floating floor. The north and south

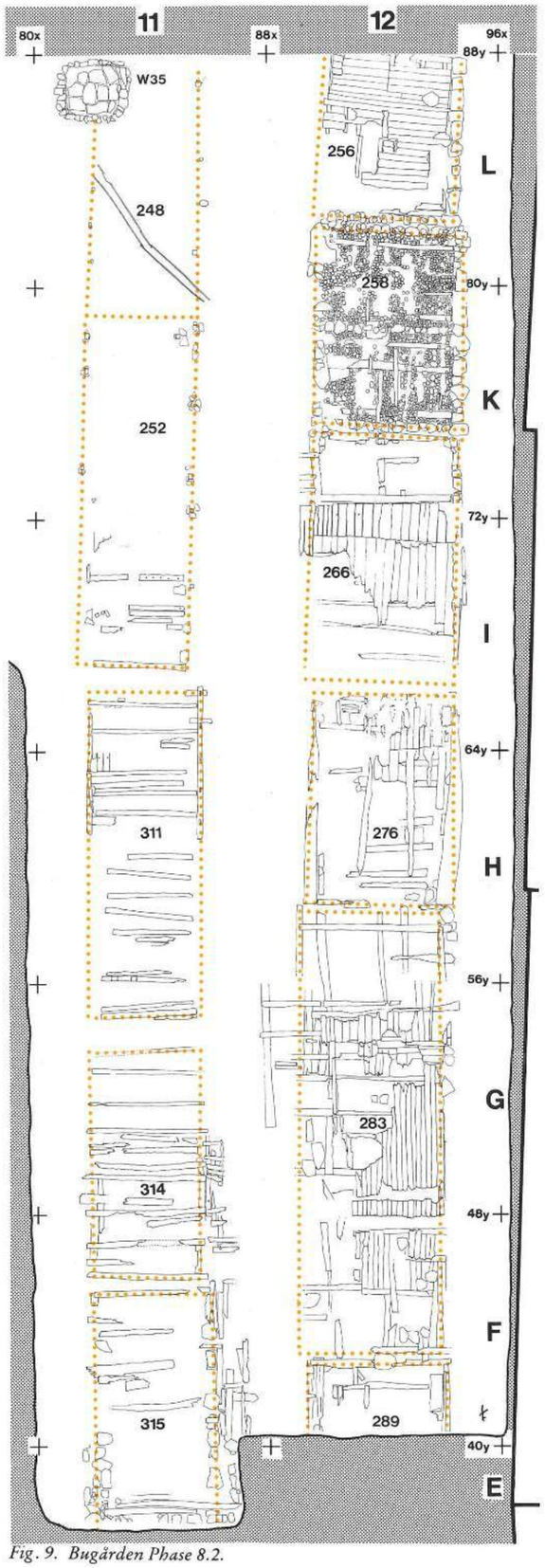
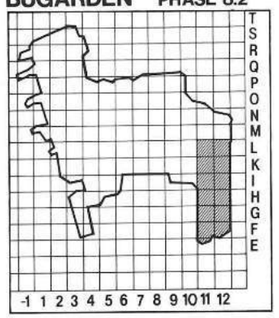


Fig. 9. Bugården Phase 8.2.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 8.2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
Ib	Prev. unknown	8	8.1, 8.1.1
II	1476	7	7
III	1413		
IIIb	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332	5	5.2, 5.2.1, 5.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.2.1, 3.1, 3.1.1
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

walls were indicated by rows of stakes in grid-square I11 at the western end, and by transverse floor-joists. The south wall ran c 90cm inside the south wall of the later Building 251, which was destroyed in the 1955 fire. Eastern limit uncertain, possibly at 78.8y; western limit at 66.8–67y. Estimated length 11–12m; width c 3.7m.

Building 311 (G11,II; H11,II; I11,II) had five squared joists belonging to a floating floor, placed at regular intervals. The south sill-beam had five mortises at regular intervals to receive upright posts, or wall studs. Eastern limit probably at 66.1y; western limit at 61.30y. The building appeared to have been cut at the west end by the ground-wall of Building 310, which was laid after Fire I.

The remains in Building 311 of a floating floor, ie a floor not attached to the side walls, represented the renewal of a primary floor, part of which had survived. It had been laid longitudinally and had also been detached from the walls. As the replacement of the floor did not involve any recordable rebuilding of the actual structure, the earlier phase has not been given a separate Building No. It was mentioned above that the remains of Building 311 must have been cut by the ground-walls of the later Building 310. Between these ground-walls, the remains of burnt foundations were recorded at the same level as those to the east, but all the joists had subsequently been cut on both the north and south sides and there was therefore no possibility of establishing the western limit of the building. However, the eastern limit of Building 314 to the west was indicated by a ground-wall along 53.60–53.80y and there are therefore reasonable grounds for assuming that Building 311 continued up to Building 314, around 53–54y. The recorded length of the building eastwards from the ground-wall of Building 310 was 4.70m; the total length was probably 11–12m, and its width was c 4m.

West of Building 311 there were more or less continuous remains from the level burnt in Fire I. The logs in the sixth course down were interpreted as ordinary floor-joists. The division of the foundations into individual buildings was difficult to recognize. The following division into two separate buildings is based on a subjective consideration of the foundations on the basis of field notes and plans.

Building 314 (F11,III; G11,III) consisted mainly of floor-joists, some of them supported on stone foundations. Eastern limit at 53.80y; western limit at c 45.6y. Estimated length 8m; width c 4.5m.

Building 315 (E11,III; F11,III) consisted of the remains of the ground-walls for the north and south walls and of charred floor-joists. Eastern limit at c 44y; western limit at c 37–38y. Maximum recorded length 7.00m; width 4.10–4.20m.

The deposits under Fire I were 20–40cm thick with no discernible structural remains.

Sub-phase 8.1.1, burnt in a local fire, Fire Ib (palm green) (not illustrated)

South Row

With the exception of Buildings 256 and 258, the structures from Phase 8.2 formed the second building phase (olive green) after the fire which had laid Bryggen waste in 1476 (Fire II). The first phase, Phase 8.1 (light blue), included six buildings in all. But at the eastern end, under Building 256 and the adjacent part of 258, there was an extra layer consisting of the partly very burnt remains of two buildings, 296 and 259. These belong therefore to an intermediate phase, Sub-phase 8.1.1 (palm green). During excavation there was some doubt as to whether Building 296 did in fact represent a separate structure. On the other hand there was the fact that the burning must have happened *in situ*. Moreover, to the west there was similar burning on the remains of a floor from a clearly separate but contemporary building. In the light of our present knowledge, there is no possibility of these features being associated either with the preceding or with the following fire. Sandwiched between Building 296 and the overlying Fire I there was the burnt building 256, while between 296 and the underlying Fire II there were the unburnt remains of Building 257. Finally, the details in the floorboards would exclude any association with Fire II: several of the boards had clear saw marks and that should give an earliest date of 1520–30. There must therefore also have been a local fire in this part of the property and this has been designated Fire Ib.

Since there was only a partial renewal of the buildings, the two new buildings at this intermediate level for practical reasons have been treated as a sub-phase of the preceding Phase 8.1, designated Sub-phase 8.1.1.

Building 296 (L12,III) comprised the burnt remains of a transverse floor, continuing eastwards beyond the limit of excavation. Western limit at c 82.6y. Maximum recorded length 5.10m; width c 4.3–4.4m.

Building 259 (K12,III; L12,IV) consisted of parts of a stone ground-wall and the scattered remains of a transverse floor. Eastern limit at 81.80y; western limit and width uncertain. Maximum recorded length 2.50m. Remains of foundations may indicate that it had the same dimensions as its successor, Building 258, ie 6.70m.

North Row

In Period 8 there was only one phase of development in the North Row and this is described under Phase 8.2.

Phase 8.1, unburnt phase over Fire II (light blue) (fig 10)

South Row

The buildings in Phase 8.1 represent the first building phase following Fire II. The remains were generally in poor condition. Within the westernmost c 14m of the row only scattered traces were left, but there is nevertheless no reason to believe that the property remained undeveloped. The following buildings belonged to this phase: (from east to west) 257, 271, 272, 290, 285 and 301.

Building 257 (L12,IV) had a cobblestone floor, surrounded on three sides by an internal wood-lined drain. Western limit at 82.25y. Maximum recorded length c 5.7–5.8m, original length probably at least 6m. Width of foundations c 5.3m.

Building 271 (K12,III,IV; L12,VI) had traces of a longitudinal floor and parts of the ground-walls were still intact. Eastern limit at c 82y, western limit at c 75y. Length c 7m; width c 6m.

Building 272 (I12,IV; K12,III,IV) had the irregular remains of a floor laid longitudinally. Eastern limit at 74.70y; western limit at 66.00y. Length 8.70m; width c 5.2m.

Building 290 (H12,II,III; I12,V) had only parts of the north sill-beam and some uncertain traces of foundations. Recordable foundations ran some 40cm lower than the corresponding remains to the east. Possible eastern limit at 65.8y; western limit at 58.80y. Estimated length 7m; width 4.00m.

Building 285 (G12,III; H12,III) had the poorly preserved remains of a longitudinal floor. Eastern limit at 58.50y; assumed western limit at 52.6y. Estimated length 5.9m; width c 5m.

Building 301 (G12,III) had only the remains of ground-walls and a few foundation logs. Eastern limit at c 52.2y; western limit uncertain. Probable length more than 5m, possibly c 9m; width c 4m.

There were no clear remains of structures in the westernmost 3m of the site at this level.

North Row

In contrast to the South Row, there was only one period of development in the North Row in Period 8 and this is described under Phase 8.2 (cf figs 9 and 10).

Tenement passage

While there was only one phase of development between Fire II and Fire I in the North Row, there were two full phases in the South Row – in fact three phases at the eastern end. The two main phases of the South Row were reflected in the tenement passage, but with such sporadic and poorly preserved remains that nothing can be said about its construction. The width seems to have varied between c 3.2m and 3.4m.

At this level the remains of a drain were only found over c 5m at the eastern end of the site, consisting of a couple of slender timbers laid longitudinally and held in place by thin stakes.

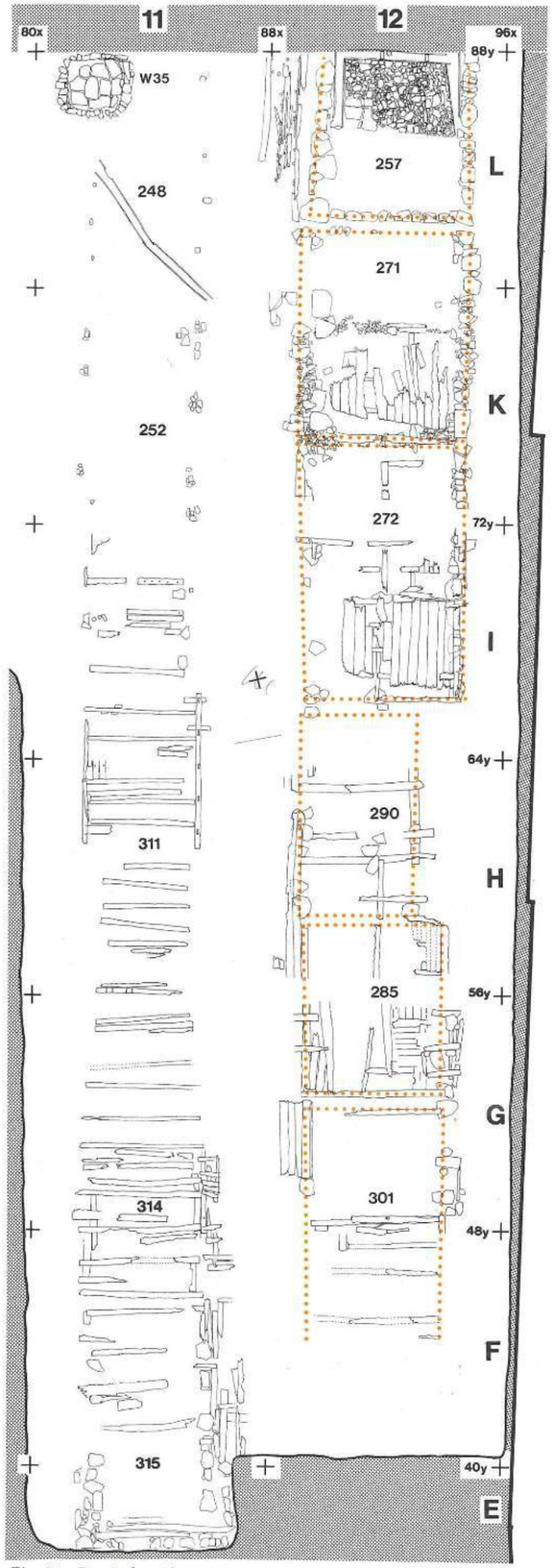
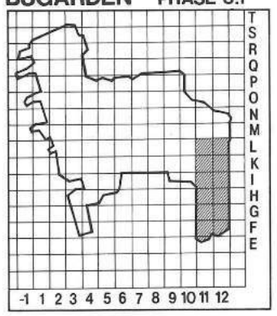


Fig. 10. *Bugården Phase 8.1.*

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 8.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.11
I	1702		
Ib	Prev. unknown	8	8.2, 8.11
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.21, 6.1, 6.11
IV	1332	5	5.2, 5.21, 5.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.21, 3.1, 3.11
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

Eaves-drip gap between Bugården and Bredsgården

In the gap between Bugården and Bredsgården there were no recordable remains associated with this phase.

Summary, Period 8

During Period 8, the North Row had only one phase of development, whereas there were two in the South Row. Also during this period a local fire led to the replacement of two buildings (256 and 258) at the east end of the South Row. In the western part of that row, there was not the same degree of sub-division in Phase 8.2 as in Phase 8.1, but nevertheless in both phases there was evidence for six buildings. The North Row contained five buildings.

In both rows there was poor correspondence in the property boundaries between Phase 8.2 and Period 9. Moreover, the eaves-drip gap between Bugården and Bredsgården was somewhat wider in Phase 8.2, but the reduction in area along the south side of the property was compensated for by an adjustment of the wall alignment along the north side, at the cost of the tenement's central passage. In both Period 8 and Period 9, the width of the buildings in the North Row was generally narrower than in the South Row, c 3.7–4.5m in the North Row compared with 4.00–5.70m in the South Row. In Phase 8.2, Building 258 in the South Row had a floor of small cobblestones, and in Phase 8.1 a somewhat similar floor was found in Building 257, also in the South Row.

In the tenement passage, the few scattered remains were in a poor state of preservation. In this period, the longitudinal drain in the passage was apparently lined with boards held by stakes on either side. This was the commonest form of drain construction in Bryggen.

In the gap between Bugården and Bredsgården to the south there were no structural remains in this period.

Period 7, burnt in Fire II (1476) (violet) (fig 11)

South Row

While there was practically no difficulty anywhere in recognizing Fire I, there were considerable complications in the underlying layers, as the deposits from Fire II and Fire

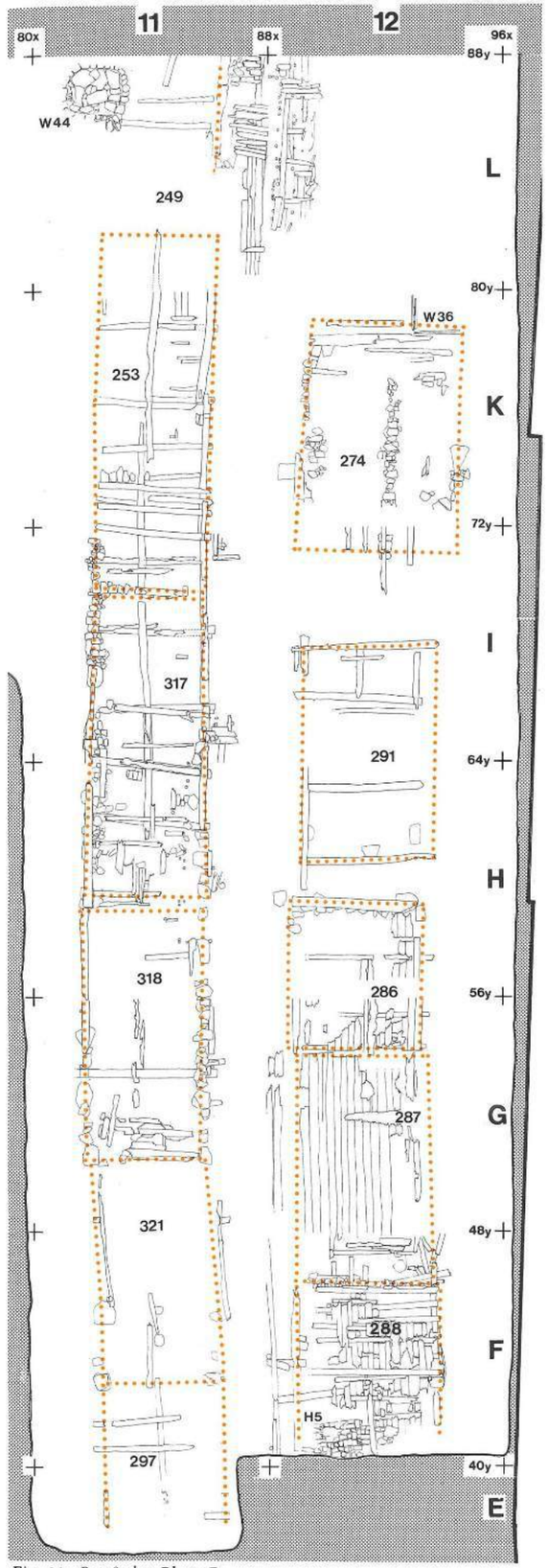
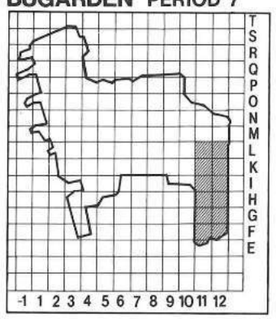


Fig. 11. *Bugården Phase 7.*

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PERIOD 7



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.11
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.11
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.21, 6.1, 6.11
IV	1332	5	5.2, 5.21, 5.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.21, 3.1, 3.11
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

III were so confused that to separate them proved most problematic. From a close analysis of the stratigraphy in the sections compared with the corresponding levels in the North Row, plus a careful study of the widths of buildings and the building materials used, it was eventually possible to disentangle the main features in the two building phases. An assumed local re-alignment of property boundaries associated with the rebuilding following Fire III in 1413 proved to be of invaluable help here. At this time an incursion was made for some unknown reason into a previously developed road on the south side of Bugården (the public thoroughfare known as *Bua-almenningen*), with the South Row of Bugården being widened – at the cost of the road area since the boundary of Bredsgården on the other side of the road clearly remained unchanged. Our dark yellow phase (Phase 6.3), which was destroyed in Fire III, was the final phase to retain the so-called narrow property width from the Middle Ages in this part of the site. Moreover, the foundations belonging to Phase 6.3 differed from the later foundations which overlay them by their use of massive well-chosen timbers with an unusually good resistance to decay. Within the areas of the tenement where the two fire layers were clearly distinguishable, this type of foundation was associated with the deposits of Fire III. The special nature of these foundations was of decisive significance where the interpretation otherwise was dubious.

Beneath Building 257 at the eastern end of the tenement there was a layer of disturbed deposits up to 30cm thick containing burnt material from a fire. The first clearly identifiable fire deposits to be encountered during the excavation of these levels were associated with the massive foundations whose southern boundary lay inside the expected alignment. According to what has been said above, this level should belong to Fire III. Further west and as far as the middle of the site at 59y, there were discontinuous remains of structures, for the most part limited to ground-walls. And in places these were the only means for separating the two fire layers. At the western end, on the other hand, there were practically continuous remains of flooring which had survived from the level burnt in Fire II.

This level, Period 7, destroyed in Fire II, comprised the following buildings: (from east to west) 274, 291, 286, 287 and 288.

Building 274 (I12,V; K12,V) comprised trim ground-walls for the side walls. Eastern limit at c 79y; western limit at c 71y. Probable length 8m; width 5.20–5.40m.

Building 291 (I12,V; H12,III,IV). Between Buildings 274 to the east and 286 to the west there were no clear traces of any buildings over a distance of 12–13m. Remains of ground-walls and a brownish layer of rotten planking in the section along 64.00y shows that there must have been a building here. Assumed eastern limit at c 68y; western limit at c 61y. Assumed length c 7m; width c 5.5m.

Building 286 (G12,IV; H12,IV) consisted of badly burnt floorboards laid lengthwise. Eastern limit at 59.20y, possibly at 60.80y; western limit at 54.30y. Length c 4.9m, possibly 6.5m; width c 4.8m.

Building 287 (F12,IV; G12,V) was the western continuation of Building 286, at a c 30cm lower level. It had a relatively well-preserved plan with longitudinal flooring. Eastern limit at 54.20y; western limit at 46.20y. Length 8.00m; width 4.40–4.50m. The building was displaced northwards.

Building 288 (F12,IV) was a direct continuation of Building 287, at the same level. They may even have been part of one building. Westwards it continued beyond the limit of excavation. It contained a brick fireplace (Hearth 5) and a relatively well-preserved longitudinal floor. Maximum recorded length 6.20m; width c 5m.

Just beyond the south-east corner of Building 274 was a well or cold storage pit, Well 36. The lining consisted of vertical boards placed edge to edge around a simple post-frame. Internal dimensions were c 100cm x 110cm; depth c 100cm. It belonged most likely to this period.

Over most of the South Row the situation was complicated, with an unclear distinction between Period 7 and the preceding phase.

There were no traces of a drain or wooden paving in the gap between Bugården and Bredsgården to the south.

North Row

At the east end of the site, the fire-layer from Fire II was recorded 20–25cm beneath the fire detritus from Fire I and just beneath the remains of the flooring. As with the previous level it was difficult to establish a definite division between the buildings. The following buildings were recorded at this level: 249, 253, 317, 318, 321 and 297.

Building 249 (L11,III) At the east end of grid-square L11 lay the remains of foundations from a building with badly burnt floorboards laid longitudinally and a contemporary paving in the tenement passage. Minumum length of building 3–6m; width unknown.

Building 253 (I11,III,IV; K11,III; L11,III) consisted of foundation timbers with the remains of a longitudinal floor. Estimated eastern limit at c 81.8y; western limit possibly at c 69.8y. Probable length 11.9m; width c 3.9m.

Building 317 (H11,II; I11,II–IV) comprised burnt foundation timbers with an assumed eastern limit at c 69.4y, western limit possibly around 59y. Probable length 10.5m; width 4.15m.

Building 318 (G11,IV,V; H11,III,IV) consisted of the remains of foundation timbers beneath the north wall and across the middle, and a few foundation stones beneath the south wall. At the west end, there were a few badly burnt transverse floorboards. Eastern limit at c 59y; western limit at 50.50y. Probable length c 8.5m; width 4.40–4.50m.

Building 321 (F11,V,VI; G11,IV,V) comprised the burnt-out remains of the north and south wall-alignments, with uncertain limits at the east and west ends. Possible western limit at 43.00y or 42.00y, where foundation stones separated the timbers burnt in Fires II and III. They may have used the same foundations, also for the partition wall. Approximate length 7.5m, alternatively 8.5m; width 4.10m.

Building 297 (E11,VI; F11,V) comprised the badly burnt remains of the structure. Eastern limit uncertain, possibly at 42.00y; western limit beyond the limit of excavations. Maximum recorded length c 4m; width at west end c 4.2m.

In contrast to the South Row where it was difficult to distinguish between the levels burnt in Fires II and III, throughout most of the North Row there was a clear separation of 20–40cm between the two fire-levels. Even so, it was difficult to distinguish the remains of the burnt buildings in the two levels, as for the most part only the foundations were left.

All things considered, Well 44, the predecessor of Well 35 (see p 23), must belong to this period. It was also lined with a stone wall built with more or less flat untrimmed stones of various sizes. Also like Well 35, there were flat stones on the bottom. It was oval in plan with internal dimensions of 155cm x 190cm and an estimated depth of c 2m.

Tenement passage

Practically no remains of the passage had survived apart from in grid-squares L11/12 where there were traces of a drain supported by stakes. The width of the passage varied from c 3m to 3.30m.

Eaves-drip gap between Bugården and Bredsgården

In the eaves-drip gap between Bugården and Bredsgården no structural remains were recorded.

Summary, Period 7

This period consisted of a single building phase with five buildings in the South Row and traces of six buildings in the North Row. Between this and the following Period 8, there was practically no agreement in the property boundaries. On the south side, the eaves-drip gap was even wider in this period than it was in the later phases and this was mostly at the expense of the width of buildings in the South Row, which varied between 4.40m and 5.50m. In the North Row, their width ranged from 4.10m to 4.50m.

Two wells or cold storage pits were recorded in this period, the wooden-lined Well 36 in the South Row, and the stone-lined Well 44 at the east end of the North Row, being a forerunner of the stone-lined Well 35 in Period 8. And quite unexpectedly, there were the remains of a fireplace right at the west end of the site, in Building 288.

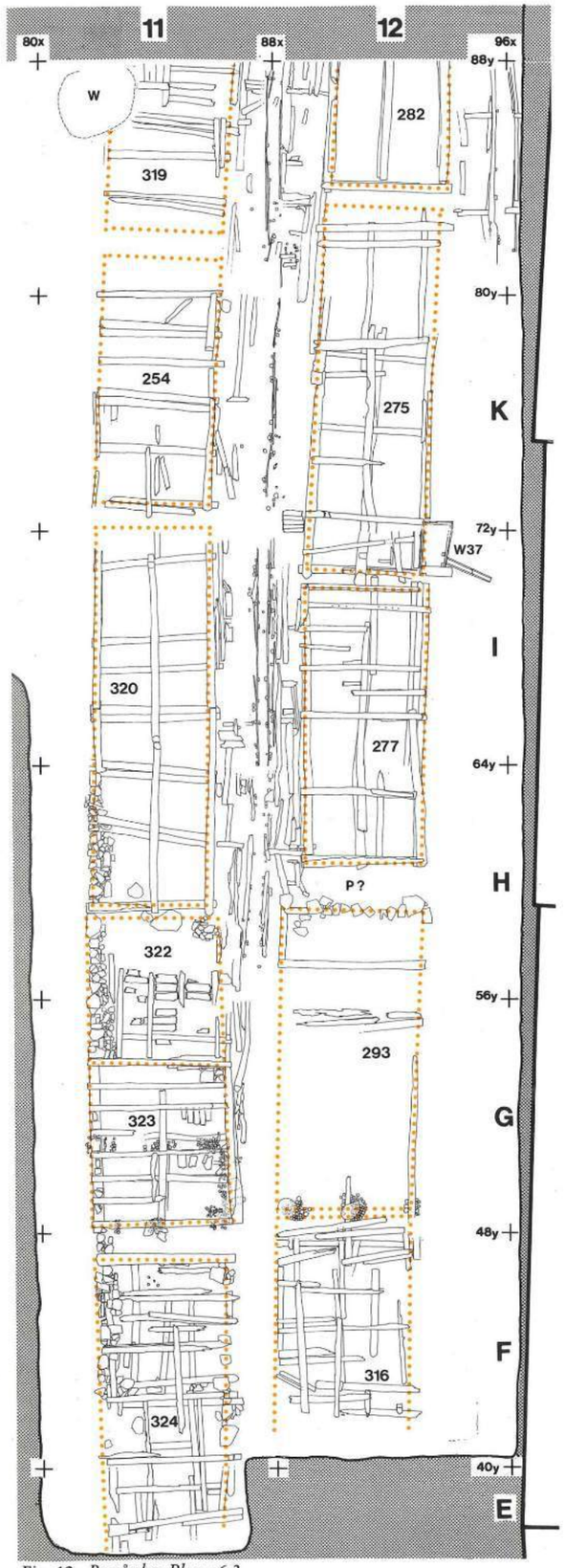
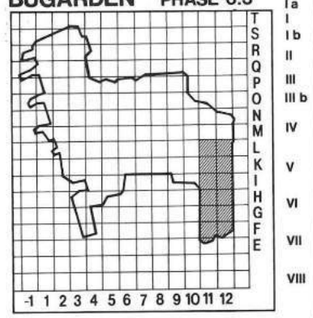


Fig. 12. Bugården Phase 6.3.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 6.3



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.11
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.11
II	1476		
III	1413	7	7
IIIb	1393	6	6.2, 6.21, 6.1, 6.11
IV	1332		
V	1248	5	5.2, 5.21, 5.1
VI	1198	4	4.2, 4.1
VII	1170/71	3	3.2, 3.21, 3.1, 3.11
VIII	Prev. unknown	2	2.2, 2.1
		1	1.2, 1.1

Practically nothing was found of the tenement passage in this period, except at the eastern end where there were traces of transverse planking and stakes which held the planks lining a central drain.

No structural remains were recorded in the eaves-drip gap between Bugården and Bredsgården.

Period 6

Phase 6.3, burnt in Fire III (1413) (dark yellow) (fig 12)

South Row

As with the buildings which were destroyed in Fires I and II, the situation which had burnt in Fire III could also be traced across the whole site, but the layer of detritus from the fire itself was only found here and there in the western half.

As already mentioned (p 27), the level burnt in Fire III marked the transition from the narrow properties of the earlier periods to the wide rows described above. The three buildings nearest the waterfront in this period, however, were of the same width as that recorded in the overlying levels, ie c 5m, and it was the width of the tenement passage which changed. Phase 6.3 comprised five buildings: (from east to west) 282, 275, 277, 293 and 316.

Building 282 (L12,V,VI). Under Building 257 in Phase 8.1 (palm green) there was a disturbed layer with no clear remains of buildings which could be associated with Fire II. The width of the building and the type of raw material used indicates that the underlying building phase must have burnt in Fire III. However, there were no remains of the building itself, only its foundations. Maximum recorded length c 4m; width c 4m. The south wall lay 1.40m further north than the corresponding south wall of Building 295, which burnt in the 1955 fire. The position of the north wall was unchanged.

Building 275 (I12,V,VI; K12,V–VII; L12,VI). There were no remains of the building above the foundations. Eastern limit at 83.60y; western limit at 70.60y. Estimated length 13m; width 4.30–4.40m.

Building 277 (H12,IV,V; I12,VI–VIII) comprised four to five courses of timbering in the foundations, as well as floor-joists and parts of the flooring. Eastern limit at 70.10y; western limit at 60.80y. Length 9.30m; width 4.20–4.40m.

Close up against the south-west corner of Building 275 lay Well 37 with an overflow drain in the form of a hollowed-out log 2.00m in length. The well was lined with vertical boards placed edge to edge and held in place with a simple post-frame. Internal dimensions were 80cm x 140cm; depth c 100–120cm.

Building 277 was separated from the next building to the west by a wider gap than usual. This seems to be due to the fact that at an earlier phase in this period there had been a privy here, which was entered from the tenement passage. When Buildings 277 and 293 were built, the tradition was retained, but not for the full width. There were no visible traces of the privy and it may structurally have been a continuation of Privy 7 in the previous period.

Building 293 (G12,V,VI; H12,IV) comprised traces of the flooring and discontinuous remains from the foundations. Eastern limit at 59.20y; western limit at c 48.7y. Estimated length 10.5m; width c 5m.

Building 293 was succeeded on the west side by Building 316, which is commented on below. The identification of these two buildings was very problematic for some time. Firstly, there were only a few scattered traces under Fire II in grid-squares F12 and G12 in the western part of the site. Secondly, it was not recognized during excavation that these scattered traces of burning comprised two distinct fire levels, Fire III in the previously established fire sequence and a local fire, subsequently labelled Fire IIIb, just underneath. The problem was made even worse by the fact that vertical posts had been driven down through the horizontal timbering of the substructure to form foundations, and the stratigraphy contained few clues for establishing the sequence of events. These posts were square-cut, c 2m long, and set in groups across the row, one cluster on the north, one in the middle and a third group on the south side. The tops of the posts were level and on two of the clusters lay a large flat stone, presumably for supporting the ground beams of the building.

The dating of these pile foundations remained an open question for a long time: they may have been related to the level burnt in Fire III (Building 293 and its neighbour to the west), but an association with the preceding local fire could not be entirely eliminated, even though it stopped 5m further east. It had to be assumed *a priori* that the pile foundations were secondary to the horizontal log foundation through which they were driven. It would seem to be pointless if they were part of the newly laid substructure (Kar 98) which, with its relatively fresh and loose filling, would have provided better stability than pile foundations. It was more reasonable to regard them as part of a later phase. This was confirmed in that they were banged down between and around the logs which were laid *after* the local fire and the construction of the log substructure Kar 98. They must therefore be regarded as part of the foundations of Building 293 in Phase 6.3, burnt in Fire III.

There were no actual structural remains associated with the pile foundations, but just to the west there was a fragment of burnt flooring from a contemporary building. For technical reasons it is difficult to believe that Building 293 continued further west than the extent of the substructure, and it makes better sense if the traces of floor belonged to a separate, but contemporary, building, so that the log substructure was a common foundation for them both. The western building was labelled Building 316 and it must have continued westwards beyond the limit of the excavations.

Building 316 (F12,V; G12,VI) apparently shared an end-wall with Building 293. Remains of flooring were found over a distance of 1.40m. Minimum length 8–9m; width c 5m. Eastern limit at c 48.7y; western limit beyond 41y.

North Row

Throughout most of the North Row there was evidence for two unburnt levels, but at the western end nearest the waterfront, the wharfside building at least must have burnt in a local fire shortly before Fire III. This corresponds to Fire IIIb in our chronological fire sequence.

The following buildings belonged to the level burnt in Fire III: (from east to west) 319, 254, 320, 322, 323 and 324.

Building 319 (L11,IV) consisted of burnt parts of the structure with the remains of a floor laid lengthwise over transverse joists. It continued eastwards outside the excavated area. Length and width unknown; maximum recorded length 5–6m.

Building 254 (K11,IV) had only the foundation timbers, the limits of which were uncertain. Possible western limit between 72.00y and 73.00y. Probable length 8–9m; width c 4.1m.

Building 320 (H11,I,V,VI; I11,IV–VI) had continuous foundation timbers with a clear western limit at c 59y in grid-square H. Probable length c 14m, possibly two separate buildings. Width 4.10–4.20m.

Building 322 (G11,VI; H11,IV,V) consisted of the burnt remains from the building with parts of a transverse floor. Probable eastern limit along 58.50y. Length 5m; width c 4.7–4.8m. There is a possibility that it shared a common wall with Building 323 to the west.

Building 323 (G11,VI,VII) consisted of the burnt-out remains of the structure with traces of a longitudinal floor. Its east wall was possibly common to Building 322. West wall at 48.30y. Length 5.30m; width 4.90m.

Building 324 (F11,VI,VII) consisted solely of the foundation timbers and the ground-wall for the north and south walls. Eastern limit at 47.40y, possibly at c 48y; western limit uncertain. It perhaps went as far as c 38y with a possible end-wall along 43.00y. Length up to 10m; width c 4.4m.

West of c 45y the foundations consisted of all the layers of timbering to a depth of -2.80m. Moreover, all the filling above a depth of c -3.6m must belong to this building phase, which was burnt in Fire III.

Also in the western part of this row it was difficult to determine the boundary between Phases 6.2 and 6.3, especially as the front area in Phase 6.2 (under Buildings 323 and 324) had clearly been swept away in connection with the reinforcing and extension of the foundations for the subsequent Phase 6.3. In contrast to the South Row, where

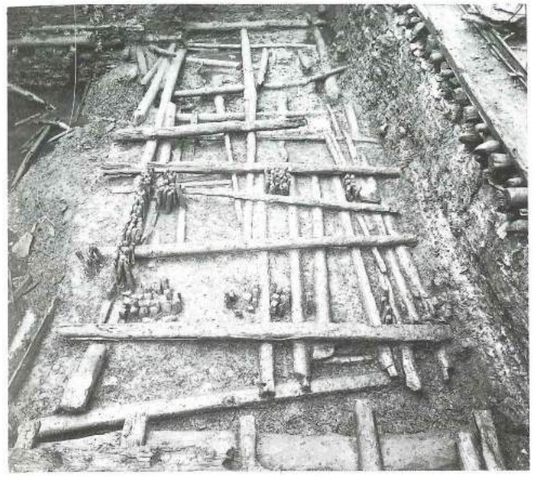


Fig. 13. Pile foundations from Phase 6.3 in Bugården North, looking west. The stakes have been driven down through the underlying Phase 6.2 foundations.

isolated pile foundations formed supporting points, in the North Row they covered a complete rectangle (fig 13). The preceding foundation substructure, Kar 107, showed signs of significant settlement, particularly on the north side. This caused problems for which compensation had been required, for example, in the form of piles, which are therefore regarded also here as the primary foundations for Phase 6.3, burnt in Fire III.

Tenement passage

Practically nothing was left of the wooden pavement, but the supporting stakes and side boards of a drain and remains of timber infill had survived over a length of 37m, out to 51.00y in grid-squares G11/12. Width of pavement c 3m, increasing to 3.40–3.50m for a stretch within grid-squares K11/12.

Eaves-drip gap between Bugården and Bredsgården (the Bua-almenning public thoroughfare)

At the far eastern end of the gap between this and the neighbouring tenement, there were the remains of boards set on edge and slender supporting stakes from a drain, as well as the remains of what had probably been the joists for the wooden paving. It is unclear whether these are just the remains of a limited stretch of wooden pavement, or whether it originally ran the whole length of the tenement. There were in any case no traces of wooden paving further west at this level.

Well No. 37 seems to have been situated mostly out in the thoroughfare and its overflow channel went into the main drain.

Phase 6.2, burnt in Fire IIIb (1393) (dark brown) (fig 14) (= the lower level below Fire III)

South Row

There were five buildings belonging to this level: 300, 299, 279, 278 and 294.

Throughout the whole row there was a good separation between Fires IV and III, varying from 60cm to as much as 1.20m, and it was found that most of the buildings in the dark yellow Phase 6.3 were preceded by structures which had not burnt. In a couple of cases there were even two levels of unburnt material. Moreover, in the western part of the tenement there were traces of a local fire just prior to Fire III. This, together with other conditions, led to complications in the identification of the separate building phases. The degree of preservation was at times quite poor, and this was often the case just where the transition between building phases would have been expected. In addition, there had been a significant compression and settlement over large areas of the tenement, as much as 80cm over a distance of only 8m in one part of the passage. If the adjacent row of buildings did not settle to the same extent, one would expect that the passage would have been partly built up to compensate, but under such poor conditions of preservation it was not always easy to distinguish such secondary layers from the primary construction. Finally, the different buildings in one and the same phase had different lengths of life, and this caused problems which were often difficult to solve.

In the massive timber foundations below Building 282 in Phase 6.3, there was a distinction between round tree-trunks simply stripped of their bark and regularly laid square-trimmed cross-beams (course 5 beneath Fire III in the long section). During excavation there was some doubt whether these were floor joists *in situ* or re-used material, but the seating in the side-logs was carefully made and the cross-beams were laid in quite a different manner than the other foundation timbers. However, it was the regular spacing (75–85cm) which was the criterion for being able to identify these as joists laid *in situ*. These square-trimmed beams together with the underlying two layers of logs are interpreted as a separate building, Building 300, belonging to Phase 6.2 (dark brown). Immediately to the west, a demarcation in the foundations was recorded beneath Building 275, also here marked by square-trimmed joists placed at regular intervals. They lay 18–20cm lower than the joists in Building 300 and have been interpreted as a separate building, Building 299. There was an even greater difference in levels between Buildings 282 and 275 in Phase 6.3 (dark yellow).

Building 300 (L12,VI,VIII) comprised square-trimmed floor joists, placed at regular intervals, as well as parts of the timber foundations. It extended eastwards beyond the limit of excavation. Maximum recorded length 3.55m; width 3.80–4.00m.

Building 299 (K12,VII,VIII; L12,VII,VIII) consisted of timber foundations and the square-trimmed floor joists placed at regular intervals. Eastern limit at 83.80y; extent westwards unclear, but at least to c 78y. Maximum recorded length 5.80m; width 4.20–4.30m.

Under the western part of Building 275 it was not possible to recognize any definite remains of buildings, but beneath Building 277 there were the relatively well-preserved remains of two buildings from Phase 6.2, Buildings 279 and 278.

Building 279 (I12,VIII,IX) lay to the east with a floor laid longitudinally. It was a short building, only 2.80m. It is perhaps possible to interpret the floorboards as

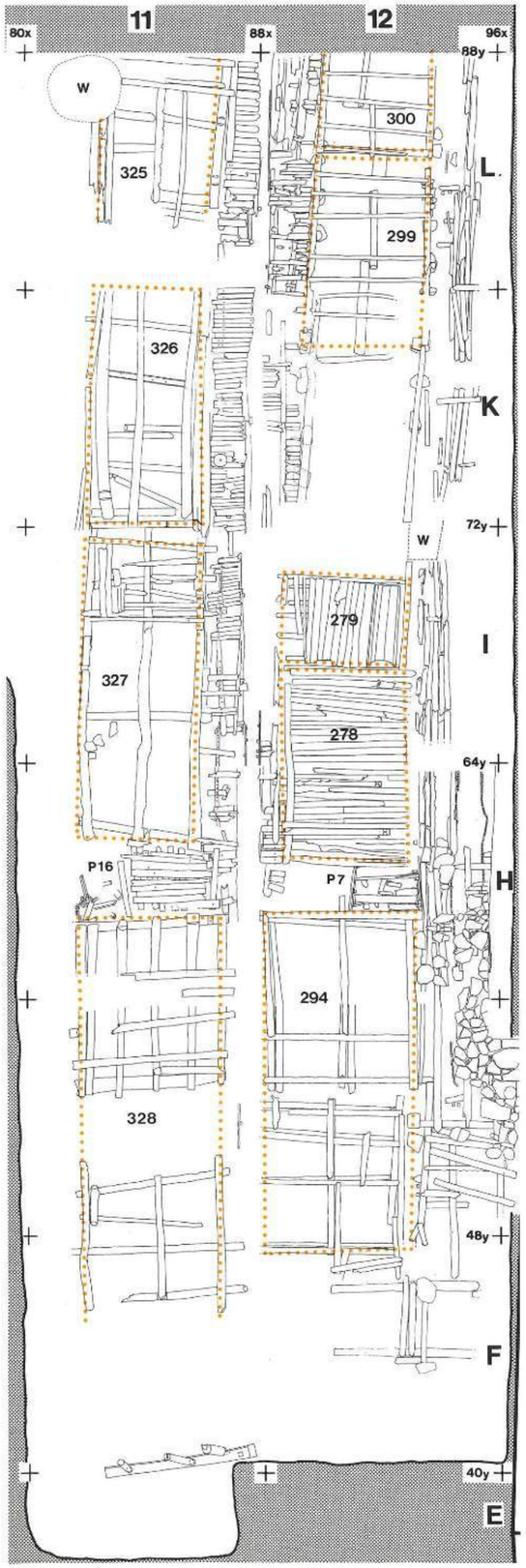
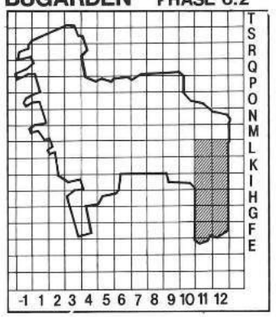


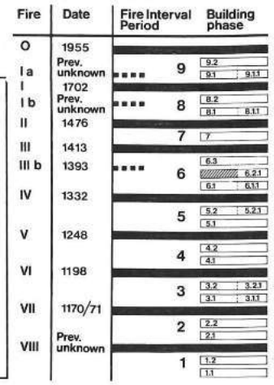
Fig. 14. Bugården Phase 6.2.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 6.2



CHRONOLOGY



the pavement in a cross-passage, but it seems a little too wide for this. Moreover, it was only 13–15m back from the assumed waterfront and there can hardly have been any need for a cross-passage at this point. The planking has therefore been regarded as belonging to a building. Eastern limit at 70.20–70.30y; western limit at 67.40y. Width 4.00–4.25m.

Building 278 (H12,VIII; I12,VIII,IX) consisted apparently of the sill-beams for the east and west end-walls, possibly also a layer of closely placed cross-beams, which without exception were re-used building material. This compact layer could in fact belong to Building 277 in the following phase. Building 278 must have replaced an earlier building, designated Building 302 in Phase 6.1 (dark blue), even though all actual traces of a building had been removed. The decisive argument for interpreting this as two separate buildings, 302 in Phase 6.1 and 278 in 6.2, is that there were two distinct layers in the tenement passage, as well as in the Bua-almenning thoroughfare, corresponding to the two layers of building. Eastern limit at 67.20y; western limit at 60.80y. Length 6.40m; width c 4m.

There was the same wide gap to the west of Building 278 as was noted to the west of Building 277 in Phase 6.3, and in this gap were the remains of the ground frame and base boards of a privy, measuring c 2.2m x 1.6m (Privy 7). It was a relatively rudimentary structure, the horizontal boards being held in place by internal stakes.

The next building, Building 294, differed from the other buildings of Phase 6.2 in that it had burnt in a «local» fire, the visual traces of which were limited to the westernmost part of the tenement. Its relationship to Fire III, of which only sporadic traces were found here, proved especially problematic to understand (cf p 30). Comparable, but more obvious, localized fires in both Bugården North and in adjacent areas of Engelgården to the north have, however, helped to provide an explanation in this case. Burnt logs from the foundations of Building 277 were also found. The fire was apparently not as restricted in its extent as was first assumed. Although its effect was only reflected within a limited area of the western part of the tenement, nevertheless all the buildings in the property were replaced, giving us our Phase 6.3 which followed this local fire. It must therefore be regarded in a much wider context, and we shall be returning to this in due course.

Building 294 (F12,V; G12,VI–VIII; H12,IV,V) was only documented by its foundations, whose uppermost level was completely burnt through c 5.5m from the building's eastern boundary. The foundations, however, continued for a further 1.5–2m, indicating a total length of c 6m, which in itself is not unreasonable compared with the other buildings in the Row. But the foundation substructure continued with overlapping logs out into the Bua-almenning thoroughfare and on to an extensive log substructure further west with twenty-eight courses of logs, which had apparently been laid in two stages. The lower nine courses (courses 20-28) formed a distinctly separate unit (Kar 97), while the upper nineteen (Kar 98) seem to have belonged to Phase 6.2. Together with the logs under the eastern part of Building 294, they formed a continuous foundation covering a length of 11.60m and it is tempting to associate this with the tenement's wharf-side building. Estimated western limit of Building 294 at c 47.6y. Width of building c 5m.

The position of the wharf is unknown, as any informative archaeological evidence was presumably removed during later construction work. The foundation substructure (Kar 98) ended between 47.00y and 48.00y, but it was so irregular that any idea that it could have functioned as a wharf must be rejected. From the long section (pl 1) it can be seen that one of the beams in the seventh course of logs counting downwards projected c 1.2m out from the front of the substructure. The foundations under the public thoroughfare on the south side of the tenement could be followed for at least 7m further forward, beyond 41.00y, while for the North Row, the foundations ended in a very clear line of piles forming the front of a wharf c 7m further forward, at c 40.5y (pl 2). All these features should normally have helped us to understand what was happening at the front of the South Row, but so many strange features were encountered in the course of the excavation that the possibility of local deviations in the waterfront could not be ignored, such as a wharf pulled back from the general alignment to form a little bay or inlet, known locally as a *hop* in Norwegian. However, the nature of the foundations excludes such a possibility: if there really had been no wharf at the front of the tenement, then we would have the peculiar situation in the South Row of a wharf-side building standing behind a very irregular arrangement of projecting timbers. We must therefore reject the idea of a local inlet on purely technical grounds, and this conclusion is confirmed by the situation in the area of the thoroughfare and in front of the North Row. Moreover, the pottery from the overlying substructure, Kar 99, is generally different from that which is characteristic for Phase 6.2, as found in substructure Kar 98. As a consequence, one is left with the fact that the supporting foundations, whose eastern limit was at 59.00y, ended with the foundation substructure Kar 98 around 47.6y, and that in front of this there would have been a wharf supported on piles, which on the evidence of the North Row could have measured between 5m and 7m from front to back. The public thoroughfare continued for a further couple of metres beyond the front of the wharf.

North Row

The buildings belonging to this level were 325, 326, 327 and 328.

Building 325 (L11,V) continued eastwards beyond the limit of the excavations. The north wall was cut by the shaft of a later well. Probable western limit at 82.80y, as indicated by the sill-beam of the south wall. Maximum recorded length c 5.4m; estimated width c 4.4m.

Building 326 (K11,V) had unburnt foundation timbers. There was a well-preserved pavement in the passage continuing from Building 325 on the east side. Unsure limits at both east and west ends. Probable eastern limit at c 81–81.5y; western limit at c 72y. Estimated length 9–9.5m; width 4.10–4.20m.

Building 327 (H11,VII; I11,VII) could be estimated from the neatly squared joists. Parts of the floor and foundation timbers survived, as well as the adjacent passage. Eastern limit at c 71.8y; western limit at c 68y, but the west end of the building was probably cleared away during the construction of the later Building 320. Maximum recorded length 3.50m; width c 4m. It may have been up to 10.8m long, terminating at c 62y.

From the evidence it seems that Building 327 continued up to c 62y, where the house foundations were cut by a c 2.2m wide strip of transverse boards laid side by side, stretching from the passage to a point within the tenement. As with a comparable situation in the South Row, this has been interpreted as a gap between buildings which was used for a privy (Privy 16), placed in the part of the property furthest away from the passage. It would have measured c 2m x 1.4m, although no actual remains of the structure were found. The situation, in other words, indicates that there had been another building on the west side, and that this had burnt in the local fire preceding Fire III, as described above.

Building 328 (F11,IX,XI; G11,IX; H11,VI,VII) comprised badly burnt foundation timbers, partly covered by a reddish fire-layer 10cm thick, which contained tile fragments and small stones. Eastern limit at 59.00y. The fire-layer extended for a good 4m, and the underlying foundation unit continued for c 6.3m. Both features seem too limited to indicate a building at this level, which would have to be the tenement's wharfside building. However, the foundations continued westwards for a further c 8m in the form of a new substructure (Kar 107), and the western limit of the building in this phase must correspond with this foundation unit, at c 45–46y. This gives a total length of some 13m, which would not be unreasonable for a wharf-side building in this period, immediately prior to Fire III.

The contemporary wharf-front was presumably indicated by a row of piles along 40.5y. Estimated width of the wharf was c 5.5m. The depth of water in front of the wharf was 3.4m, which would give a corrected depth of water of probably 2.7m, when a settling and compression of the deposits of c 100cm and the land-rise are taken into account (cf p 19).

It seems surprising that one dared to make use of constructions of the type clearly illustrated on the long sec-

tion. Even though there were no buildings erected on the very front of the substructure, it is difficult to believe that the projecting part of Kar 107 could have had stable footings on the vast deposits of loose backfill which were dumped into the sea at a depth of from 2m to 6m, most of it in association with the reconstruction work following Fire IV. There is no reason to doubt that the ground must have been highly unstable.

Tenement passage

As in the upper levels, the passage was disturbed down the centre. It consisted of a transverse wooden pavement laid on longitudinal joists, all generally well-preserved, covering a stretch of 28m from the east. All traces had been removed in the front 18m. The drain was marked by side planks set on edge. The width of the passage was between 3m and 3.2m.

Eaves-drip gap / the Bua-almenning public thoroughfare

In this phase there were continuous remains of the street for practically the whole length of the tenement, consisting partly of supporting joists placed close together, and partly of a staked drain and stone paving (figs 15 and 16). From the evidence, this level seemed to represent the final phase in a series of similarly constructed arrangements. The primary feature consisted of pairs of supporting posts joined with cross-beams, which sometimes carried longitudinal joists on which the wooden pavement was laid, and sometimes carried a filling of long timbers placed side by side. At the front of the site, the foundations were in principle much the same as in the substructures, except that the cross-beams were laid much closer together. The substructure unit also projected to a certain extent in front of the line of buildings.

The drain or sewer consisted of slender stakes, c 1.4–1.5m long and roughly square in section, which were driven in at close intervals at an angle to form a V-section, measuring between 70cm and 100cm across at the top and 50-60cm across at the presumed base of the drain. Any underlying constructions had been cut through in order to allow a free flow in the drain. The upper part was built up with a couple of timbers laid across each other, and the sides of the drain were stabilized by a filling of gravel and wood chips of various thickness providing the bedding for the untrimmed paving stones.

At the eastern end of grid-square G12 and the adjacent area of H12, which was the only place where the wall alignment of Bredsgården could be located, the street was 3.50m wide.

Phase 6.1, unburnt level beneath Fire IIIb (dark blue) (fig 17)

South Row

This level contained three buildings: 281 with a fireplace (Hearth 12), 302 and 303.

Fig. 15. Stone paving from Phase 6.2 in the public thoroughfare of Bua-almenning, looking south towards Bredsgården.

Fig. 16. Stake-lined drain from Phase 6.2 beneath the stone paving in the Bua-almenning thoroughfare.

Under Building 300 from Phase 6.2 in the eastern part of the site there were no traces of buildings, but there were mixed deposits forming a layer up to 20cm thick covering the underlying fire layer. However, against the south wall of the adjacent Building 299 and on the same level as the base of the foundation beams, there was a clay-lined stone arrangement measuring 1.30m from east to west and 1.60–1.70m from north to south. There can be no doubt that this represents the remains of a fireplace (Hearth 12) in an initial building phase following Fire IV. The building has been designated Building 281 in Phase 6.1 (dark blue).

Building 281 (K12,VIII; L12,VIII) was limited on the east side by a transverse ground-wall between 84.60y and 85.00y, but the western limits were uncertain, possibly at 76.60y. Probable length c 8m; width c 4.1–4.2m.

Within the next 11–12m of this level there was no clear evidence of any remains of buildings, and the next recorded building 302 had an unclear eastern limit. Furthermore, this building was only indicated by its surviving foundations, which consisted of four courses of logs beneath Building 278. The deciding argument for making two separate buildings here has already been given (see p 31 above): they corresponded to the two levels in the tenement passage.

The earlier phase must have comprised courses 3–6 of the logs in the eastern part of H12 (pl 1). The surface of the passage at the same height as the third course of logs rested on a transverse beam in the fifth course of logs of the adjacent foundation substructure, Kar 96, to the west. The relatively large substructure in the western part of H12 and the eastern part of G12 must therefore also have been constructed in several stages. Firstly, Fire IV marks a dividing point in the substructure at the twelfth course of logs, beneath which the substructure is labelled Kar 95. Moreover, the uppermost eleven courses must belong to two successive building phases, Phases 6.1 and 6.2. The lower part, which would seem to comprise courses 5–11, is associated with the Building 303 in Phase 6.1, while the upper part, courses 1–4, can be seen in association with Building 294, which was burnt in the local Fire IIIb in Phase 6.2. One must therefore assume a first phase, Phase 6.1, following Fire IV, which is represented by Buildings 302 and 303.

At the south end of the 1.4–1.5m wide gap between Buildings 302 and 303 was a privy (Privy 17), whose physical remains had been removed, but which had probably had the same dimensions as Privy 7 (see p 32).

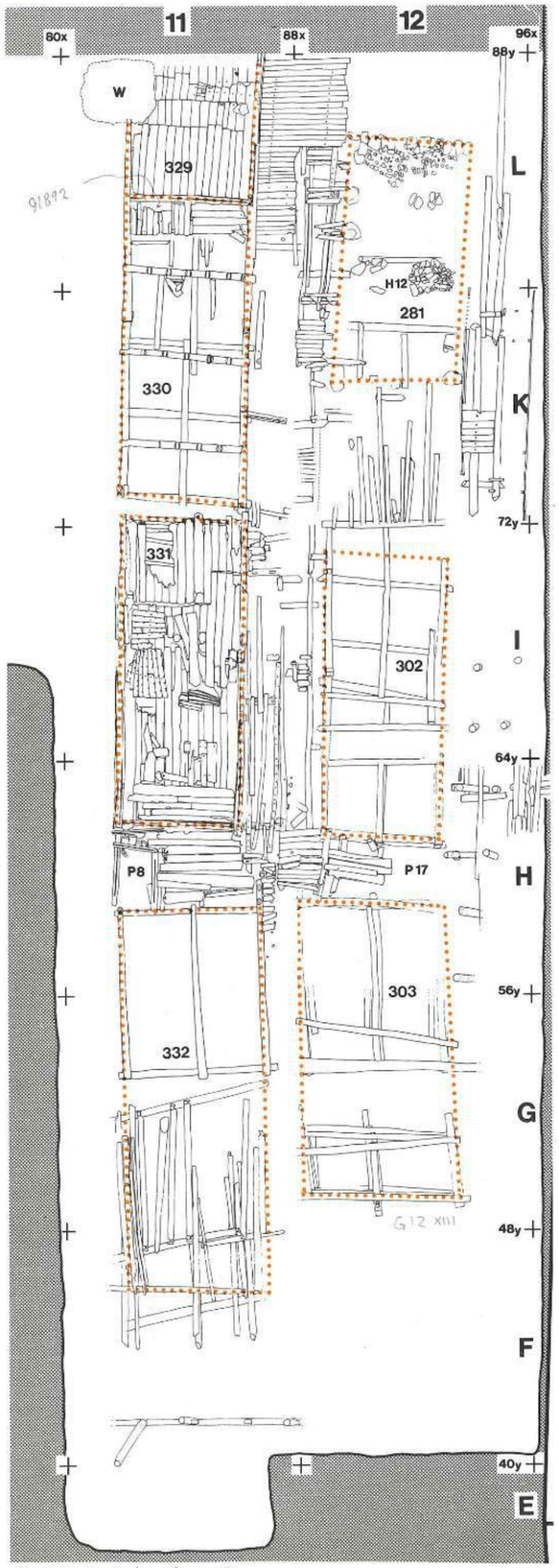
Building 302 (H12,VII; I12,IX) comprised four courses of foundation timbers. Eastern limit unclear, probably around 70y; western limit at 61.20y. Assumed length c 8–9m; width c 4m.

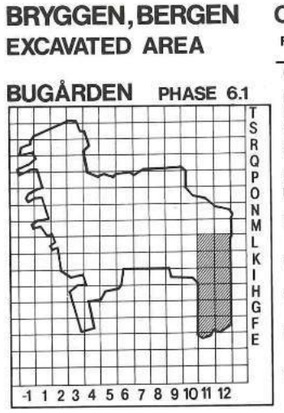
Building 303 (G12,VIII,IX,XIII,XIV; H12,VII) was represented solely by timber courses 5–11 in the foundation substructure Kar 96. This ended 5.60m further forward at 53.60y, which would therefore suggest a minimum length of 5.60m for Building 303.

The way in which the front of Kar 96 lay some 80–90cm further back than the underlying substructure Kar 95 clearly demonstrated that this could not be the end of a tenement. We seem to find ourselves in a situation similar to the following phase, in that the foundations themselves do not form the front of the wharf. This must have lain further forward. To the west, however, there was the large foundation substructure in the western part of grid-square G12, which, as indicated above, comprised two separate sections, a shorter one underneath (Kar 97) and a longer one above (Kar 98). The long section through the site (pl 1), which is relatively representative, shows the upper section (Phase 6.2, dark brown) separated from the lower one (Phase 6.1, dark blue), which is shorter and narrower, and can almost be regarded as a «torso». It would appear that this represents only part of a foundation unit, the part which formed an anchor for an original extension of the Phase 6.1 (dark blue) structure. The rest had been subsequently removed and an amount of material deposited, after which the upper nineteen courses of logs were laid. There is a certain amount of overlapping with regard to the substructures 95 and 96, which clearly demonstrates that Kar 98 is secondary compared with these.

The log substructure Kar 97 continued out to c 49y, which would give a maximum length of 10m for Building 303.

As in the following phase 6.2, there were no clear indications of the front of the wharf in Phase 6.1. That the foundation substructure also served as a wharf in this





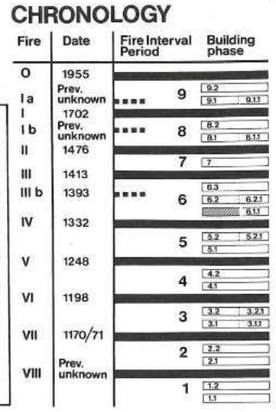


Fig. 17. *Bugården Phase 6.1.*

phase cannot therefore be ignored, but such a solution would seem improbable as there is evidence for the remains of a wharf in the northern half of the tenement in both the first and the second phases following Fire IV (cf the long section through Bugården North, pl 2). If the arrangement in the Rows were more or less similar, one would expect a waterfront along c 42y, all of 7–7.5m in front of the substructure Kar 97. The wharf would thus have a maximum length from front to back of c 7m.

North Row

The timber in Buildings 325–328 in Phase 6.2 was in a better state of preservation generally than that in the later phases, but it was still difficult to distinguish the individual buildings with certainty. In the unburnt Phase 6.1 the state of preservation was so good and the building material so richly represented that the buildings could easily be identified. The level comprised buildings 329, 330, 331 and 332.

Building 329 (L11,VI) was represented with the practically intact ground-plan of a timber-frame building, whose eastern part lay in the unexcavated area. It comprised the sill-beams, the longitudinally-laid floor and the adjacent wooden pavement of the tenement passage. Maximum recorded length 5.20m; width 4.45m.

Building 330 (K11,VI; L11,VI). The sill-beams of the side-walls and some of the foundation timbers continued westwards through grid-squares K11, I11 and the adjacent part of H11, a distance of c 20m in all. Building 330 was the easternmost of the buildings here, its remains consisting only of foundation timbers, together with joists in the passage. Between 329 and 330 there was a c 1.2m wide gap paved with short flat pieces of wood. Eastern limit at c 81.8y; western limit at c 72.8y. Length 9m; width 4.40m.

Building 331 (H11,VIII; I11,VIII; K11,VII) comprised the relatively well-preserved remains of the floor of a timber-frame building, together with the wooden paving of the passage. Eastern limit at c 72.5y; western limit at 61.90y. Length 10.6m; width 4.25m.

West of Building 331 there was a 2.80m wide gap directly beneath the gap which was recorded between Buildings 327 and 328 in the phase above. Like this, it had a floor of short flat pieces of wood stretching from the tenement passage to a point about half-way across the row, where it finished in a rectangular ground-frame of sill-beams. These had a slot in the upper edge to receive a wall of vertical planking. The deposits suggest that the ground-frame belonged to a privy, Privy 8, which had measured c 2m x 1.30m. It is interesting to note that in Phase 6.2 there were privies on the opposite side of the tenement passage in the South Row, but there were no physical remains from such an arrangement in Phase 6.3. In all, the privies would appear to confirm our interpretation of the chronological sequence of layers in the two rows.

Further west there were no clear remains of any structures belonging to this phase 6.1, following Fire IV, but the plank floor of the privy at this level was connected with the sixth timber course (counting downwards) in the foundation substructure Kar 104 to the west. Phase 6.1 ought therefore to have comprised the foundation timbers up to and including the sixth course, probably also the fifth course. As mentioned above, the substructure Kar 104 continued to c 53.3y, but, as in the succeeding phase, the row in this first phase following Fire IV could hardly have ended here, as Kar 104 was lying on deeper substructures which projected significantly further west. During excavation it had not been possible to gain any clear picture of the connection between these various substructures. Moreover, there was some doubt as to how the intervening fire layer, Fire IIIb, should be interpreted: whether this fourth fire layer from the top really was the fourth fire in our predetermined sequence or not. We shall be returning to this point later.

There were in fact five separate substructures here, 102–104, 106 and 107. But even though these were apparently built into one another, it proved relatively simple to distinguish the individual units (pl 2).

Starting with the deepest one, Kar 102, in the western part of H11 and the eastern part of G11, a relatively straight front was recorded at 52.5–53y at the west end. This comprised timber courses 36 to 23 inclusive, counting upwards. Some 2–3m in front of Kar 102, the long section showed a long slanting post, which was held at the base by a transverse beam on the same level as the substructure. There can hardly be any doubt that this post, which belonged to a row running across the property, indicated the front of the wharf.

From this it follows that the substructures 106, 104 and 107 must all be later, but they have not belonged to the same phase. If one traces the courses of logs upwards in the rear part of Kar 102, one finds burnt timbers in courses 12, 9, 7 and 5. In course 12, it is a question of several burnt timbers and parts of timbers, placed relatively close together across the northern part of the substructure (mostly off the long section). They seem to have been placed here in order to correct a partial sinking of the foundations.

As there were burnt deposits on a level with the base of course 12 which were a direct continuation of the almost continuous burnt deposits back to the true fire-layer IV at c 71y, the junction between courses 12 and 13 was tied to this fire and interpreted as a dividing line in the substructure. The hypothesis was strengthened by the fact that above course 13 there was a shift to the west and the upper logs were associated with those in the substructure Kar 106, which projected even further, as shown on the long section. This implied that courses 36–13 in Kar 102 and Kar 103 belonged to the level which burnt in Fire IV, while courses 12–6, Kar 104, belonged to the first phase, Phase 6.1 following Fire IV. This situation can be interpreted in two ways: either there was a limited foundation substructure which went as far as c 53y to the west of Kar 103 and was later removed, or Kar 103 itself represented the western limit of the wharf-side building, which would give a wharf of c 6m from front to back. With the first alternative the wharf would have been somewhat shorter, 2–3m at the minimum.

While the rear of Kar 104 rested on Kar 103, it was constructed with its front resting on timbers belonging to Kar 106. The latter consisted of timber courses 44–27, of which 27 was the same as course 14 in Kar 104, which represented the first building extension following Fire IV. There is reason to believe, however, that Kar 106 originally continued to about the same height as Kar 107 or in any case to a point level with timber courses 5–6 in Kar 104 to the east. The reason why we are not willing to combine 106 and 107 into a single substructure is because of certain features which cannot be disregarded. In the transition between 106 and 104, the timbers in course 13 in 104 (which is the same as course 26 in 106) were cut through and this must *a priori* be seen in association with some later activity, perhaps connected with the renewing of the western part of the substructure (Kar 106). It would therefore seem right to take into account from the start the possibility that 106 in Phase 6.1 was originally higher, that it was dismantled down to courses 27–28 in Phase 6.2, and that 107 belongs to the later phase, 6.2, the second phase after Fire IV.

Another feature which is of vital significance for our interpretation of the connection between 106 and 107 is an intervening layer of sand some 20cm thick running in front of the substructure on a level with timber courses 28–30. At the time when the sand was deposited in the foundations, the filling in and around the timber substructures must have been at this height. This deposition of material, whose existence is indicated by the layer of sand, has therefore been not only a necessary prerequisite for the westwards extension of the substructure, but an integral part of the extension. But in the way in which it has been revealed in substructures 106 and 107, this extension could hardly have been part of the original plan.

If the layer of sand is seen in connection with the logs in the foundation substructure 104/106 which were cut through, the suggestion that substructure 106 had been partly dismantled before being re-used becomes more viable, because the sand deposit could represent a levelling up of the feature, as well as a basis for the new substructure 107.

The long section also gives the distinct impression that Kar 107 could not have been a part of Kar 106, but was rather part of some subsequent development.

The top of Kar 106 was recorded at c -1.60m. On the assumption that the stratigraphy here had become compressed by at least 70–90cm, the working level would have been taken down to c 70–80cm below mean sea level, or c 30–40cms below water level at low tide. This would have given quite acceptable working conditions.

If the substructures 106 and 107 were part of the same waterfront construction in Phase 6.1, the thick deposit of

sand in and around Kar 106 would hardly make any sense. As layers of sand in other phases were found to indicate an initial levelling up of the site, it is preferable to use the same interpretation in this case. In other words Phase 6.2 began with the depositing of a sand layer to form a basis on which Kar 107 was erected.

As already suggested in the commentary on Bugården South in this phase, a braced line of posts running across the property along c 40y is thought to be the front of the quay.

On the basis of what has been said above, the foundation substructures 104 and 106 are interpreted as part of the waterfront in Phase 6.1 and as the foundation of its waterfront building, 332.

Building 332 (F11,XI–XIII; G11,IX,XI; H11,VIII) was only represented by its foundations. Eastern limit at 59.00y; seaward facade must have been along c 49y. Assumed length c 10m; width estimated at 4.8–5m.

The waterfront in this phase would seem to have been identified at c 42y (figs 17 and 18). The length of the wharf from front to back was c 7m and the depth of water in front was c 3.6m.

The building up of the substructure shows that Fire IV was followed by quite a formidable backfilling and raising of the sea-bed in front of the old wharf from c -5.8m to c -2m. In the following phase a more limited backfilling was recorded. The most remarkable feature with both of these phases, however, is that the height of the sea-bed was raised to such a level that the depth of water in front of the wharf was reduced from c 6m to c 3.6m. A correction of almost 100cm should be taken into account for the settling of the foundations, so that the depth of water would have been reduced from c 5.2m to c 2.9m at mean sea level.

The interpretation offered here, which is based on a stratigraphical and structural analysis, can only be corroborated by the results of the pottery analysis and dendrochronological investigations. But these will also contain uncertainties. The enormous volume of deposits which are involved may contain finds spread over a long period of time, even though the constant rebuilding activities would have led to a regular cleansing of the town. With the dendrochronolgical material there is a danger that samples are from re-used timber, but the possibility of errors here seems to be small, since samples were always taken from apparently previously unused logs.

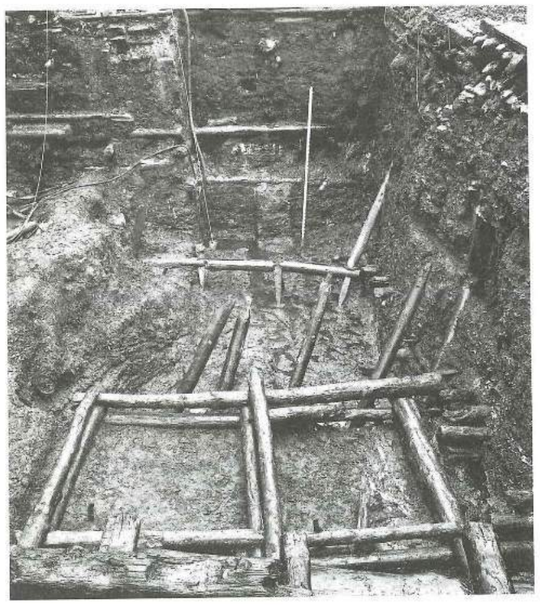


Fig. 18. In the background: the remains of posts which had carried the quays from Phase 6.1 in Bugården, together with the foundation substructure. Centre: remains of 5 posts carrying the Phase 5.2 wharf. Looking west.

Tenement passage

In this phase the remains in the passage were obliterated in the front part of the property, but in L11/12 the planking in places was beautifully preserved for the full width. And it went well up to the buildings. The width of the passage was 2.80–2.85m, while the distance between the rows was 3.00–3.10m. There was no evidence for a drain. In the western part, pile foundations were used to support the joists on which the boards were laid.

Eaves-drip gap / the Bua-almenning public thoroughfare

In the gap between Bugården and the adjacent tenement there were continuous remains in grid-squares K12 and L12. These consisted of longitudinal joists with fragments of five planks in the western part of K12, where there were also the remains of the stakes and side-planks from a drain. Further traces were recorded in H12, where they consisted of two, possibly four, pairs of supporting posts. The transverse joists connecting them were cut through by the laying of the staked drain in Phase 6.2, which was affected by Fire IIIb.

The remains at this level cannot be traced westwards with any certainty beyond 60.80y, but the contemporary waterfront lay 14–14.5m further forward at 45.5–46y. The width at 64.00y was c 3.6m.

Between this level and Phase 6.2, which burnt in Fire IIIb, there were the remains of two posts and fragments of overlying joists in the western part of H12. These had also been cut through by later structures. This intervening feature lay 20–25cm above the remains from Phase 6.1. As there were no other traces of an intermediate level in the gap between the tenements, it seems reasonable to regard it as a partial raising of the paving at the western end of the thoroughfare during Phase 6.1.

Summary, Period 6

During this period, which lasted for 81 years, both rows underwent three distinct building phases, 6.1, 6.2 and 6.3. The final phase, 6.3, represented the rebuilding following a fire in 1393, but it lasted no more than 18–19 years before it was destroyed in the 1413 fire, which marked the end of the period. This was the first time that there was any evidence in Bryggen itself for the fire in 1393 and it was only recorded in the western part of the tenement. However, scattered fragments of burnt timbers in the lower levels of the foundations to the east confirmed that the whole tenement had been rebuilt after a fire. The same situation was found in the neighbouring tenements of Engelgården and Søstergården to the north. It is reasonable to assume that the fire in 1393 did not spread beyond Søstergården, possibly stopping between the South and North Rows of that tenement.

In Phase 6.3 there were five buildings in the South Row and six in the North Row. In Phase 6.2 there were also five buildings in the South Row, but only four in the North, while in the earliest phase, 6.1, the South Row had three buildings and the North Row four.

While the tenement in the latest phase continued westwards beyond the edge of the excavations, in the two earlier phases it terminated within the excavated area with wharfs carried on posts. In this period therefore, one has been confronted with hitherto unknown details in the construction of the wharfs and the expansion of the wharf-side development out into the harbour basin. In Phase 6.1 the dumping of deposits to a depth of 6m was followed by the construction on a formidable scale of horizontal timber foundations consisting of up to 40 or more courses of logs. In Phase 6.2, however, there was only a minor adjustment of the waterfront itself, limited to an extension of the wharf of c 1.5m. The structural details and the development of the wharf are documented in the North Row; in the South Row conclusions have been based on comparative material.

The property boundaries varied somewhat compared with Period 7, with the exception of the western part where the boundary between 59.00y and 60.00y was constant. During the three phases of Period 6 the boundaries remained more or less constant.

In the course of this period the southern limit of the tenement moved further north and the width of the South Row became more like that of the North Row, which was constantly narrow. Throughout the whole period there were simple plank-walled privies in the South Row, and in the first two phases there were similar arrangements directly opposite in the North Row. As elsewhere within the excavated area of Bryggen, the privy was placed at the far end of a cross passage between two buildings, as far away as possible from the tenement's central passage. A well connected with Building 275 was constructed in Phase 6.3 out in the eaves-drip gap between Bugården and Bredsgården. There was a hearth or fireplace in Building 281 in Phase 6.1.

The state of preservation of the tenement passage varied, being worst in Phase 6.3, but with extremely well-preserved parts in Phases 6.2 and 6.1, especially at the rear part of the site. They all had transverse planking and, except in Phase 6.1, there was a central plank-lined drain.

The eaves-drip gap between Bugården and Bredsgården appeared in Phase 6.2 as a proper street and in the description of the earlier periods it will be referred to as the public thoroughfare of Bua-almenningen. It was paved with irregular paving stones and had a carefully constructed drain at the western end consisting of long thin stakes placed close together. The street was 3.5m wide in this part.

Period 5

Phase 5.2, burnt in Fire IV (1332) (red) (fig 19)

South Row

In 1979 the excavations were extended eastwards. The top layers in the new area were removed by machine, but this was taken so deep that in only two places in grid-square N12 were there any traces from Fire IV. Within the original area, however, there were clear traces from the fire, and the layer could be followed continuously from the east end through most of the tenement as far as c 62y in the middle of H12. Sporadic traces from the fire and burnt timbers continued for a further 5m as far as 57y at the edge of G12. In contrast to the problems in separating Fires II and III, Fire IV was easy to recognise, as it always lay at least 60cm below Fire III (cf p 31).

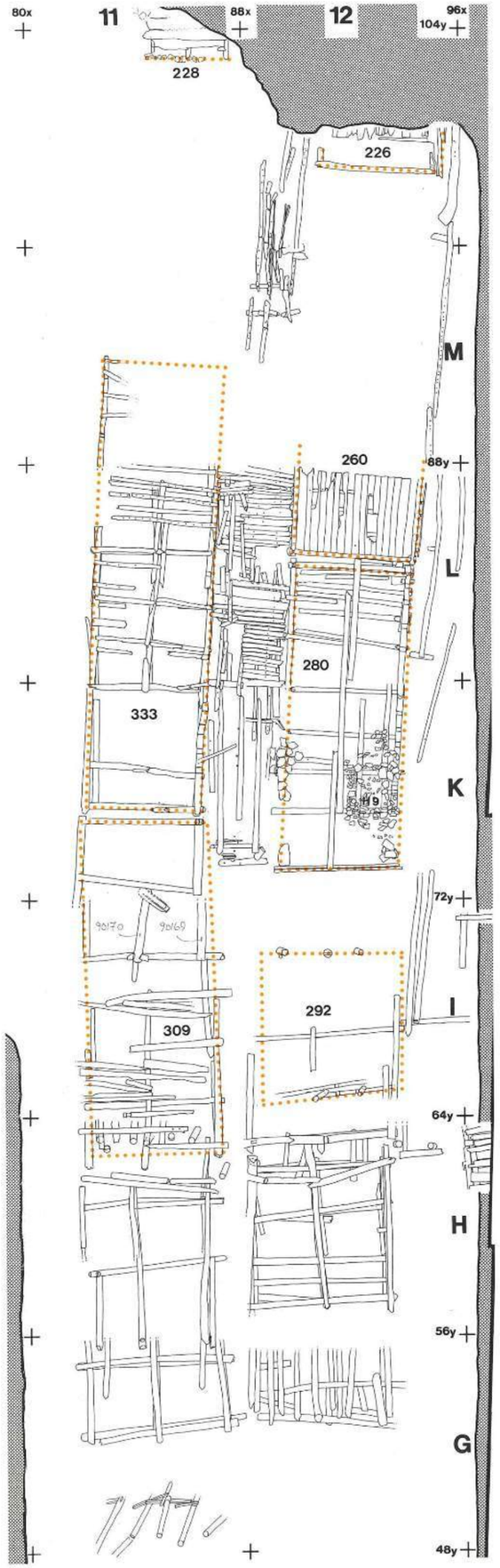
This level apparently comprised five buildings, of which the two at the eastern end, 226 and 260, were relatively well preserved. The next two to the west, 280 and 292, were only documented from the foundations, while to the west of 292 there were only foundations lying at a lower level, indicating a wharf-side building of 10–11m in length. This assumed building has not been allocated a separate number.

There were occasional traces of burning in Buildings 226 and 260, which were otherwise separated from the actual fire layer by a layer of brownish organic material a couple of centimetres thick. There is therefore a possibility that the buildings had already been demolished with the intention of replacing them before the fire occurred and that this plan had been thwarted by the fire. However, it is also possible that these two rear buildings close up to the public thoroughfare of Bua-almenning had been pulled down at an early stage while the fire was raging in order to create a fire-break, in which case the layer of organic material could have come from the turf roofs of the buildings. The matter must remain open, but regardless of which interpretation is chosen, only a short period of time can be involved. On the basis of the level at which the buildings stood, they have been placed in association with Phase 5.2 and regarded as burnt in Fire IV.

Building 226 (N12,II) comprised the sill-beams on the south and west sides, and sections of a well-preserved floor laid longitudinally. The structure continued eastwards beyond the limit of the excavations. Maximum recorded length 1.60m; width 4.30m.

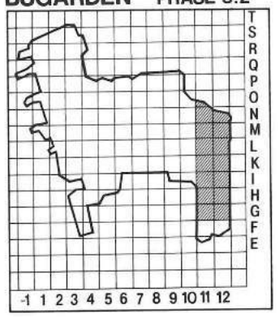
Building 260 (L12,IX,IX.1) was a log-built structure raised on posts with a longitudinally-laid floor. It continued eastwards beyond the limit of the excavations, and any further remains were destroyed in 1979 during the removal by machine of the overburden. Maximum recorded length 3.4m; width 4.60m.

Building 280 (K12,IX,XI; L12,IX,IX.1) was indicated only by the log foundations comprising 4–5 courses. Eastern limit at 84.40y; western limit at 73y. Length c 11.4m; width 4.35m. As the layer of fire detritus continued uninterrupted over the whole foundation structure, the area could not have lain open for very long. The fire layer and the foundations must therefore be associated with a definite building.



BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 5.2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332	5	5.2.1, 5.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.2.1, 3.1, 3.1.1
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

This seems to be confirmed by a collection of stones up against the south wall 2.75m from its junction with the west wall. The stones covered an area c 2.4m x 1.8m and must have come from a hearth or fireplace, Hearth 9.

Building 292 (I12,IX,XI) comprised two rows of supporting posts, a row of three or possibly four beneath the east wall, and a row of four beneath the west wall. Eastern limit at 70.20y; western limit at 65y. Length c 5.2m; width uncertain. The posts under the east wall stood on a large foundation substructure, Kar 93, while those beneath the west wall stood on a smaller substructure, Kar 94, in the middle and western part of grid-square I12.

Fire IV, which destroyed Building 292 and had even affected the posts supporting the building, was recorded for a further 4–5m to the west across a large substructure, Kar 95, consisting of 16 courses of logs. Also in this phase there were no clear indications of a separate wharf-front apart from the remains of a post in front of substructure Kar 97. This was found slanting at an angle due to the pressure from the substructure behind, and it must be regarded as corresponding to the posts found in a row across the North Row (cf the long section through the North Row, pl 2, and comments p 37). The posts, which had survived for almost their full length, leaned at the same angle and stood on the same line as the single fragment in the South Row, around 50–50.4y. It is therefore tempting to interpret this fragment as a post from the front of the South Row wharf.

On the basis of a wharf-front at this point, there would be as much as 15m in front of Building 292, which could have been occupied by a waterfront building and wharf. Assuming that the front of the building coincided with the edge of the foundation substructure, it would have been 11.5–12m long. However, as there were no remains of an actual building, it has not been given a separate Building No.

North Row

Also in the North Row, grid-squares M11 and N11 to the east of the original excavations could now be drawn into the analysis. The upper deposits over this new area were removed by machine before the archaeological excavation was resumed in 1979.

Fig. 19. Bugården Phase 5.2.

Over the whole of the new area and most of the original site (as far as 70.6y) lay the remains of Fire IV as a black to reddish brown deposit 15–20cm thick. The level continued westwards with the burnt-out remains of buildings overlying the projecting substructures Kar 102 and Kar 103 to around 53–54y in the western part of G11. There was thus a clear chronological division along the whole row.

This level comprised the following buildings: 228, 333 and 309.

Building 228 (N11,II; O11,I) consisted of the remains of a longitudinally-laid floor which continued eastwards beyond the limit of the excavations at 104y. The west wall was indicated by a row of stones along 103y. Maximum recorded length 1m; recorded width 3.40m, but the building was probably wider.

The next 10–11m west of Building 228 contained no definite evidence of buildings at this level.

Building 333 (K11,VII; L11,VII,VIII; M11,I) comprised floor joists laid relatively close together at regular intervals and the remains of the underlying foundation substructure. Eastern limit at 91.90y; assumed western limit at 75.4y. Probable length 16.5m; width c 4.4m.

To the west of Building 333, the deposits from Fire IV continued for a further 4.80m, as far as 70.60y. They contained the burnt and at times extremely charred remains of flooring and sill-beams indicating the outer limits of a building, 309.

Building 309 (H11,X–XII,XII.1; I11,IX–XI; K11,VII,VIII) comprised the fire-damaged sill-beams of the east and south walls and a few charred remains from the floor. Two burnt posts also possibly belonged to this building, although their function remains unknown. Eastern limit at 75.10y; western limit uncertain, possibly at 62.80y, alternatively 66.60y. Estimated length 12.30m, possibly 8.50m. Width c 4.4–4.5m as in the following phase.

If Building 309 had continued to 62–63y, this would imply that the foundations in the western part continued over the top of loose deposits. There would therefore have been an extra need for support. Attention is therefore drawn to an irregular row of posts under the assumed west gable of the building and more posts c 6–11m further east, which seem to belong to the level burnt in Fire IV. It is tempting to regard these as supporting elements in the foundations of Building 309, partly because it has not been possible to find any other satisfactory explanation for them.

As mentioned above, Fire IV continued as an unbroken layer as far as 70.60y, but it could easily be traced beyond this on the basis of a more or less continuous sequence of burnt logs and parts of logs and scatters of charcoal. The burnt log fragments, however, seem to have been used to some extent as material for levelling up the site and can therefore be interpreted as the first layer of timbers over the fire layer rather than as part of the fire layer itself. They continued on a definite slope over the next foundation substructure, Kar 101, at c 67y and on to the next one, Kar 103, which probably extended to the west end of substructure Kar 102 with its wharf-front indicated by posts at c 50y (pl 2). Whether the supporting foundations from this phase ended at c 53y or at 56y is not known: the boundary may have been at the front edge of Kar 103 at 56y, from which point the distance back to Building 309 was 7m. However, the foundations may have ended 3m further forward at the front edge of Kar 102. There would in either case have been room for a sizeable wharf-side building here, with a minimum length of 7m and a maximum length of 10m. The length of the wharf from front to back was therefore either 3m or 6m, and the depth of water in front of the wharf was c 6m, which may be corrected to c 5.2m.

It is natural here to draw attention to the marked difference in height between the burnt level in the foundation substructure and the top of the posts of the wharf, as can be seen in the long section (pl 2). In the vertical plane they would have stood some 10cm above the mean water level, while the upper edge of the substructure lay between -1.00m and -1.20m, in other words a difference in height of 1.10–1.30m. In itself this is not particularly unusual: within the mass of ordinary buildings standing on relatively solid footings there was always a significant difference in height between the horizontal foundations and the contemporary vertical elements. The situation mostly varied from c 30cm to 70–75cm according to how compact or compressible the underlying deposits happened to be.

In the extreme case here, the divergence between the horizontal substructure and the posts of the wharf was essentially due to a greater settlement of the substructure, even though the long section also shows a marked sinking of the wharf-front. In this case, moreover, the two types of foundation had different functions and this contributed to the general tendency of a more substantial settlement of the horizontal foundations.

Tenement passage

The remains of the passage were traced over the rear 30m of the tenement, while the rows of buildings were traced over a distance of 50m. In L11/12 the wooden pavement was partly intact, but the variety of material which had been used indicated local repairs. Running down the passage in M11/12 and N11/12 were the remains of a drain lined with boards set on edge. The width of the passage was c 2.8m, while the distance between the two rows of buildings was c 2.9m.

Eaves-drip gap / the Bua-almenning public thoroughfare

At this level there were only a few traces of the thoroughfare and even these were badly preserved. To the west lay the possible remains of a plank surface and scattered joists. There had probably been a drain, but no definite remains were recorded. The width at 64.00y was 3.50m. The level was followed as far as c 61.5y, where it continued beyond the limits of the investigated area. The wharf-front here was at c 50y.

Phase 5.1, unburnt level below Fire IV (forest green) (fig 20)

South Row

Apart from Building 226 in Phase 5.2, all remains of buildings from both Phases 5.1 and 5.2 at the eastern end of the

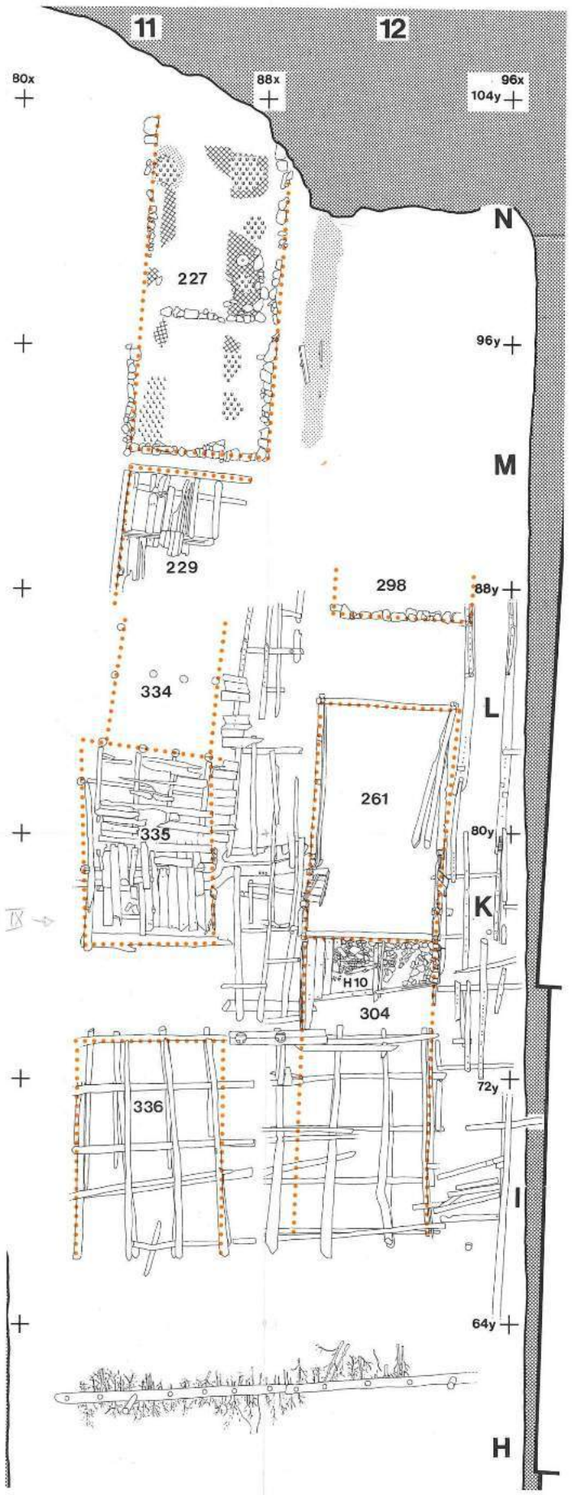
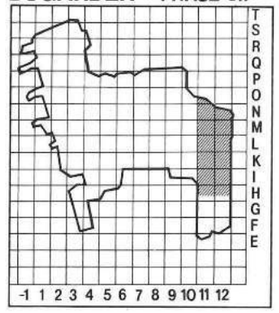


Fig. 20. Bugården Phase 5.1.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 5.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2 / 9.1 9.1.1
I	1702		
Ib	Prev. unknown	8	8.2 / 8.1 8.1.1
II	1476		
III	1413	7	7
III b	1393	6	6.3 / 6.2 6.2.1 / 6.1 6.1.1
IV	1332	5	5.2 5.2.1
V	1248	4	4.2 / 4.1
VI	1198	3	3.2 3.2.1 / 3.1 3.1.1
VII	1170/71	2	2.2 / 2.1
VIII	Prev. unknown	1	1.2 / 1.1

tenement had been destroyed in 1979 during the removal of the overburden by machine. Within the original area of excavations there were traces of three buildings from an unburnt phase between Fires V and IV, Buildings 298, 261 and 304.

Building 298 (L12,XI.2) was only documented by a relatively well-preserved ground-wall beneath its western gable wall. Traces of the building continued beyond the edge of the original site, but were removed by machine in 1979. Maximum recorded length 1m; recorded width 4.20m.

Building 261 (K12,XI,XIII; L12,IX.1,X) comprised four well-preserved courses of timbers from a log-built house with two door openings, a wide one giving access from the public thoroughfare on the south side and a doorway of more normal width opening on to the tenement passage on the north side. Building 261 has often been referred to in earlier accounts as the «Doorway House» (Norw *dørhuset*) and it has been possible on the basis of the three or four intact courses of timbering and associated finds to establish more or less correctly the dimensions of this two-storey building with its external gallery and to reconstruct it (cf Herteig 1969, 39–40, fig 7). A good deal of the timber from this building must have been used in the foundations of the succeeding Building 280. Eastern limit at 84.30y; western limit at 76.60y. Length 7.70m; average width 4.50m.

Building 304 (K12,XII,XIII) lay to the west and shared an end wall with Building 261. It can therefore really be regarded as an annexe to that building. It was a timber- frame structure and contained a clay-lined hearth, Hearth 10. Fragments of the longitudinal floorboards survived. Eastern limit at 76.60y; western limit uncertain. It may have extended to the front edge of the contemporary substructure at c 67y. Maximum recorded length 3.80m, estimated length c 9.5m; width c 4.5m.

To the west, Building 304 was standing on the foundation substructure Kar 93, which continued for a further 6–6.5m in front of the building, to 66.6y. At the seaward end, this had projecting timbers and it cannot therefore be interpreted as the front of a wharf. The situation here, however, presented a much clearer picture in that along c 62y 4.6–4.7m in front of the substructure there was a row of posts mortised into a solid sleeper beam running right across both the tenement and the thoroughfare. This row of posts must indicate the front of the wharf in this phase, Phase 5.1, preceding Fire IV. It formed a straight line running at an angle to the property, and it showed that the front of the wharf and the seaward end of the public thoroughfare to the south lay on the same alignment.

The foundations referred to here beneath the west end of Building 304 consisted of two essentially different sections: the upper part comprised the actual foundation substructure, Kar 93, with eleven courses of timbers from the fifth to the fifteenth course inclusive, under Fire IV pl 1). The fifteenth course was a collection of beams laid lengthwise close together, going partly into and partly over a log-built arrangement with thirteen courses of timbers, Kar 92 (figs 21 and 22). During excavation this was labelled the «Submarine House 1» (Norw *undervannshus 1*). This and a similar but lower structure, Kar 100, known during excavation as the «Submarine House 2», occupying the equivalent position in the North Row, were originally parts of buildings which had been dragged into the water to be re-used as foundation substructures standing on the sea-bed – or rather on top of the deposits which had been dumped on the sea-bed of the preceding phase (cf pl 2).

There was no clear evidence, either in the stratigraphy or in the other excavated data, which could demonstrate whether the substructure Kar 92 was contemporary with the larger substructure Kar 93, or if it was the reduced remains of an originally separate foundation unit. In the latter case it could represent the first stage following Fire V (Period 5), or the stage immediately preceding it (Period 4). This problem, which was noted already during excavation, can at the best only be solved by a thorough examination of the stratigraphy, comparing the situation with that in the North Row, and by a detailed study of the pottery associated with the layers, and, with certain reservations, by a dendrochronological analysis.

For practical reasons, we can take as our starting point the wharf-front at c 79y, consisting of two sections, a major one – Kar 90 – (coloured orange) in Phase 3.2, and a limited addition to the front part to correct a sinking of the foundations. This addition is designated Sub-phase 3.2.1 (light green) and it contains parts of the original planked surface burnt in Fire VI.

Several metre-long hawsers attached to some of the front posts show that the structure at least for a time (Phase 3.2, fig 26) must have served as a wharf. That these hawsers really were from ships would seem to be demonstrated by the fact that one of them ended in a spliced loop. This wharf-front was the second stage in a great extension out into the harbour basin following Fire VII.

Phase 3.2 with its front along 79y is one of the definite points in the ensuing discussion and it is common to both Rows. Another established fact is the substructure Kar 93 on the west side (and Kar 101 in the North Row) forming the wharf in Phase 5.1, with its front carried on posts at

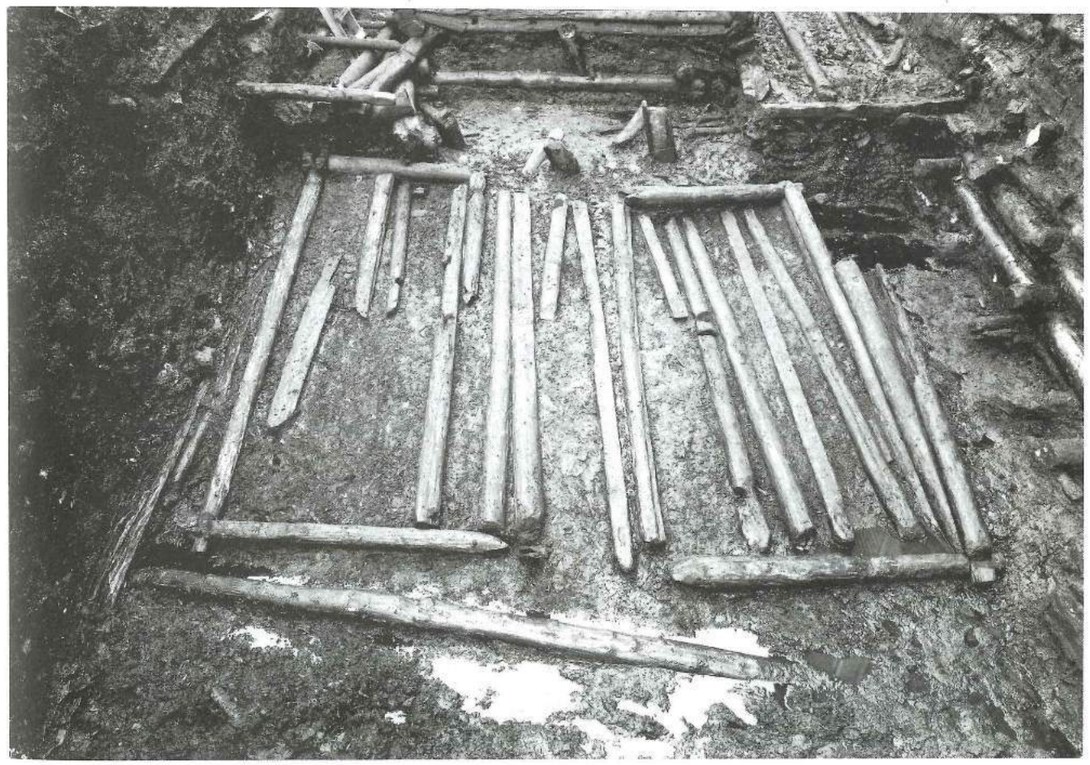


Fig. 21. Horizontal timbers overlying deposits in the foundation substructure Kar 92 (the «Submarine House 1»), used to level up the site. Bugården South, looking east.

62y. A third definite point is the level of the sea-bed as it appeared in Phase 3.2: it could be traced for some 15m or 16m running out from the base of the wharf at 79y (Kar 90) and was covered with a finely sorted deposit of sand 5–6cm thick, which seems to indicate that there had been undisturbed conditions along the waterfront for some time prior to Fire VI (in Phase 3.2) without any dumping of deposits in this area.

Any remains of buildings from Phase 4 must lie between the two extremities represented by Kar 90 with its associated sea-bed in Phase 3.2 and Kar 93 in Phase 5.1. These can be represented by the following features: a small substructure, Kar 54, in the North Row just in front of the wharf at 79y, a row of posts from a wharf at 75y in the South Row, and the foundation substructures Kar 92 in the South Row and Kar 100 in the North Row. Moreover, the level of the sea-bed from the time around Fire VI had been raised to receive the foundation units Kar 92 and Kar 100, and these were further stabilized internally and externally by the dumping of similar deposits. Over the stable foundation formed by Kar 92, the great substructure Kar 93 was erected (cf Kar 101 in the North Row). The problem revolves around the relationship in time between these various features.

As far as one can see, there are several ways of reconstructing the development between Phases 3.2 and 5.1.

Alternative 1: the adjusted and levelled wharf at 79y may represent the west end in Sub-phase 3.2.1; the front of the wharf at 75y and substructure Kar 54 in the North Row would represent the next stage, Period 4; and the major combined substructure, 92 and 93, would represent Phase 5.1, possibly with 92 as an initial stage in this phase.

Alternative 2: the adjusted and levelled wharf at 79y may have been accompanied by Kar 54 in the North Row and the wharf built on posts at 75y all in Sub-phase 3.2.1, while 92 and 93 may represent Phase 5.1, possibly with 92 as a separate first stage.

Alternative 3: Sub-phase 3.2.1 as described in Alternative 2, with Kar 92 (and Kar 100 in the North Row) forming a separate foundation substructure in Period 4. Units 92 and 100 were then partly dismantled and formed the basis for 93 and 101 in Phase 5.1.

Of these three possibilities the second can be eliminated as it makes no allowance for deposits from Period 4. Alternative 1 has one advantage in that there was no observable evidence in the relatively well-preserved remains of the planked surface behind the front of the wharf for a differentiated use, such as a passage or floor of a building. On the assumption that the adjustment in Sub-phase 3.2.1 only involved the very front section, the wharf, and not the whole structure, the 3.5–4m wide wooden paving could be regarded as having been part of a wharf. If the wharf which was supported on the line of posts at 75y belonged to Sub-phase 3.2.1, then in addition to the old wharf there would be a new c 4m extension, giving a total of 7.5–8m in length. This would be a radical deviation from the traditional pattern, which at that time demanded a wharf of 3–4.5m at the most. Moreover, it is possible that

Fig. 22. Kar 92, the «Submarine House 1», in Bugården South, looking east.

some of the posts at the front of the old wharf would be standing higher than the general level of the planking. So much weight was attached to these aspects during excavation that the front of the wharf at 79y was regarded as also being the front in Sub-phase 3.2.1, which was destroyed during Fire VI.

As there was nothing further west which might suggest on structural or chronological grounds that the substructure Kar 92 on the one hand and Kar 93 on the other (and 100 and 101 respectively in the North Row) did not belong to the unburnt Phase 5.1, one is left with the fact that the wharf on posts at 75y must represent Period 4. This wharf extension would have been preceded with a general raising of the site behind and this may have gone as far as the old wharf which ended at 79y.

The great foundation substructures to the west, however, presented problems of interpretation. In the South Row, the foundation unit Kar 93 was built up naturally from the underlying unit Kar 92. As mentioned above, this consisted of thirteen courses of logs and had previously been part of a building with opposing doorways, the western one of which still retained its spline – the vertical element keyed into the ends of the logs at the door opening (fig 22). It would therefore seem hardly reasonable to interpret Kar 92 as a substructure in its own right marking the front of a separate wharf. In the North Row, however, there was a 20–30cm thick layer of deposits between Kar 100 and the overlying levelling-up layer of logs on which Kar 101 was sitting (pl 2). It therefore looks as if Kar 100 could be the remains of a reduced foundation substructure either from Period 4 or from an initial phase of Period 5. But there does not appear to be any reasonable explanation why a substructure equivalent in size to Kar 101 and its associated filling and deposits should be dismantled to the level at which Kar 100 was left and the level then adjusted with loose deposits, instead of building directly on the reduced foundation. What has been said here about Kar 100 and Kar 101 in the North Row must also apply in full to Kar 92 and Kar 93 in the South Row.

It is of course possible that as much of the original substructure Kar 100 was removed as was practically possible and that material was then dumped on top of what was left and levelled off, before adjusting the level with a course of logs which extended for a further 2–3m to the west as a supporting foundation for the overlying unit Kar 101. In the South Row the ground was also levelled up with a layer of logs, which in this case were laid out over the remains of the original foundation substructure Kar 92. Yet there seems to be too much missing for the underlying units Kar 92 and Kar 100 to be regarded as foundation units in their own right. There was, for instance, no trace of piles in front which could have supported a wharf and which the situation would seem to demand. During excavation, therefore, the suggestion that Kar 92 and Kar 100 had been reduced in height seemed to be so hypothetical that one dared not attach any weight to it. With some reservation they were interpreted as supporting structures for Kar 93 and Kar 101 from Phase 5.1. This interpretation (Alternative 1) was preferred during field work and became in due course the accepted explanation.

The interpretative problems in this part of Bugården, however, were revived during 1987 when the results of the preliminary analysis of datable English medieval pottery seemed to be at variance with the accepted explanation of the development. The initial results of analysis carried out by Dr Alan Vince of the Museum of London showed that the pottery in the deposits under and around the foundation units Kar 92 and Kar 100 were different from those associated with units Kar 93 and Kar 101. According to Vince, the original deposits must have been dumped in the closing ten or twelve years of the preceding period, ie Period 3 (dated by the fires to the period 1170/71–1198). The London Area Shelly Sandy Ware, which is the relevant material in this case, occurs in this period with a possible extension into the first couple of decades of the thirteenth century. The deposits containing sherds of this pottery would therefore have been dumped in the period after Fire VI (1198) at the same time as the substructures Kar 92 in the South Row and Kar 100 in the North Row were being laid. As the overlying units both on stratigraphical grounds and from the pottery evidence are later (Phase 5.1), then the underlying units alone must be associated with the preceding phase, Period 4, and the boundary between the lower and the upper units must correspond to the chronological boundary between Periods 4 and 5. To this extent, the results of the pottery analysis would seem reasonable, but it is nevertheless still difficult to equate them with the particular situation: how to explain the fact that from the two log-built houses which were re-used as foundation substructures (Kar 92 and Kar 100) and which were drastically reduced in height, not a single notched log from the upper sections of either building was found during what was practically a total excavation of the Bugården tenement; or to explain how the re-used lower part of a building with its two door openings and even with part of the doorframe still in place formed a satisfactory wharf foundation; or to explain the lack of evidence for a separate wharf; and so on.

In the face of such problems, a comparative analysis has been undertaken of the main features in the development of the tenements to the north and this has demonstrated convincingly that Alternative 1 fits poorly with the building phases as recorded in those tenements. In order to obtain a broader and better basis for interpretation, we must take a look at some of the results there, especially in Engelgården, the tenement situated immediately to the north of Bugården.

It is a general characteristic that after Fire VII every single phase was preceded by a significant dumping of deposits in the harbour basin. It is quite obvious that the raising of the sea-bed in this way could not take place in front of an individual tenement without disastrous consequences for the neighbouring properties on either side. Consequently this expansion by the deposition of material in the water must have taken place in concert, at least while it was a question of moderate depth. If the wharf-fronts and associated depth of water are compared from the same periods in Bugården and Engelgården, the same trends should be noticed.

Table 2 shows the rate of expansion for the North and South Rows in Engelgården and Bugården starting with Period 2, which was destroyed in Fire VII, and continuing to Period 5, which was destroyed in Fire IV, and Table 3 shows the height of the sea-bed associated with the respective foundation units and wharf-fronts in each period.

Table 2 demonstrates the very even rate of development and expansion in these four Rows, except for Period 4 when the interpretation is based on Alternative 1. In Period 3 the apparent difference between Engelgården North and Bugården South is quite simply due to the fact

Table 2. The rate of expansion for the North and South Rows in the two tenements of Engelgården and Bugården between Period 2, destroyed in Fire VII, and Period 5, destroyed in Fire IV.

	Engelgården		Bugården	
	North Row	South Row	North Row	South Row
	expan-sion	expan-sion	expan-sion	expan-sion
Original beach	104y = 0m	104y = 0m	104y = 0m	104y = 0m
Period 2	96y = 8m	96y = 8m	96y = 8m	96y = 8m
Phase 3.1	84y = 20m	83y = 21m	81.5y = 22.5m	81.4y = 22.60m
Phase 3.2	83y = 21m	82y = 22m	79y = 25m	79y = 25m
Phase 3.2.1 (= Period 4 in Alt. 1)			76y = 28m	75y = 29m
Period 4 (Alt. 3)	69y = 35m	69y = 35m	69.8y = 34.2m	69.5y = 34.5m
Phase 5.1		62y = 42m	61.8y = 42.2m	62y = 42m
Phase 5.2		49y = 55m	50y = 54m	50y = 54m

Table 3. The height of the sea-bed in front of the foundation units and wharf-fronts of Engelgården South, Bugården North and Bugården South between Phases 3.2 and 5.2.

	Engelgården S		Bugården N		Bugården S	
	foundation unit	wharf-front	foundation unit	wharf-front	foundation unit	wharf-front
Phase 3.2	?	–1.4 – –1.6	–1.60	–1.60	–1.40	–1.40
Phase 3.2.1			–1.90	–1.90	–1.40	–1.70
Period 4	–3.00	–2.60	–2.30	?	–2.30	?
Phase 5.1	–2.80	?	–2.30	–2.95	–2.30	–2.90
Phase 5.2	c –3.7	?	–4.20	–6.00	–3.60	?

that the waterfront from north to south deviated westwards. If Alternative 3 is chosen, the front of Bugården in Period 4 falls into line with the front of Engelgården, and they continue to be similar in the subsequent phases.

A comparison of the depth of the sea-bed in front of the foundation substructures and the wharf-fronts (table 3) shows a similar general trend.

Before Phase 3.2 the height of the sea-bed on the whole is unknown, but in Phase 3.2 the front foundation unit was laid on a surface which dropped from -1.40m on the south side to a maximum of -1.60m on the north side.

Sub-phase 3.2.1 in Bugården with a wharf-front along 75–76y represents a local development, which does not have a counterpart in Engelgården. The depth of the sea-bed was between c -1.7m and -1.9m, but this is due to it projecting further forward, on much the same level as the wharf-front along 79y in Phase 3.2.

In Period 4 (Alternative 3) the projecting foundations of the tenement lay on a level of -2.30m: the corresponding point in Engelgården was c -3m. But this divergence may have been compensated for during the construction of the wharfs. It seems that in Engelgården they had a bottom level of -2.60m, but the corresponding figure for Bugården is not known.

In Phase 5.1 the depth of water in front of the wharfs is assumed to have been around 2.9–3m, which may be corrected to 2.4–2.5m; in Phase 5.2 it was around 6m, or c 5.1–5.2m when corrected.

The discrepancy in the stratigraphic and structural evidence between the Period 4 wharf-front of Bugården along 75y according to our earlier interpretation and the contemporary front of Engelgården along 69y is so remarkable when seen in relation to the ceramic evidence, that it demands a re-evaluation. The closest parallel to Engelgården with regard to both the position of the end of the wharf and the depth of water in front of it is found in the foundation units Kar 92 and Kar 100, whose western limits lie at 69.5y and 69.8y respectively. They are thus on the same alignment as Engelgården's Period 4 waterfront. And as we have already pointed out, the subsequent development of the two tenements continues in step from now on.

Having obtained the impression of a certain conformity in the arrangement and rate of development which has been documented here and which seems generally to reflect the original situation, we feel obliged to abandon all counter-arguments. The consequences of a re-evaluation are as follows:

1. The post-built wharf along 75y and the foundation unit Kar 54 in the North Row must be associated with the latter part of Period 3, ie Sub-phase 3.2.1. This could mean that the wharf-front building was erected further forward at what had previously been the front of the wharf along 79y (cf fig 25).
2. The foundation units Kar 92 in the South Row and Kar 100 in the North Row must be regarded as the reduced sections of the main foundations from Period 4. Such a thorough reduction can be difficult to explain in itself, but investigations in the other tenements have shown that it is the rule rather than the exception. In fact, a new expansion usually involved a very significant alteration of earlier wharf-fronts (cf fig 24).
3. The stratigraphy is brought into line with Vince's ceramic dating evidence. The London Area Shelly Sandy Ware must have been deposited at the same time as the construction of the foundation units Kar 92 and Kar 100 and the dumping of associated deposists, immediately following Fire VI in 1198.
4. Phase 5.1 began with the construction of foundation units Kar 93 and Kar 101.

By and large, the deposits mentioned above were similar in nature in the deeper layers, consisting of an often slightly sandy, heavily crushed matrix containing wood chippings, twigs, leaves, moss, nutshells, and a scatter of artifacts. They stretched for some 20m in front of the Period 3 wharf. Deposits like these played an essential role each time the wharf was extended forwards and especially after it began to encroach into deeper and deeper water. It comprised thick layers of varying thickness which were relatively easy to distinguish in a longitudinal direction, and this must surely correspond to the stages in the dumping process. As the respective layers represent significant amounts even in their compressed state, spreading at times 15–20m in front of the wharf, they must be regarded as an expression of a great planned operation. Their nature in the area of Bugården as described above indicates that the layers at least up to the bottom of the foundation units Kar 93 and Kar 101 express a relatively concentrated and intentional back-filling, and this impression is definitely strengthened by the fact that the wharf built on posts along c 62y in Phase 5.1 was resting on the same deposits and lay at the same level as the adjacent parts of the foundation unit Kar 93.

It must be assumed that an illegal dumping of deposits could never have been done on such a large scale as that recorded here. Moreover, had it been a matter of dumping illegally, the configuration in the long section would have been different, with a marked apex at a short distance in front of the point from which the material was dumped – the front of the wharf – and it is reasonable to assume that they would have had a more mixed nature. Such deposits are often characterized by their content of food waste and were in fact clearly documented in a couple of cases further north.

North Row

In the North Row there were clear traces everywhere of the unburnt Phase 5.1 beneath the level burnt in Fire IV (Phase 5.2). The following buildings belong to this phase: 227, 229, 334, 335 and 336.

Building 227 (M11,I,II; M12,I; N11,II,II.1; N12,II) had relatively continuous ground-walls beneath the north, south and west walls, as well as beneath an internal cross-wall. Eastern limit uncertain, probably at c 103y; western limit at 92.40y. Minimum length 10.6m; width c 4.5m.

Within the excavated part of Building 227 there was an almost uninterrupted concentration of a finely burnt, granular mass consisting mostly of burnt twigs, while close against the outer wall there were six pits, A–D, F and G, which contained a concentration of charcoal and a limey deposit in alternate layers.

On the basis of its slender foundations, Building 227 should perhaps be regarded as just a workshed over an extensive lime-slaking activity. This activity must go back to Phase 4.2 at least, as there were the remains of a stone-lined lime pit, Pit E, beneath the internal wall (cf p 50).

Building 229 (M11,I) contained in the north-east part the remains of relatively well preserved longitudinal floorboards and associated joists. Approximately 2m from the wall at the east end lay a particularly remarkable joist with a raised central rib and a continuous rebate on either side for floorboards. Eastern limit at c 92y; western limit not identified, probably at c 88y, so that this floor-joist would be marking a central division. Maximum recorded length c 4m; width c 4.1m.

Building 334 (L11,VII–IX; M11,I) comprised ten foundation posts, including two rows of four running across the building, and a relatively well-preserved longitudinal floor in the eastern part. Eastern limit uncertain, evidently at c 87y; western limit at 82.80y. Length c 4.2m; width c 4m.

Building 335 (K11,IX; L11,IX) stood on posts. Fragments of both transverse and longitudinal floors survived, possibly from two phases of the building. At the east end it may have shared foundation posts with Building 334. Western limit uncertain, possibly at 75.4–75.6y. Probable length 7.4–7.5m; width c 4m.

As can be seen from the long section, Building 335 practically ran out into loose deposits at the west end. These must have been deposited in connection with this phase and, as the commentary on the South Row has indicated, the foundation unit Kar 101 must also have belonged to this level.

There was a distance of 10.5m between the assumed west wall of Building 335 and the front edge of the foundation unit, which would allow for a sizeable waterfront building. This has been designated Building 336, as there could clearly only be a single building here.

Building 336 (I11,XII; K11,IX) comprised only the foundations. Eastern limit at 73.6y, possibly at 75.5y; assumed western limit at 66.6y. Length 7–9m; width of foundations 4.40–4.50m.

The contemporary wharf-front was indicated by a row of posts at 61.8y running right across the tenement and placed on a solid sleeper beam. The wharf measured at least 5m from front to back and the depth in front of it was 2.90m.

Building 336 rested mostly on the large foundation unit Kar 101, consisting of timber courses 6–18. Beneath this was an almost continuous surface of boards laid longitudi-

nally and these overlay three or four courses of logs from a log building, which had been placed in position on the sea-bed alongside the foundation unit Kar 92 in the South Row. Kar 92 was the re-used section of a log building, known during excavation as the «Submarine House 1». This other re-used building section in the North Row was known as the «Submarine House 2», and it formed the foundation substructure Kar 100 (cf pl 2). Apart from the fact that Kar 100 was separated from the overlying foundations by a 20–30cm thick layer of deposits, the situation in the two rows of the tenement at this point was exactly the same. The reader is therefore referred to the description of the South Row (pp 43–47).

Tenement passage

In the two easternmost grid-squares there were no definite remains from the passage, but at places in K11/12 and L11/12 some relatively well-preserved remains of a paved surface were recorded, apparently with no drain. The passage was laid on the great foundation substructure common to the whole tenement, but was independent of the buildings on either side. It must have been more or less flush with the threshold of Building 261 in the South Row (the so-called «Doorway House» with its two door openings).

The pavement-boards were between 25cm and 30cm wide. There was no good connection between the wooden paving and the adjacent buildings. In front of Building 261 the width of the wooden pavement was 3.35m, while the distance from one house wall to the other was 3.45m. There were continuous remains over a length of some 15m. The buildings went on for a further 6.5–7m and it can be assumed that the passage also continued.

While there was only evidence for two phases of buildings in the 84-year-long period between Fires V and IV, there were the remains of at least four different paved surfaces in the tenement passage, even though there was not evidence for all of them throughout the whole length.

After some time the first layer of boards was renewed with a new layer (Sub-phase 5.1.1) at the same time as a drain was laid with re-used boat boards placed on edge (fig 23). This surface, of which only scattered pieces had survived, was 10–12cm higher than the previous one. Over the easternmost four 4 m, there was evidence for a new planked surface c 15cm higher up (Sub-phase 5.1.2), probably forming just a local stretch of pavement with a step down to the original paving at the west end. The connection with the adjacent buildings was not clear, but all levels of the passage appear to have belonged to the first phase of buildings following Fire V.

Eaves-drip gap / the Bua-almenning public thoroughfare

In the public thoroughfare along the south side of the tenement, there were clear and generally well-preserved remains of joists to which boards had been plugged and there were also some underlying supporting beams. There was no evidence for a drain. The width of the thoroughfare at 72.00y was 3.50m. Traces could be followed over a stretch of some 35m continuing beyond the edge of the excavated area at 64.80y, c 2.8m behind the waterfront from this phase.

At this level, the front of Bugården's wharf, which was indicated by posts standing on a sleeper beam, continued right across the tenement and the full width of the thoroughfare, showing that the wharf and the thoroughfare ended on the same line.

Summary, Period 5

The period comprised two distinct building phases, 5.1 and 5.2, both with their western, seaward edge lying within the excavated area. Phase 5.1 had a waterfront supported on posts, running right across the tenement and continuing across the width of the public thoroughfare on the south side; Phase 5.2 had posts preserved in front of the North Row.

When the excavation area was extended eastwards in 1979, the overburden and upper layers were removed by machine, and only chance remains survived and could be recorded from this level – and in places also from Period 4.

Period 5 represents the most extensive expansion out into the harbour basin with the dumping of vast amounts of deposits, followed by the construction of foundations which consisted of logs laid in horizontal courses up to a height of 4m over a distance of 25m. The final interpretation of the first phase has led to an adjustment of earlier notions concerning details of the preceding phases – Sub-phase 3.2.1, Period 4 and Phase 5.1. It has united the purely stratigraphic evidence with the strict dating offered by the major ceramic types (see detailed account pp 45–47).

In Phase 5.1 only two buildings and the ground-wall of a third were recorded in the South Row, but in the North Row there were the remains of five buildings. In Phase 5.2 four buildings were recorded in the South Row and three in the North Row, but at the seaward end of the tenement there were only foundation substructures. In the first phase the substantial remains of a building were found in the South Row, known during excavation as the «Doorway House» (Norw *dørhuset*). It consisted of the lower three to four courses of logs forming the complete frame of the building, while more logs from the structure lay loose inside. There were two door openings, a narrow one facing the internal passage to the north and a wider one facing the public thoroughfare on the south side. From the surviving timber it has been possible to reconstruct the two-storeyed house with fairly accurate dimensions for the ground floor and for the external gallery on the upper floor.

The boundaries of the individual structures making up the tenement did not remain constant between the two phases in the period, nor between the second phase and the following Period 6, apart from a short alignment in the eastern part of the South Row. The actual width of the buildings, however, remained relatively stable throughout the whole of Period 5, with the South Row generally a little wider than the North Row.

In Phase 5.2 we encountered pits and layers of charcoal and other material from lime-slaking, an activity for which evidence was also found over the whole of the rear part of the site in the early medieval layers.

The tenement passage contained evidence of four layers of surface in Period 5, the first three all falling within Phase 5.1. Except for at the earliest level, 5.1.1, there were no remains of a drain. The greatest width of the passage in Phase 5.1 was 3.35m, and in Phase 5.2 c 2.8m.

In the public thoroughfare between Bugården and Bredsgården, no trace of the planked surface had survived from Phase 5.1, but there were well-preserved supporting joists in two layers with evidence for transverse planking. In the following phase, Phase 5.2, there were traces throughout most of the length of the tenement, but only a few poorly preserved remains. The thoroughfare was 3.50m wide. At the seaward end it formed a continuous waterfront with the wharfs of the North and South Rows.

Period 4

Phase 4.2, burnt in Fire V (1248) (yellow) (fig 24)

South Row

Turning our attention to Period 4, we find that we have already demonstrated (pp 44–47) that the built-up area had been extended a further c 10m compared with Period 3, firstly by the dumping of deposits to raise the sea-bed, then by bringing the substructure Kar 92, the «Submarine House 1», into position as a supporting foundation with the waterfront at c 69.5y (see also pl 1). When excavated, Kar 92 was in a secondary, reduced state, in use as the foundation for structures belonging to Phase 5.1. It was filled and packed round with the same kind of deposits as those on which it was standing, and it is assumed that in front of it there had been a separate wharf standing on posts, but no trace of this was found. Evidence for fire-layer V was found to the east over the whole of the 1979 extension, except for a 2–3m wide belt adjacent to the original site, but the relationship is nevertheless clear. Fire V was followed by the deposition of a massive layer of sand and gravel up to 50cm thick, which sealed the underlying deposits for practically the whole length of the tenement. This must belong to Period 5, which was destroyed in Fire IV.

In the rear part of the tenement lay the remains of the only building which was recorded from this period, Building 231. It had two floor levels, apparently corresponding to two periods of use.

Building 231 (M12,II.1,II.2; N12,II.1,II.2) consisted of sill-beams for the north and south walls, as well as extensive remains from two wooden floors laid longitudinally. Transverse beams show that the building had two rooms. It continued eastwards beyond the limit of the excavation and was de-

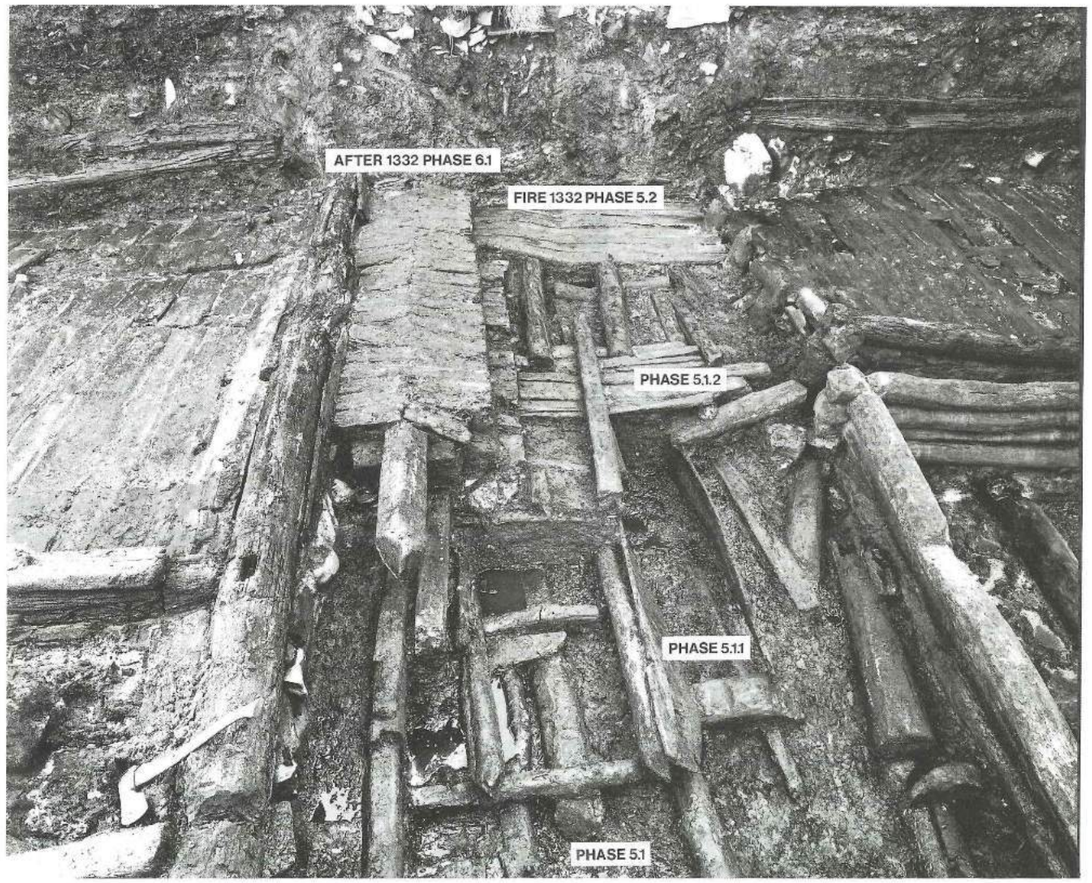


Fig. 23. Five levels in the tenement passage in Bugården. The remains of buildings visible on either side include Building 261 from Phase 5.1 to the right, and Building 329 from Phase 6.1 to the left. Looking east.

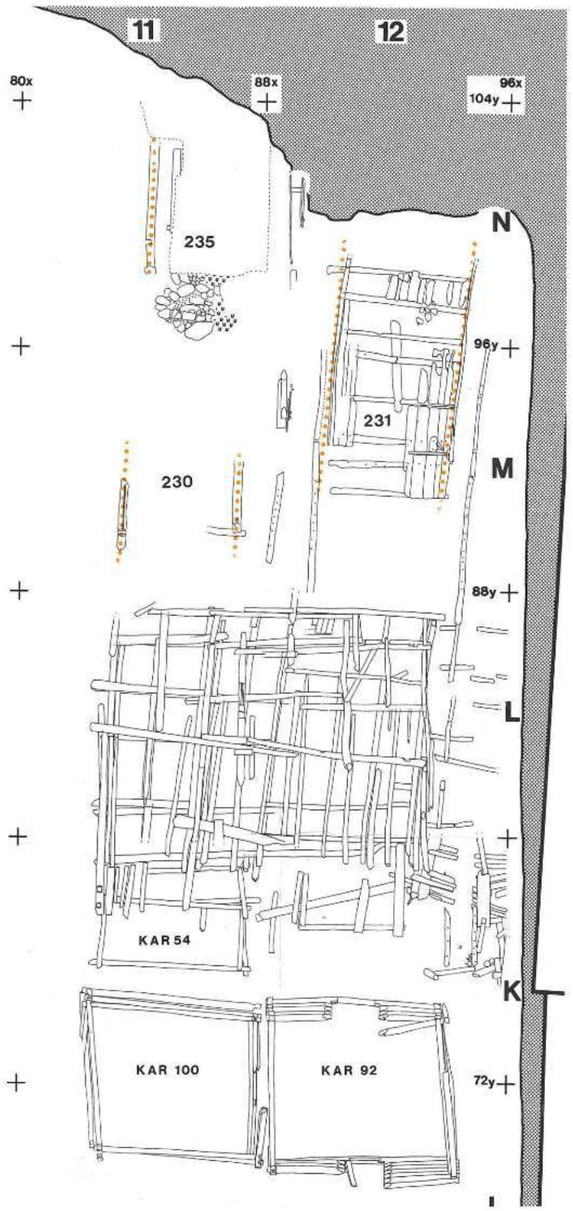


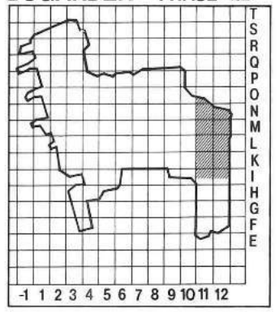
Fig. 24. Bugården Phase 4.2.

stroyed by fire on the west side at 91.10y, but as this was only 1.40m from the internal dividing wall, the building must originally have continued for a further 3m or 4m. Maximum recorded length c 11m; width c 4.2m.

The distance between the assumed position of the west wall of this building and the front of the foundation substructure at 69y was c 21m. This would allow plenty of room for a wharfside building at this level, but no traces were found.

BRYGGEN, BERGEN
EXCAVATED AREA

BUGÅRDEN PHASE 4.2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2; 9.1; 9.1.1
I	1702		
I b	Prev. unknown	8	8.2; 8.1; 8.1.1
II	1476		
III	1413	7	7
III b	1393	6	6.3; 6.2; 6.2.1; 6.1; 6.1.1
IV	1332	5	5.2; 5.2.1; 5.1
V	1248	4	4.1
VI	1198	3	3.2; 3.2.1; 3.1; 3.1.1
VII	1170/71	2	2.2; 2.1
VIII	Prev. unknown	1	1.2; 1.1

North Row

Within the original site the fire-layer was only found intact at the very eastern end. For most of the eastern area it had been removed during the stripping of the upper layers by machine, and it was only recorded in the adjacent parts of L11 and M11, but burnt foundations were followed both to the east and to the west.

Beneath Building 277 from Phase 5.1 only a limited area was excavated along the eastern baulk, where traces of a structure, Building 235, were uncovered.

Building 235 (N11,II.1) comprised a longitudinal beam, which may have been a sill-beam for the north wall, floor-joists, and fragments of longitudinally-laid floorboards. The eastern and western limits of the building are unknown. It was traced as far as 102.60y to the east and 98.60y to the west. Maximum recorded width c 1m.

Beyond the assumed position of the west wall of Building 235 was a stone-lined lime-pit, Pit E, with an internal diameter of c 1m.

Building 230 (L11,X,XIII; M11,I,II) comprised the remains probably of the southern sill-beam. Otherwise only the foundations had survived. Probable eastern limit at c 92y; western limit uncertain. Maximum recorded length 3m; probable width c 3.1m.

The foundation substructure continued as an integrated part of the tenement foundations for a further 11m, as far as c 79y, but as in the South Row, the supporting foundations ended at c 69.8y. There were no traces of a wharf in front of this. Compare the detailed comments on pp 44–47.

Tenement passage

There were no remains from the tenement passage associated with this level.

Phase 4.1, unburnt phase below Fire V (not illustrated)

North Row

If Building 230 described above stretched as far as the waterfront, it would have measured 22m. This would obviously not have been the case, and there were probably two buildings in front of it. Underneath Building 230, however, only the remains of a large privy – Building 306 – were recorded, stretching across the tenement. It must have belonged to a first phase following Fire VI – Phase 4.1. It would seem to suggest that there was at least one building belonging to the same phase in front of this, as there was no tradition locally for having a public privy facing the waterfront. The first building at the seaward end of the tenement would have been the most prominent building and one of high status, since it was traditionally the house in which the landowner lived. Although this has long been a tradition, it need not have applied in the middle of the thirteenth century, but it is nevertheless more reasonable to expect a proper building facing the waterfront and not a privy. This was the case in the adjacent property of Engelgården in the same period, where a building was recorded in front of a large privy. As there is no evidence for more than a single building phase in the front part of the North Row of Bugården, it must be assumed that the building in front must have been contemporary with both the privy, Building 306, and its successor, Building 230. Had there been two buildings there, they would have been 8–9m long and c 4m wide, assuming the passage was c 2.5m in width. The total width of the foundations at this point of Bugården was 10.5–10.6m.

Building 306 (M11,I,I.2,II) was a privy comprising slender supporting posts and fragments of slender floor-joists associated with a massive layer of moss and excrement extending the full width of the property. Eastern limit at 90.80y; western limit at 88.40y. The layer of moss indicates that the building continued somewhat further to the west. Maximum recorded length 2.40m; estimated width c 4m.

Tenement passage

Only a short stretch of the tenement passage was recorded in Phase 4.1, in association with the privy, Building 306. Maximum recorded length 4m; recorded width 1m.

Eaves-drip gap / the Bua-almenning public thoroughfare

In the public thoroughfare of Bua-almenningen the remains of 3–4 courses of supporting beams were recorded at a lower level between c 96y to a little beyond 75.50y. The construction was independent of the rest of the foundations. The alignment of a drain at a later level was indicated by joists which had been cut through. The width of the thoroughfare was c 3.5m. No details were recorded.

Summary, Period 4

Really only one construction phase was recorded in Period 4 with one building in the South Row and two in the North Row, but the presence of a privy partly underlying one of the buildings in the North Row shows that there must have been two phases. Ever since the excavation there has been much doubt concerning the western limit of the tenement in this period. It was previously thought to have ended with a wharf carried on posts at c 75y, but data from the pottery and a comparison with the rate of expansion in the other tenements would seem to demonstrate that Bugården in this period ended with the foundation substructures, Kar 92 and Kar 100, at c 69.5–69.8y. These were originally higher, but had been greatly reduced in height. In all probability there was a separate wharf carried on posts in front, but no traces were found. (Cf the detailed account on pp 44–47).

Building 231, which was a two-roomed building of some 14m or 15m, was partly well-preserved, but most of the structures to the north were destroyed during the removal of the upper layers by machine. There was a large lime-pit here, beneath the western part of Building 235.

Phase 4.1, the first part of Period 4, was only represented by the privy, Building 306. This was possibly built at right-angles to the row.

The remains in both the tenement passage and the public thoroughfare on the south side were few and very poorly preserved.

Period 3

Sub-phase 3.2.1, burnt in Fire VI (1198) (orange) (fig 25)

Apart from in the rear part of the original site, the layer of detritus from Fire VI was only found as a continuous deposit for a length of 20m, between c 80y and c 100y. At the very rear of the site were the very burnt remains of one building in the South Row, Building 236, and one in the North Row, Building 313, but the period was otherwise marked by an unusually rich building activity covering two main phases, 3.1 and 3.2. Moreover, these both included re-adjustments to the actual waterfront, for which sub-phase numbers have been chosen, 3.1.1 and 3.2.1. The period was terminated by Fire VI.

Within the original area of excavation the level destroyed in Fire VI consisted only of an adjustment to the front of the earlier wharf of Phase 3.2 along 79y. It involved only a few beams with an accompanying planked surface at the very front of the wharf, together with a separate quay standing on posts in front of the South Row. It measured some 3m in width from front to back and reached to 75y. The depth in front was 1.70m, which when corrected gives an estimated depth of water of 1.2–1.3m.

It is assumed that the North Row had a different foundation arrangement involving a rectangular substructure, Kar 54.

It is not clear whether the adjustment to the front of the wharf affected any of the buildings in Phase 3.2 or parts of these. If not, then the total length of the wharf from front to back must have been 7–8m. Although the surviving planked surface did not apparently function as the floor of a building, but as the surface of a wharf, it is reasonable to assume that at this stage at any rate there would have been a waterfront building which must have extended to the previous wharf-front along 79y. See also the comments concerning Phase 3.2.

Phase 3.2 (light green) (fig 26)

South Row

Building 236 (M12,III,IV; N12,II.2) was the only building identified in Phase 3.2. The remains of an apparent

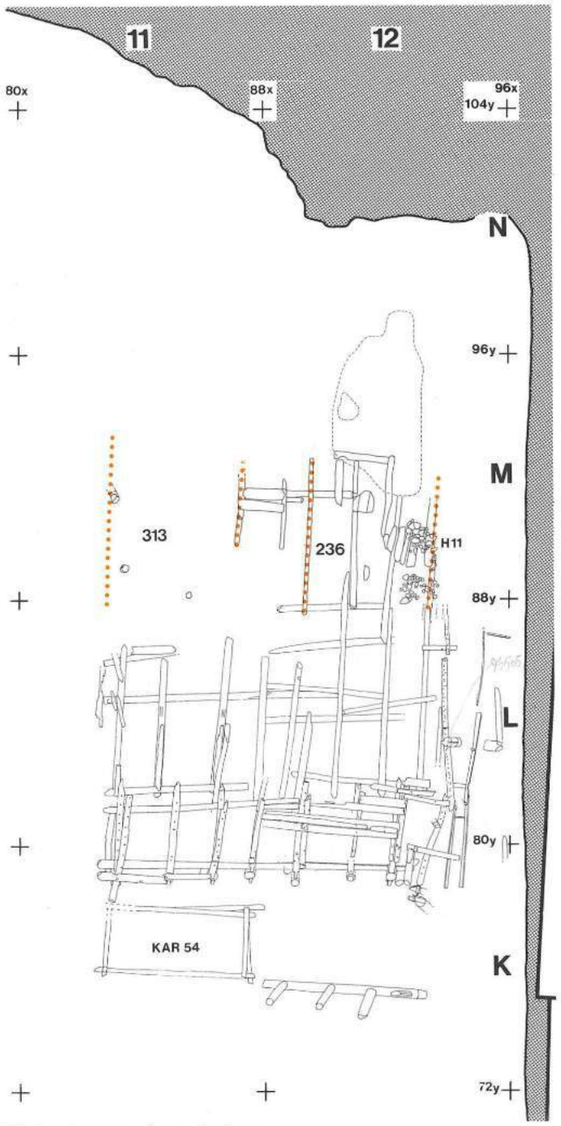
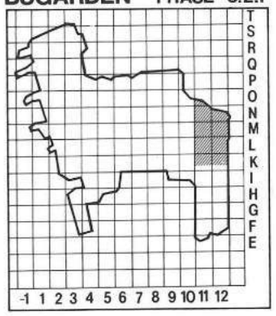


Fig. 25. Bugården Sub-phase 3.2.1.

hearth, Hearth 11, and a concentration of warp-weights from an upright loom indicated the position of the south and north walls respectively. The burnt-out remains of a longitudinal floor stretched from 89y to 93.80y, but the building continued in both directions, but more so to the east. The assumed western limit was around 88y, and the estimated length was 7–9m. Its width was estimated at c 4–4.2m (fig 26).

The main construction of the wharf consisted of two rectangular, relatively slender units, Nos 90 and 91, measuring 4m and 3.3m in length respectively, and 2.2–2.3m in width. They were arranged with their long axis transverse to the tenement, with a gap of c 2.5m



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476		
III	1413	7	7
IIIb	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332		
V	1248	5	5.2, 5.2.1, 5.1
VI	1198	4	4.2, 4.1
VII	1170/71	3	3.2, 3.1, 3.1.1
VIII	Prev. unknown	2	2.2, 2.1
		1	1.2, 1.1

between them, so that they covered the full width of the double tenement from the eaves-drip gap on the north side to the public thoroughfare of Bua-almenning on the Bredsgården side. The southern unit, Kar 90, comprised nine courses of logs, courses 9 to 17 inclusive, crossing each other (see the long section, pl 1). In front, these were held together and stabilized by vertical posts, and the uppermost layer of logs, course 9, which carried the planked surface, passed through holes or notches cut in the vertical posts and were held firmly in place by thin wedges on the outside (see detailed drawing, fig 27).

This twin substructure stood on a thick layer of loose deposits and must have subsided to a significant degree within a relatively short time. In the east–west direction a subsidence at the front of up to 64cm over a distance of only 2.80m was noted during excavation (fig 27), while across the property the subsidence was more noticeable on the north side than on the south. This was compensated for by the addition of two courses of logs, one in each direction (orange) forming Sub-phase 3.2.1. All the transverse logs were laid with their thicker root end to the north, while the longitudinal logs were laid on the existing foundation at the back and partly on the tops of the posts at the front. Portions of the planked surface had survived *in situ* over a distance of a good 3.5m back from the front posts, extending right across the tenement irrespective of the division into two rows and central passage (cf fig 2). It is therefore reasonable to interpret the planking as the remains of the surface of a wharf, which must have measured at least 3.50m from front to back. The height of the wharf was c 1.5m, which gives an estimated depth when corrected of c 1–1.2m at mean sea level, and c 50–60cm at low tide.

Eaves-drip gap / the Bua-almenning public thoroughfare

On the line of the public thoroughfare there was some difficulty in identifying the remains of the level which burnt in Fire VI, since the major structure was from Phase 3.2 with additions in Sub-phase 3.2.1, and possibly also a local adjustment. Four, or more likely five, short posts with evidence of burning probably belonged to the parts which burnt in Fire VI. Two of these stood opposite each other. They were difficult to relate to any of the other remains and they were probably part of the supporting foundation of the thoroughfare which had burnt in Fire VI.

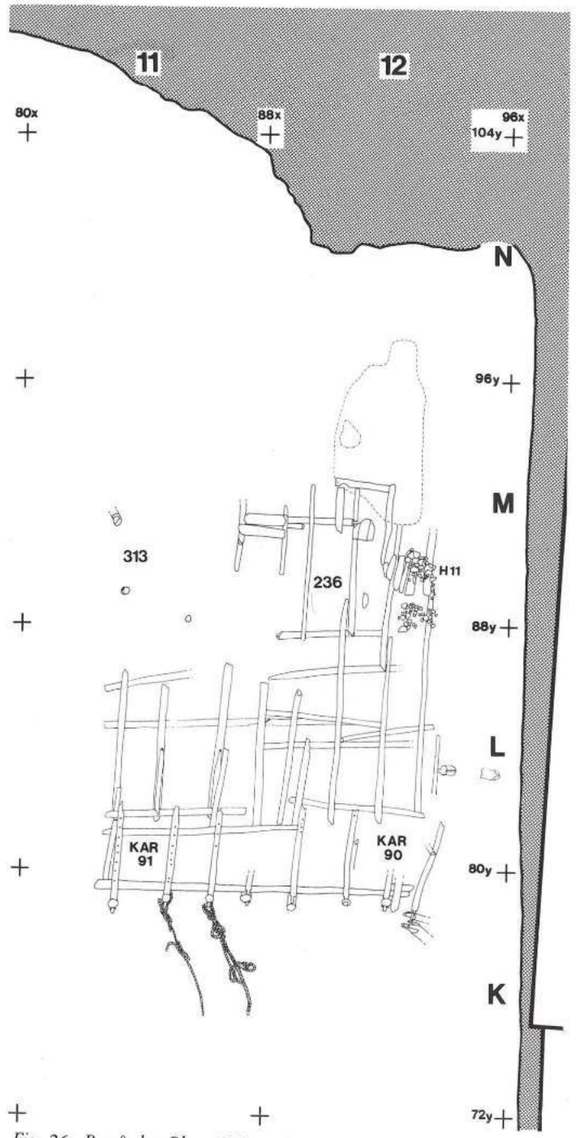
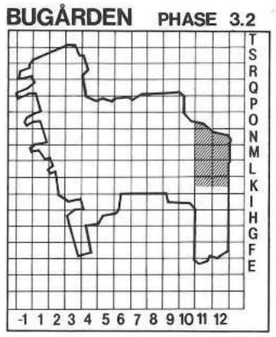


Fig. 26. Bugården Phase 3.2.

The earliest remains from Phase 3.2 comprised three beams whose combined length was 9m, the front one of which rested in a notch cut in a post a short distance in front of the wharf. They all had plug holes where transverse planks with an average width of 15–16cm had been fastened to them. The outermost beam, which was 3.10m long, had a single set of plug holes, the other two had two sets of holes, which implies that the planking had been replaced. In seeking an answer to the question why this was not reflected in the front beam as well, it is tempting to see some association with the partial heightening of the foundations of the tenement at the front end in Sub-phase 3.2.1. This raising of the level involved only the outermost 2.50–3.00m of the wharf. As pointed out, the planking of the thoroughfare had been replaced from this point



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476		
III	1413	7	7
IIIb	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332		
V	1248	5	5.2, 5.2.1, 5.1
VI	1198	4	4.2, 4.1
VII	1170/71	3	3.2, 3.1, 3.1.1
VIII	Prev. unknown	2	2.2, 2.1
		1	1.2, 1.1

onwards, which could suggest that this level remained unchanged through both Phase 3.2 and Sub-phase 3.2.1, while for the outermost 2.5m in the later phase it was heightened and the surface relaid on new supporting beams. Also, immediately in front of the surviving post in front of the thoroughfare from Phase 3.2 there was a similarly notched post with a rebate for a c 30cm high beam. This post was not physically connected with any other construction and it has therefore been difficult to associate it with any particular level, but it could have belonged to Sub-phase 3.2.1, or perhaps to Period 4.

The original relationship between the height of the wharf surface and the planking of the thoroughfare in Phase 3.2 is difficult to ascertain, as the wharf and, to an even greater extent, the thoroughfare had both subsided significantly, particularly at the front. In the thoroughfare, this was marked by a break in the slope c 5m from the waterfront, just beyond which the surface of the thoroughfare continued at c 15–18cm below the level of the wharf as identified during excavation. Down the centre of the thoroughfare the side boards of a drain had survived over a distance of 8.50m and there was an exact correlation between the western end of these boards and the Phase 3.2 surface.

North Row

The remains of Fire VI covered an area similar to the fire-layer from Fire V, 6–7m in all in the mutually adjacent areas of L11 and M11. The two rows of buildings were integrated on a continuous timber foundation overlying separate substructures. Some burnt boards associated with the wharf in front of the South Row continued over to the North Row.

Building 313 (M11,II) was indicated solely by three foundation posts, two from under the north wall and one in the middle. Eastern limit at 92y; western limit at c 88y; but the building clearly continued in both directions. Maximum recorded length 4m; estimated width 3.7–3.8m.

The timber foundations beneath the building continued in the same way as in the South Row, as far as the foundation substructure at c 79y (cf commentary concerning Phase 3.2 in the South Row). Once again there were two phases for the front of the row, the latter one Sub-phase 3.2.1, being represented by a simple heightening of the

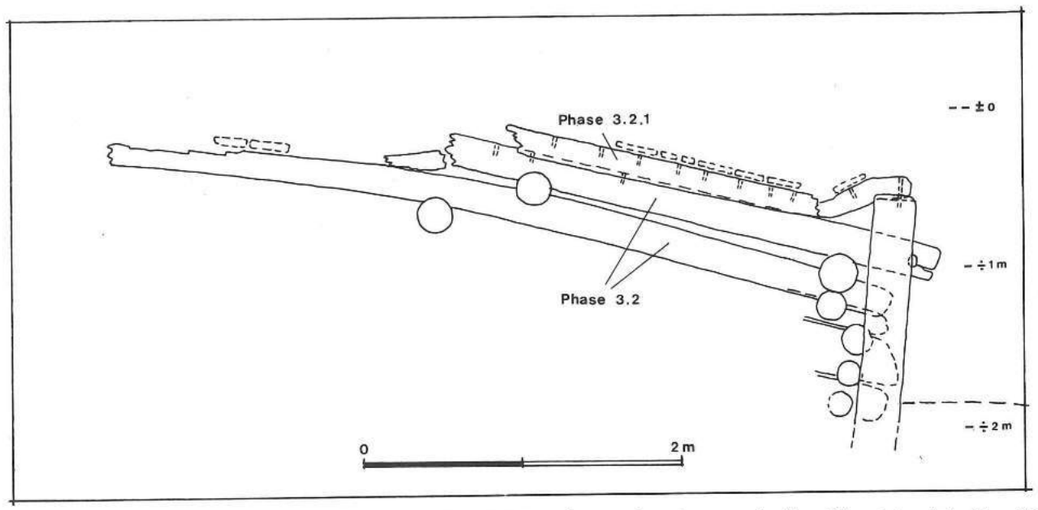


Fig. 27. Long-section of the wharf in Bugården burnt in Fire VI (1198), showing the primary section from Phase 3.2 and the Phase 3.2.1 addition after its subsidence.

level at the very front. Its use as a wharf was clearly demonstrated by the presence of hawsers several metres in length still fastened to the front posts (cf figs 2 and 26).

The distance from the western part of Building 313 to the waterfront at 79y was c 9m. Even if the outermost 3–3.5m were reserved for the actual wharf, there would still be room for a waterside building at this level.

When the site was extended in 1979, there was unfortunately no opportunity to follow this level further back, but there was evidence that the development in the North Row had been similar to that in the South Row. In Phases 3.1, 3.1.1, 3.2 and 3.2.1 the problems were the same right across the double tenement and, as far as it was possible to record them, the solutions which had been chosen were the same, right down to the very details. As the documentation is based on the situation in the South Row, which was more or less clear, in the North Row we shall only give a summary of the development, but with continual reference to the contemporary situation in the South Row.

Sub-phase 3.1.1 (light brown) and Phase 3.1 (pastel blue), unburnt levels below Fire VI (fig 28)

South Row

Foundation units Kar 90 and Kar 91, which formed the basic foundations of the wharf in Phase 3.2, were laid right in front of the earlier wharf, which was raised on posts along c 81.5y after the area had been backfilled to the height of the topmost beam at the front. The earlier wharf, like the later one, consisted of two phases: an initial development, Phase 3.1 (pastel blue), and a later addition, Sub-phase 3.1.1 (light brown).

The initial phase consisted of a single layer of beams supported in notches cut in the vertical posts at the front and wedged fast in the same way as in the later Phase 3.2. These beams carried the planking, but the plug holes for the boards were limited to the first 3m behind the front posts, which presumably corresponds to the width of the wharf at this time. A detailed analysis of the location of the plug holes would provide information about the width of the boards. The height of the wharf is not known as there was no opportunity to investigate more deeply than c 75cm below the assumed level of the wharf surface. Around several of the front posts thick hawswers were found in layers.

As in the following phase, the wharf in Phase 3.1 subsided so much that after a while a partial heightening of the wharf-front was necessary. This was achieved by adding two layers of beams, which were recorded only in the first 3m, and to judge from the surviving evidence it was possibly only done on the south side. It is this level – Phase 3.1, with the partial heightening in Sub-phase 3.1.1 – which formed the foundation for the rear part of the wharf in the next phase, Phase 3.2 (and Phase 3.2.1), which burnt in Fire VI.

Our suggestion of two separate phases in Period 3, even though there were no definite remains of any buildings earlier than Building 236 which was destroyed in Fire VI, is based on the fact that the timber courses from Phase 3.2 continued for c 12m over the foundations of the original wharf from Phase 3.1. The whole of this area could not possibly have lain undeveloped or just have been used as an open wharf, inasmuch as the actual deck of the wharf was indicated by plug holes over a distance of c 3–3.5m from the front of the wharf. Further back the plug holes were missing, clearly as a result of overlapping foundation beams from neighbouring buildings. That there is no evidence for any buildings earlier than Building 236 is due to the fact that it was not possible to excavate more deeply in the South Row.

As can be seen from the long section (pl 1), the beams which carried the boards of the wharf in Phase 3.1 ran back

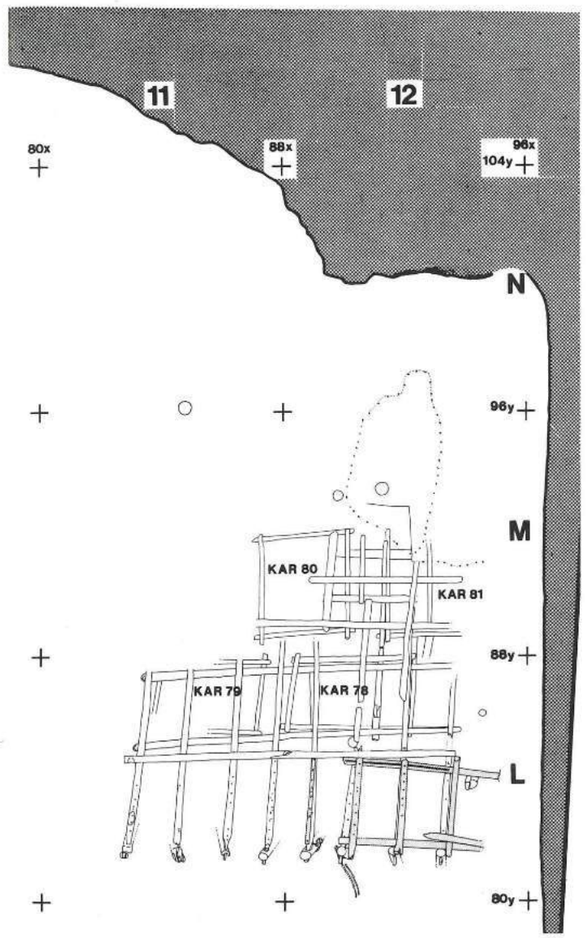
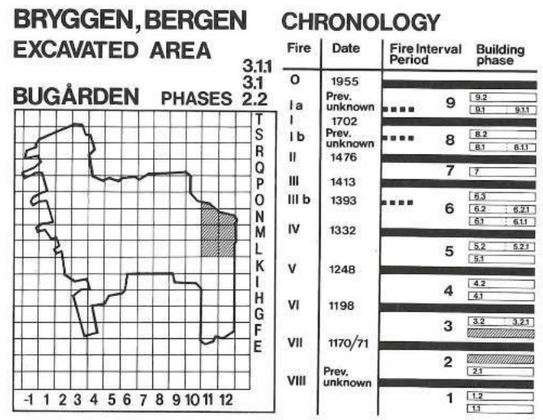


Fig. 28. The wharf construction from Phase 3.1 (pastel blue) in Bugården was heightened at its south-west end in Sub-phase 3.1.1 (light brown) following its subsidence. The posts further back (purple) are from Period 2.

over the foundation substructures behind. There were five units in all, consisting of up to six courses of timbers. The two in front were rectangular (Kar 78 and Kar 79), those behind were square (Kar 80, Kar 81, and an unexcavated one further north) and their dimensions were 4m x 2.35m and 3m x 3m respectively. They extended over both rows of buildings and were bound together at the top by two courses of timbers laid at right angles to each other. The front of this wharf substructure, which lay along c 85.4y–85.5y, was originally strengthened with vertical posts, of which three, possibly four, partially survived. Both during excavation and later there were problems in understanding this waterfront: whether it should be interpreted only as a stage in the erection of the wharf carried on posts at 81.5y, or whether it functioned for a while as a separate wharf, in which case it would represent a third phase of development in the twenty-seven years covered by Period 3. To judge from the evidence, the latter possibility must be eliminated, since as far as can be seen there would not have been sufficient depth of water in front. During excavation the bottom of the units were found to lie at c -1.2m. As well as a general subsidence estimated at 40–50cm, the front of the structure itself must have subsided c 40cm more than the central and rear parts, which would suggest that it originally stood 80–90cm higher. This would give a maximum depth of water of 30–40cm in front of the wharf, but this would still seem to be too shallow, and it has therefore been chosen to interpret this group of foundation units as a part of the first phase of this period, Phase 3.1.



Summary, Period 3

In the course of the twenty-seven years covered by this period, Bugården experienced two stages of development, Phases 3.1 and 3.2, and in both of these the waterfront subsided so much that a partial levelling up and heightening of the wharf was required. This particular subsidence of the foundations must be seen in connection with the fact that the front part of the property was built on less compact deposits than the rear part, where the foundations were more composite.

In Phase 3.1 the supporting foundations consisted of five separate units, three at the back and two in front, stretching the full width of the double tenement. They were joined together at the top by two layers of logs laid at right angles to each other. The beams which carried the planked surface rested at the front in rebates cut into vertical posts and at the back on the transverse upper layer of logs. The subsidence led to a levelling up of the front section, but after a time reconstruction was necessary and a new wharf was erected, which extended the full width of the double tenement. The area in front of the earlier wharf was partially backfilled to the height of the wharf, so that the new wharf could be extended further forward. The foundations for this new wharf consisted of two narrow units, built together at the top and at the front to make a good solid substructure for the wharf, and the presence of lengths of hawsers several metres long testify to its use as such, without any separate wharf built on posts in front of it. The initial stage of Phase 3.2 was followed by a partial

levelling up, Sub-phase 3.2.1, and this was accompanied by a wharf built on posts in front of the South Row at c 75y. The North Row may have had a different arrangement, based on a rectangular substructure.

In Period 3, only one building was recorded, Building 236 in the South Row, which contained the remains of a fireplace and a group of warp-weights from an upright loom. No remains were recorded in the tenement passage, while in the public thoroughfare on the south side the traces seem to reflect the development in Phase 3.2 and the partial heightening of the wharf in Sub-phase 3.2.1. The thoroughfare was surfaced with transverse boards and had a central plank-lined drain.

Period 2

Phase 2.2, probably burnt in Fire VII (1170/71) (purple) (fig 28)

South Row

The earliest structural remains in Bugården South were two thick posts up to 40cm in diameter, which projected through the detritus of Fire VI within the rear part of the site. There was no opportunity to investigate this area further. These two posts stood more or less in line with a post of similar dimensions in the North Row and two similar posts in Engelgården South. The depths of the last three could be checked during the subsequent mechanical excavation of the site and they were found to be anchored with cross bars at depths of -2.10m to -2.50m. The post in Bugården North also had traces of a horizontal beam across the top, laid lengthwise to the tenement. On the basis of our knowledge gained from the evidence in Søstergården and Gullskoen concerning this period, this row of posts between c 93.50 and 96y in Bugården and Engelgården can be regarded as the posts which supported wharfs. The tops of the two posts in Bugården South were at 82cm and 104cm respectively. The height of the wharf is unknown, but it was presumably relatively high.

The dating of these posts was not stratigraphically documented. It is reasonable to assume that they were earlier than Fire VI, and during excavation they were considered to be part of the first phase after Fire VII on the basis of comparative material in the tenements to the north. From measurements taken during building work on the site in 1980, the point in this part of the site where the underwater shelf fell steeply away into the deeper waters of the bay is assumed to have been around 104y, c 10m behind the posts. From this point the beach rose gently and evenly, and ran c 30m back to the land. Around the time of the town's foundation at the end of the eleventh century, the gently shelving beach must have been used for loading and unloading cargo and for beaching vessels. But already in the early part of the twelfth century the built-up area began to encroach over it, and by the middle of the century it had extended as far as to the edge of permanent water, where within most of the area excavated it seems to have ended with a line of caissons – small square log-built foundation structures filled with stones. In front of these ran wharfs 3–4m wide on posts in the back-filled area of the harbour.

Our two posts in Bugården South may have belonged to a wharf from Period 2 destroyed in Fire VII, but they stood c 10m beyond the assumed edge of the underwater shelf and from the waterfront structures which stood on this alignment further north. This distance would seem to be too great for a wharf from this period. As pointed out above, however, the Bugården posts are on the same line as two in Engelgården which seem to be associated with a partial extension to the waterfront based on caissons. This may either be part of this development or be connected with a secondary development within Period 2. It is therefore possible that the recorded distance of c 10m from the edge of the built-up area to the posts was actually less if there were more caissons or foundation substructures below the permanent waterline also here. If this interpretation is chosen, it would indicate that Bugården and Engelgården must have been ahead of the development compared with the structures to the north just before Fire VII. Alternatively, the posts could have belonged to the first phase of development after Fire VII, in which case the Bugården/Engelgården area must have been somewhat behind in the first period following Fire VII. Compared with the total development in the Bryggen area briefly mentioned above, we have preferred the first interpretation, associating the posts with Period 2, in particular the latter part of this period designated Phase 2.2, even though the evidence is thin.

Phases prior to 2.2

It follows from what has been said above that the earliest phases which were recorded in the tenements to the north, particularly in the Gullskoen area, were not identified within the excavated area of Bugården.

Summary, Bugården

In the North Row there was really no opportunity to excavate beneath Fire VI. It was nevertheless possible to gain a picture of the general development of the area prior to Fire VI by making comparisons with relevant points in the South Row and in the neighbouring tenement of Engelgården on the north side. If we take as our starting point the building phase which is assumed to have been destroyed in Fire VII, Period 2, and which in the first instance extended as far as the edge of the underwater shelf around 102–104y, we find the following stages of expansion into the deeper waters of the harbour:

Period 2 (purple)

No contact was established during excavation with the built-up area,which lay further back in this period, but it is assumed that it terminated on the seaward side with a wharf on posts, indicated by two massive posts in the South Row at around 93.4–94y and one, or possibly two, in the North Row at c 96y. Two similar posts at c 96y in Engelgården South can probably be related to these.

If our interpretation of the posts is correct, it would suggest that each tenement had its own wharf, and that the waterfront for the North Row lay slightly further back than that of the South Row. This feeling that there were individual wharfs would appear to be strengthened by the observation in the North Row, as well as in Engelgården South, that the posts were not placed on a common sleeper beam, but were individually provided with short cross bars to prevent them from sinking into the thick layer of previously deposited material.

The tops of these five front posts varied from 22 cm to 138 cm. It was only possible to establish the height of the transverse bar on one of the posts in Engelgården South: its upper edge lay at -2.48m. No other details are known from this level, as it was not excavated archaeologically.

The level burnt in Fire VII.

Period 3

Phase 3.1 (pastel blue)

From this level onwards, the double tenement was developed as a single unit as far as the foundations and the waterfront were concerned. The Period 2 development was replaced by the construction of five separate foundation substructures, Kar 78 and Kar 79 in front, and Kar 80, Kar 81 and an unexcavated one behind. They stood on backfilled deposits and spanned the full width of the tenement. In front they were reinforced with vertical posts. The actual wharf consisted of a single layer of beams, their back ends resting on these substructures and their front ends locked to vertical posts, which stood 3m further forward. This layer of beams, to which the deckboards were plugged, formed layer 8 under Fire VI in the long section (pl 1). The height of the wharf is unknown.

Sub-phase 3.1.1 (light brown)

After a while the wharf began to subside to such an extent that the structure in the South Row had to be heightened by adding two layers of timbers to the front (layers 5 and 6 in the long section, pl 1). The new deck was laid c 25cm higher than the original one. There was no direct evidence for a «passage» on the south side, but there were indications that the wharf and the front edge of a «passage» formed a continuous waterfront in Phases 3.1 and 3.1.1. The depth of water in front of the wharf is not known.

Phase 3.2 (light green)

After some time the area in front of the Phase 3.1 wharf was backfilled and two earth-filled timber substructures, Kar 90 and Kar 91, were brought into position. They spanned the full width of the tenement. Kar 90 is marked on the long section (pl 1). The substructures were stabilized by passing the front end of the uppermost layer of beams, which carried the deckboards, through holes in vertical posts erected in front along c 79y. It was this construction which was given the name of «King Sverrir's Quay» at the time of the excavation. As in Phase 3.1, this wharf was also subject to a significant and uneven subsidence at the front. The height of the wharf from its base to its upper edge measured 1.40–1.60m. After correction for a c 20cm landrise and an assumed compression of the underlying deposits of c 60cm, the depth of water in front of the wharf is estimated at c 1.0–1.2m.

Despite the fact that the locking beams projected 20–25cm, it is probable that this log construction functioned at least for a while as a wharf, since mooring ropes were found still fastened to a couple of the front posts.

No remains of the tenement's central passage were recorded.

The passage on the Bredsgården side – the later public thoroughfare known as Bua-almenning – was surfaced in places with boards 15–16cm thick and had a drain which was lined with planks set on edge. The greatest recorded width was c 3.5m. At the seaward end, the front posts in the passage area stood 40–50cm further forward than the row of posts forming the front of the wharf.

Sub-phase 3.2.1 (orange)

The subsidence in Phase 3.2 must have occurred relatively quickly and as in Phase 3.1 it was compensated for by the addition of horizontal logs in places. Several of the deckboards had survived *in situ*. It is possible that this subsidence led either to the demolition of the front building from Phase 3.2 or to its being extended to 79y, as it seems that a new wharf was erected on posts standing at c 75y in front of the South Row. In the North Row, this was apparently followed by the construction of a timber substructure, Kar 54, forming the foundation of the wharf in front of this Row. The wharf measured c 4m from front to back. Kar 54 was c 1.9m high on the north side and c 1.7m high on the south side. The depth of water in front of the wharf when corrected for the factors mentioned above was between c 1.3m and 1.5m.

Buildings 326 and 313 belonged to Phases 3.2/3.2.1.

The adjustment of the waterfront was reflected in a similar raising of the level of the front part of the «thoroughfare», which was recorded as far west as c 78.2–78.3y.

Sub-phase 3.2.1 ended with Fire VI.

Period 4 (yellow)

Period 4 must have included two phases of development, but the only evidence from the earlier phase was a privy, Building 306, underlying Building 230 in the North Row. The possibility cannot be excluded, however, that the other buildings from this period, Building 231 in the South Row and 235 in the North Row, also existed from the beginning of the period and should belong to Phase 4.1.

During this period the ground level was raised by half a metre and a new waterfront was erected on foundation substructures 92 in the South Row and 100 in the North Row. It seems that they were originally higher and were reduced in height at a later stage. They presuppose the existence of a separate wharf supported on posts in front of them, but no evidence was found.

The interpretation of this sequence is based on a comparative study of the remains in the neighbouring tenement of Engelgården on the north side. Both the level of the sea-bed and the alignment of the waterfront are in agreement with the situation in Period 4 in Engelgården and this is a particular characteristic for every phase which was recorded in the development of the tenements within the excavated area.

The sea-bed in front of the foundation units in both rows lay at c -2.3m. The width of the wharf from front to back is not known.

In Period 4, the remains of a plank-lined drain were recorded, providing the earliest indication of a distinct tenement passage.

In the «public thoroughfare», foundation beams were recorded as far forward as c 75.50y. Its maximum recorded width was 3.50m.

The period ended with Fire V.

Period 5

Phase 5.1 (forest green)

Between Fire V and Fire IV there were two major phases of expansion pushing the front of the tenements 16–18m out into the harbour basin, involving depths of 5–6m. Along the waterfront, the old foundation substructures Kar 92 and Kar 100 were reduced in height to a minimum, after which the whole area was partly backfilled with deposits and partly built up with closely-laid timber in layers, on which the new foundation substructures were erected: Kar 93 in the South Row and Kar 101 in the North Row.

In front of these a wharf was constructed on posts across the full width of the double tenement, and the public thoroughfare. The width of the wharf from front to back was c 5m, and the sea-bed in front of the wharf was recorded at -2.90m, which should be corrected to c -2.4m.

The buildings belonging to this phase were Buildings 298, 261 and 304 in the South Row, and 227, 229, 334, 335 and 336 in the North Row. The location of the wharfside building in the South Row was not established, but it must have extended to c 67y.

The remains of two construction levels were recorded in the tenement passage over a distance of c 15m, with the planking of the later phase being well-preserved in some parts. The width of the passage was c 3.4m. No drain was recorded.

The public thoroughfare of Bua-almenning was recorded over a distance of a good 35m as far as c 2.8m behind the waterfront. The maximum recorded width was 3.50m.

Phase 5.1 was unburnt.

Phase 5.2 (red)

This phase began with the dumping of loose deposits in front of the earlier wharf in a layer which increased in thickness from c 0.6m to 1.4m over a distance of 10–12m. On top of these, a smaller foundation substructure, Kar 94, and a larger one, Kar 95, were erected in front of the South Row, and substructures Kar 102 and Kar 103 were constructed in the North Row. In the latter row, a wharf measuring at least 3m from front to back was erected on posts along c 50y. Its height at the front was c 6m and the corrected height of the sea-bed would be c - 5 to -5.2m. In the South Row there were only the remains of a single post, most likely from the wharf.

Belonging to this phase were Buildings 226, 260, 280 and 292 in the South Row, and 228, 333 and 309 in the North Row. The wharfside buildings were not located.

At the same time as the buildings were being renewed in Phase 5.2, there was also an extensive renovation of the tenement passage, the remains of which were very well preserved in places. The width of the passage was c 2.8m.

Of the public thoroughfare there were only a few scattered remains. The maximum recorded width was c 3.5m.

The phase burnt in Fire IV.

Period 6

The period between Fires IV and III was also marked by a lively building activity, covering three distinct phases. In the front part of the tenement, Phase 6.2 was terminated by a fire which had not hitherto been recorded in the Bryggen area and which was not identified until after the excavation had finished. It has been dated to 1393 and labelled Fire IIIb. A closer study has shown that it also affected the rest of the tenement, as well as the neighbouring tenement of Engelgården and at least the southern row of buildings in Søstergården.

Phase 6.1 (dark blue)

After Fire IV, the ground level was built up over the whole site and the waterfront was extended forwards to c 49y in the South Row and to c 45.4y in the North Row, where in addition a wharf was erected on posts at c 41.6y. There was no evidence for a separate wharf in the South Row, but as the front foundation unit here seemed fragmentary or had possibly been reduced in height, it is tempting to think that both the supporting substructure and the waterfront itself had been developed in the same way as in the northern half of the tenement. The wharf would have measured 4–5m from front to back. It was c 3.6m deep, which when corrected would give a maximum depth of water of c 2.9m.

Buildings 281, 302 and 303 belonged to this phase in the South Row, and 329, 330, 331 and 332 in the North Row.

Of the tenement passage there were some excellently preserved sections. Its width was c 2.8–2.9m.

On the south side of the tenement, the rear section of the public thoroughfare had survived with part of its planked surface intact. At its widest measurable point it was 3.6m wide.

Phase 6.2 (dark brown)

In Phase 6.2 the earlier front buildings were thoroughly removed and the foundations of the previous phase were heightened. This involved the substructure 96 and a new foundation unit 98 in the South Row, and units 104 and 107 in the North Row. The front of the substructures appears to have been around 47.5y in the South Row and c 46y in the North Row, where a wharf on posts was erected in front, extending to c 40.6y. This would give a wharf of c 5.5m from front to back. The depth was recorded as c 3.3m, which would give a depth of water when corrected to c 2.7m at the maximum.

This phase included Buildings 300, 299, 268 and 294 in the South Row, and 325, 326, 327 and 328 in the North Row.

Of the tenement passage there were continuous remains extending over 28m. The planked surface varied in width between 3m and 3.2m.

There were also extensive remains surviving in the public thoroughfare, with a stone-paved surface covering 7–8m, and a carefully constructed sewer flanked by stakes placed close together covering a distance of c 11m. The maximum width of the thoroughfare measured 3.5m.

Phase 6.2 terminated with Fire IIIb.

Phase 6.3 (dark yellow)

The building phase which followed shortly after Fire IIIb was the third phase of development since Fire IV. It was relatively well preserved and could be followed throughout the whole site. Buildings 282, 275, 277, 293 and 316 in the South Row, and 319, 254, 320, 322, 223 and 324 in the North Row were recorded.

This was the last phase in which buildings of the narrow medieval type were consistently found. The South Row from now on was gradually widened at the expense of the public thoroughfare, which appears to have gone out of use after Fire IIIb, as no further traces were recorded and a well had been sunk in the area where it used to run. At the far east end of the site, however, there were the remains of side planks from a drain, but it is not clear whether the drain belonged to the public thoroughfare or was part of the drainage system in the wide eaves-drip gap which remained between the two properties.

The tenement passage was indicated by supporting posts, side planks and logs over a distance of c 37m. The width of the passage was 3–3.5m.

Phase 6.3 burnt in Fire III.

Period 7 (violet)

The period between 1413 and 1476 comprised a single building phase, the remains of which were generally poorly preserved. It included Buildings 274, 291, 286, 287 and 288 in the South Row, and 249, 253, 317, 318, 321 and 297 in the North Row. Contrary to expectation, the foundations of a stone-built hearth were found in the front building of the South Row.

Apart from a few supporting posts from a drain, practically no remains had survived of the tenement passage. It measured between 3m and 3.3m in width. There were also the remains of a drain in the eaves-drip gap on the south side of Bugården, but this can hardly be taken to indicate the presence of a public thoroughfare here.

Period 7 ended with Fire II.

Period 8

While there were only the remains of a single phase of development in the North Row in this period (recorded as Phase 8.2), there was consisent evidence for two phases in the South Row, Phases 8.1 and 8.2, with an intervening Sub-phase 8.1.1 at the east end.

Phase 8.1 (light blue)

The buildings in the South Row in Phase 8.1 were 257, 271, 272, 290, 285 and 301.

Sub-phase 8.1.1 (palm green)

Buildings 257 and 271 were replaced in Sub-phase 8.1.1 by Buildings 296 and 259.

Phase 8.2 (olive green)

Phase 8.1/8.1.1 was destroyed in a local fire by the middle of the sixteenth century at the earliest, and the whole level was built up again as Phase 8.2 with Buildings 256, 258, 266, 276, 283 and 289.

The North Row consisted of Buildings 248, 252, 311, 314 and 315.

In the tenement passage, whose width varied between 3.2m and 3.4m, there were some apparently scattered remains.

There were no recognizable remains in the eaves-drip gap between Bugården and Bredsgården.

Phase 8.2 burnt in Fire I.

Period 9

Phase 9.1 (pink)

This period comprised two phases, beginning with an unburnt Phase 9.1, comprising Buildings 255, 262, 270, 265 and 267 in the South Row, and 305, 312, 310 and 308 in the North Row. In the South Row, Building 255 at the rear of the tenement burnt in a local fire and Building 270 was replaced for some other reason, together with Buildings 305, 312 and 310 in the North Row.

Phase 9.2 (light orange)

The new structures erected in Phase 9.2 were Buildings 295 and 263 in the South Row, and 247, 251 and 307 in the North Row. Buildings 262, 265 and 267 from Phase 9.1 in the South Row and Building 308 from Phase 9.1 in the North Row survived right up to the fire in 1955.

During the development in Phase 9.1, both the drain in the tenement passage and the one in the eaves-drip gap broke with the earlier tradition in that they were carefully built up with stones, instead of being lined with boards set on edge. The choice of material is reminiscent of that used in places for the ground-walls beneath the sill-beams in some of the buildings of this period.

In going through the phases of development in Bugården, it is clear that the two rows basically followed the same pattern of expansion, which involved constantly extending the tenement further and further out into increasingly deeper waters of the harbour. Table 4 gives the actual amount of expansion measured from the lower edge of the beach at 104y.

Table 4.

Period/ Phase	Bugården North		Bugården South	
	Expansion	Total	Expansion	Total
2		8.00m		10.00m
3.1	14.50m	22.50m	12.60m	22.60m
3.2	2.50m	25.00m	2.40m	25.00m
3.2.1	3.00m	28.00m	4.00m	29.00m
4	6.20m	34.20m	5.50m	34.50m
5.1	8.00m	42.20m	7.50m	42.00m
5.2	11.80m	54.00m	12.00m	54.00m
6.1	8.40m?	62.40m		
6.2	1.10m	63.50m		

From Phase 3.1 to Phase 5.2 inclusive the two rows were extended equally, the difference in the measurements being mainly due to the angle of the waterfront. In Period 4 there was no evidence for a separate wharf, and in Phases 6.1.and 6.2 the front of the wharf in the South Row was not recorded. Measured from the lower edge of the beach, the total amount of expansion including the width of the wharf around 1400, shortly before Fire III, was c 63–64m.

It is difficult to make a phase-by-phase or period-by-

period comparison of the recorded expansion and the building activity which it represents, since not only the topographical conditions kept changing in step with this expansion of the built-up area, but the technical knowledge and acquired experience also increased in step with the development. The expansion over the beach and out to the edge of the underwater shelf probably presented no great challenge technically, but it must have involved a financial effort combined with vision and determination. In Period 3 there was a relatively moderate advance, but it was now a question of working in increasingly greater depths of water, which demanded new technical solutions. With two phases of development both involving a considerable expansion within a short period of twenty-seven years, one gets the impression that there must have been an almost permanent need to expand. When it comes to volume and distance, incomparably the greatest activity occurred in Period 5, between Fire V and Fire IV, ie from 1248 to 1332. When the increasing depth of water is taken into account, the development in the following period, between 1332 and 1413, must also be characterized as significant. However, at every stage of development vast amounts of material were deposited on the contemporary sea-bed and huge quantities of timber must have been required for the foundation substructures.

We have here only been considering the need for expansion in the horizontal plane. From c 1200 onwards we must take increasingly into account an upwards expansion, from the single-storey buildings of the twelfth century to buildings with two, three or even four storeys plus an attic a century later.

Variations in width within the tenement

For each phase or period we have given the length and breadth of the different buildings and the width of the passage. The extent to which the variations in width affected the total layout can be seen from the plans. To give an impression of the relationship between the widths of the buildings and the passage within each phase and from one phase to the next, we have presented in fig 29 a schematic presentation of the cross section at c 80y between the K and L grid-squares. This section has been chosen at random, but is nevertheless representative. It shows that the buildings in the North Row remained very stable with an average width of 4.12m. In the South Row, a stable average width of 4.32m is observable until Fire III, after which the buildings increase in width to a varying degree, with an average width of 5.32m. The increase in width after Fire III was a result of building out into the thoroughfare of Bua-almenning on the south side. The mean width of the buildings in the South Row for the entire period was 4.82m.

The width of the built-up area of the tenement varied according to the fluctuating width of the South Row, ranging from 10.4m prior to Fire V (1248), *via* 11.5–11.8m in Period 6, to 12.7m in Period 9. Taking the built-up area and half the eaves-drip gap on both sides, the full width of the property was fairly constant around 14m.

The central passage in the tenement was also fairly constant in width, varying between 3.2m and 3.4m, except in Phases 5.2 and 6.1 when it was reduced to 2.85m and 2.80m respectively.

Construction of the timber substructures and wharfs

The development of Bugården is characterized by an expansion in stages out into the harbour basin, and the major part of this expansion from the mean tidal point in c 1170 to today's waterfront c 140m further out in the harbour bay took place in the medieval period. This expansion by stages is also reflected in the adjacent area of Engelgården to the north, and trial investigations at specific points in the neighbouring tenement of Bredsgården to the south suggest a similar development there.

The apparent total agreement in the way the problems were solved, which has been documented here, gives good reasons for assuming that the situation in Bugården is representative for a larger part of Bryggen, or at least for the other tenements within the area affected by the 1955 fire.

Within the area of artificially created land investigated in connection with the Bugården tenement, the deeper foundations consisted exclusively of horizontal timber structures put together in various ways. The earliest and simplest foundations, which were used in relatively shallow water, consisted of small, almost square, boxes or caissons c 2m x 2m, built with short horizontal logs jointed at the corners (cf figs 5 and 6). In a transitional phase, rectangular timber constructions were used, often with their long axis running across the tenement. As the foundations were laid in increasingly deeper water, the size of the log structures increased and there arose a need for strengthening them with extra timbers in both directions. In the latter part of the thirteenth century and in the fourteenth, the timber substructures usually extended over the full width of the row, and sometimes even covered the whole width of the double tenement. This was usually achieved by placing smaller, lower structures beneath the waterline or just reaching it, at which point they were joined together with horizontal timbers to form a single large continuous foundation.

It is not clear how the problem of laying the logs at right angles to one another on the sea-bed in depths of 4–5m was solved. The lowest timbers were often staked to the sea bed, but this provides no immediate clue as to the actual construction method, and it is not proposed to undertake a closer analysis for the time being.

It is also interesting to note that with very few exceptions stones were not used as ballast in these deep and large substructures: they were usually filled with loose organic deposits. On the other hand, the small caissons used just below the waterline and on the beach were almost without exception filled with stones. That these foundations had some other function does not really provide the full explanation, and the fact is simply acknowledged here without further comment.

The excavation of the Bugården tenement has provided for the first time a detailed insight into the way the wharfs were constructed in the Middle Ages. Apart from the wharf along 79y in Phase 3.2, which was log-built, the front part of the wharfs always consisted of some light structure, made up of a single layer of beams to which the planked surface was plugged. At the front, the beams were attached to a row of posts, which were either anchored individually at their base or else arranged on a common sill-beam. This is the same kind of construction as can be seen on the Bayeux Tapestry (see fig 30). Thanks to the

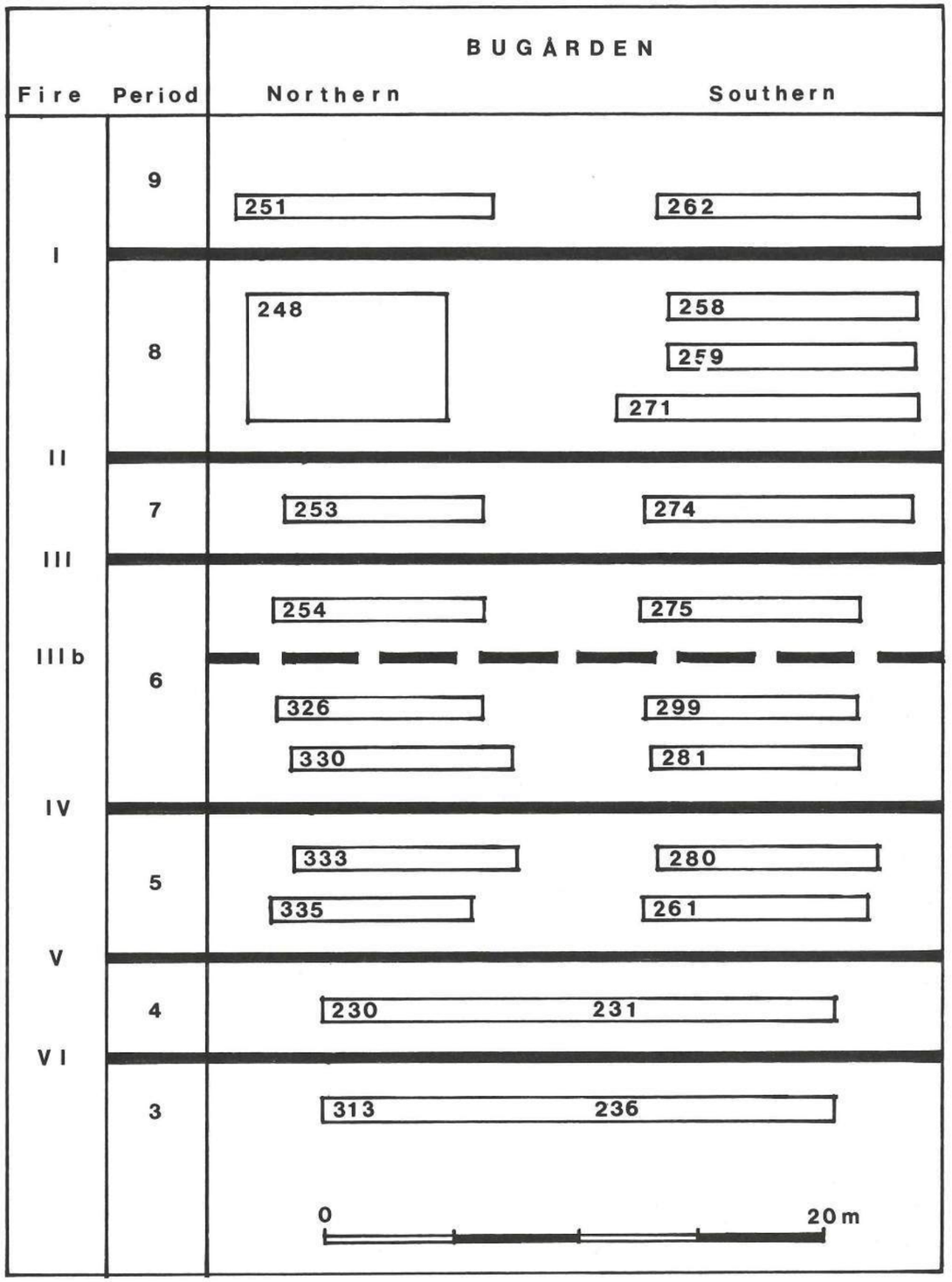


Fig. 29. Sketch demonstrating the variations in width in Bugården between Periods 3 and 9 (up to 1955).

Fig. 30. An eleventh-century wharf in southern England as depicted on the Bayeux Tapestry.

system of anchoring, it has been possible to calculate the level of the sea-bed at the time the wharf was constructed, and as the relationship between land and sea-level in the Bergen area remained practically stable throughout the Middle Ages, it has been possible to calculate the depth of water in front of the wharf in the various phases.

In the first expansion out from the tidal zone, the depth of water increased dramatically. The front posts of the wharf in Period 2 stood in deposits c 2.5m below mean sea level (the mean tidal range in the Bergen area in 1989 is 47cm). This considerable depth, which was clearly not absolutely essential, must be considered in the light of just a modest backfilling of the bay. If further expansion was required, then a more moderate depth of water was desirable for both practical and economic reasons than that pertaining in the harbour basin. It was at this time that the massive backfilling began, which must on the whole have been intentional. The foundations which were laid out in Phases 3.1 and 3.2 went no deeper than 1.4–1.6m anywhere, and the raising of the sea-bed to this height must have involved the transportation of huge amounts of deposits. A distinction has been made between the height of the wharfs and log-built foundations and the depth of water in front of them after corrections have been made for isostatic changes and compression of the deposits (see p 46). In front of the log-built wharf in Phase 3.2 the depth of water at the time of excavation was between 1.4m and 1.6m. If adjustment is made for a rise in land level of up to 20cm and a compression of the deposits of c 60cm, the result is a depth of water of between 1.00m and 1.20m at the time around 1200. This provides the most correct picture of the extent of the backfilling, but it also reflects the needs of shipping at that time.

On the basis of the same corrections, the sea depth was increased to between 1.3m and 1.5m in Sub-phase 3.2.1, and to 2.4m in Phase 5.1.

In Phase 5.2 – the period immediately before and after 1300 – the height of the wharfs was even greater, but it is reasonable to assume that there was a greater subsidence of deposits here than nearer the beach. To judge from the surviving height of the front posts of the wharf in Bugården North, their tops would have been on a level with normal mean water. The locking spars at their base were at -6m and the base of the log-built foundations just behind the wharf lay between -3.5m and -4m. This was clearly a much greater depth of water than was required by contemporary shipping and it also involved considerable amounts of timber, even if earlier building material had been reused.

In the mid and late fourteenth century and to an even greater extent in the fifteenth century, there was a continual backfilling of the harbour basin and raising of the sea-bed with the obvious aim of reducing the amount of timber required. It is reasonable to assume that this also led to a greater stability of the waterfront, something which would have been found increasingly necessary as the wharfs and buildings projected further into the bay and were more exposed to the wind and the sea. In Phases 6.1 and 6.2 the sea-bed was raised between 2.4m and 2.6m and the depth of water in front of the wharf was reduced to between 2.7m and 2.9m.

In the foregoing account it has been repeatedly pointed out that the backfilling of the harbour for which the evidence has been recorded must really have been intentional. This is distinctly at variance with the current and somewhat uncritical theory that the significant backfilling which has been recorded in the bay should really be ascribed to the unlawful and random dumping of rubbish. Historical documents prohibiting the illegal dumping of rubbish and waste demonstrate that such activities went on, but it probably concerned the innermost part of the bay where the shoemakers resided and where the waters were shallower (NgL III, 13–14). The development in Bugården recorded through excavation has confirmed that each building phase involving an expansion into the harbour basin was preceded by a planned artificial raising of the sea-bed. The long section through the tenement clearly demonstrates this. The current conception of rubbish being dumped illegally should therefore be modified.

Other special features concerning the wharfs are dealt with in the second part of this volume, to be published separately.

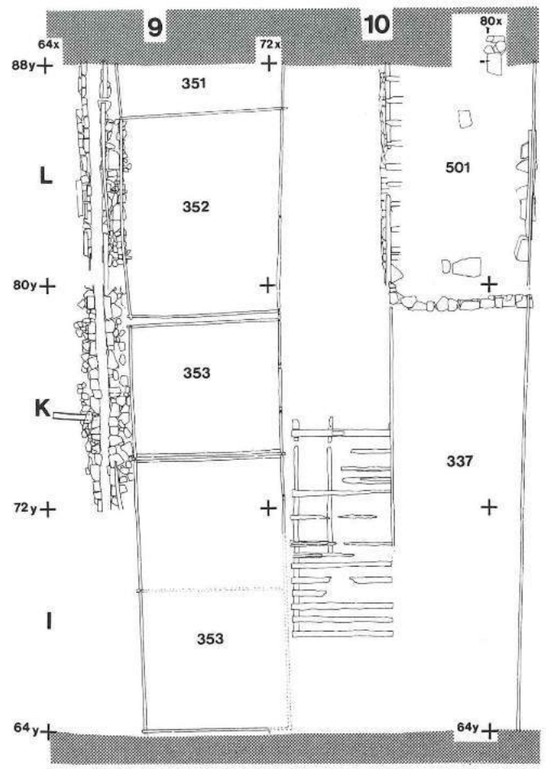
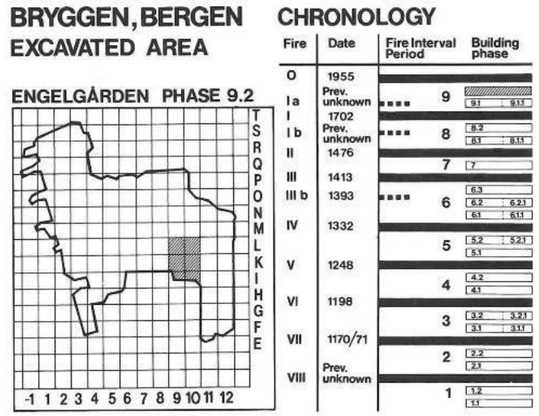


Fig. 31. Engelgården Phase 9.2.

Engelgården

Engelgården was a double tenement situated between Bugården to the south and Søstergården to the north (see fig 1). Its two rows of buildings were more or less contained within rows 9 and 10 on our site-grid. As in Bugården, the excavations originally only went as far east as 88y, the grid-line separating the L and M squares, and as far west as 63y, about the middle of the I grid-squares.

At the eastern end, the site was bounded by a stone building in each row, standing approximately 1m east of the 88y grid-line. The building in the northern row had been the communal hall for the tenement with cellars beneath; the southern building had been the tenement's kitchen quarters. The latter was demolished before it could be properly investigated, but the remains of the building in the North Row were partially excavated (Building 107). Otherwise, the area to the east of the original site was stripped by machine down to a level corresponding to the thirteenth or fourteenth century and was subsequently excavated by hand, firstly under the direction of Edward Harris in 1972 and two years later under the direction of Kalle Sognnes (Phases 6.1–5.2 in Engelgården South and Phases 6.2–2 in Engelgården North. The deepest parts were finally investigated in 1979 under the direction of the writer (Phases 2–5 in the South Row). The eastern limit of this additional area varied according to the Row and the level.



Period 9

Phase 9.2, burnt 1955 (fig 31)

South Row

The floors of the buildings in Period 9 were not drawn. Two buildings lay within the area of the excavations.

Building 501 (L10,I; L11,I,II; M10,I) had a floor laid longitudinally and was limited on the eastern side by a stone building, which was still standing. On the western side it shared a common ground-wall with Building 337. Length 10m; width 5.3m.

Building 337 (I10,I; K10,I) was part of a very long building containing several rooms. It had transverse floorboards in the eastern part and longitudinal boards in the western part. It shared a ground-wall with Building 501 along c 79y. Maximum recorded length 12.2m; width varied from 4.5m at the west end to c 5.2m to the east.

North Row

In the North Row the area first excavated had the same eastern and western limits as that in the South Row, c 88y and 66y. To the east the cellars beneath the communal rooms, Building 107, formed an obvious boundary at c 89y. For practical reasons, the final metre-wide strip was not investigated until later. Building 107 was demolished in 1970 and its site partially investigated by Edward Harris in 1971–72. It will be described under Period 7, the period in which it was built, together with the ruined stone building 374, which was found further back on the very edge of the excavation area and whose walls had survived to a height of several metres.

This level, which was destroyed in the 1955 fire, consisted of the remains of three buildings: 352, 353 and a smaller structure 351.

Building 351 (L9,I; L10,I) was originally a covered passage leading from the tenement's central passage to the north side of the communal building with its cellars. It was 6m wide, but only c 2.2m long. Western limit at c 88y.

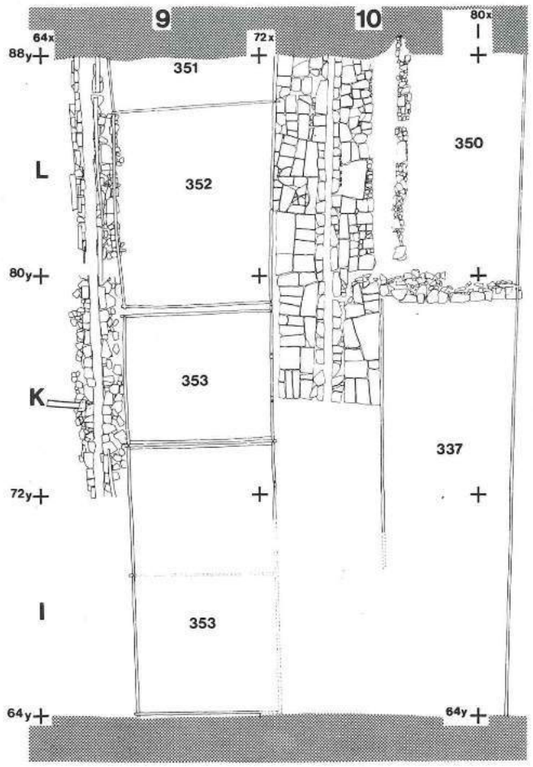


Fig. 32. Engelgården Phase 9.1.

Building 352 (K9,I; L9,I; L10,I) was a detached log-built structure with a longitudinal floor. Eastern limit at c 88y; western limit at 78.90y. Length 7.10m; width 5.90m at the eastern end and 5.50m at the western end.

Building 353 (I9,I; K9,I; K10;I) was also a log-built structure, but was longer than Building 352. It was divided into three rooms. Eastern limit at 78.60y; western limit at c 64y. Length 14.6m; mean width 5.1m.

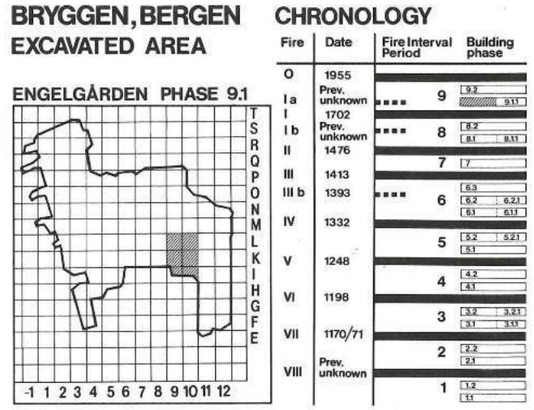
Tenement passage

In the passage down the centre of the property two layers of joists and a planked surface laid transversely had survived. The width of the planking was 3.60m at the eastern end and c 3.7m at the west end. The distance between the actual rows was 3.70m and 3.80m at the eastern and western ends respectively.

Phase 9.1, unburnt level beneath the 1955 fire-layer (fig 32)

South Row

Beneath Building 501 but overlying the layer belonging to Fire I, foundations were recorded at various places which had no functional connection with the building above. These included a ground-wall c 50cm inside the north wall of the building, and a similar arrangement at the west end.



Two distinct levels were also recorded in the tenement passage, the lower of which was paved with stone and ran beneath the north wall of Building 501, continuing as far as the ground-wall. Although there were no other structural remains, there must have been a building belonging to a first phase in Period 9 following Fire I and it has been designated Building 350.

Building 350 (K10,I; L10,I; M10,I) consisted of the ground-walls for the north and west walls. Eastern limit at 89y; western limit at c 79.4y. Length c 9.6m; width c 4.5m.

North Row and tenement passage

In the North Row only one structural phase was recorded between Fire I in 1702 and the 1955 fire, but Building 350 in the intermediate level in the South Row was reflected in a contemporary level in the passage consisting of trimmed stone slabs covering a distance of c 13m. It is possible that the passage had been paved with stone throughout its entire length. At what point Building 350 and the paving were replaced is not known. Associated with the paved surface was a central drain built up with stone slabs, and this continued in use in the latter phase.

The paved surface was 4.25–4.30m wide, while the distance between the opposing Buildings 350 and 352 was c 4.4m. The tenement passage in other words was wider than in the following phase. The narrowing of the passage in the later phase was caused by the erection of the wider building 501 on the site of Building 350.

Summary, Period 9

In the two uppermost levels, corresponding to Periods 8 and 9, only c 25m of the tenement was excavated, from c 88y to c 63y. At the east end, the site terminated at two stone buildings, known locally as cellars. One of these had formed the basement of the communal building in the North Row and it is fully described in Period 7, the period in which it was built. In the lower levels, an increasingly larger area to the east could be incorporated into the excavations, but how representative the remains recorded in this part of the site might be varied greatly as a consequence of the use of the mechanical excavator.

The period which covers the time-span 1702–1955 consisted basically of a single building phase, except for the

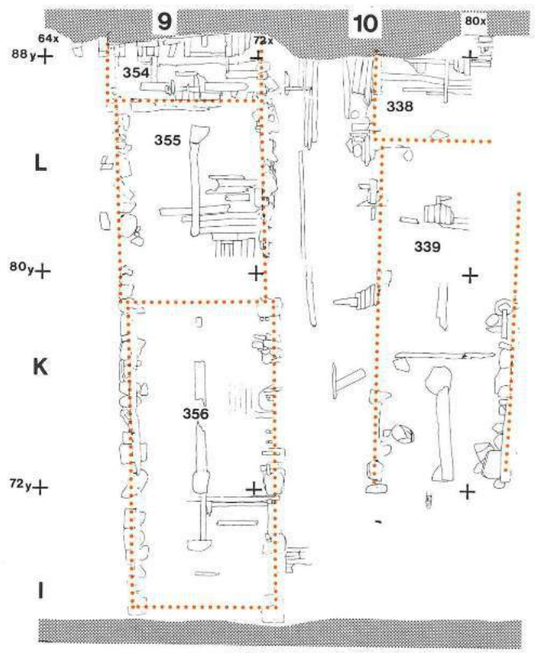


Fig. 33. Engelgården Period 8.

eastern part of the South Row, where an earlier building, 350, was replaced by a wider one, Building 501, in Phase 9.2. The South Row was markedly narrower than the North Row, but both rows increased in width from west to east, from c 4.5m to c 5.5m in the South Row and from c 5.1m to c 6m in the North Row.

In the North Row, the eastern part adjacent to the stone building seems to have constituted a covered passage between Engelgården and Søstergården.

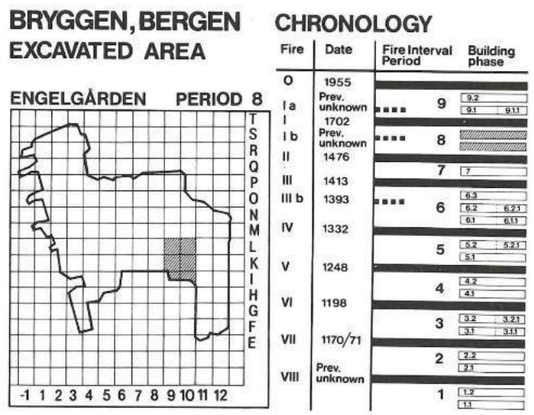
The tenement's central passage was narrower at the east end in Phase 9.2, as the building which replaced Building 350 in Phase 9.1 was made wider than its predecessor. At the east end there was in Phase 9.1 a relatively well-preserved stone-paved surface and a stone-lined drain of the same type as those found at the same level in the Bugården passage and in the public thoroughfare of Bua-almenning. The nature of the paving at the west end is not known. The exact opposite was the case in the later phase where a planked surface was recorded only at the west end.

Period 8, burnt in Fire I (1702) (fig 33)

South Row

The detritus layer from Fire I was in some places as much as 40cm thick, but in other places it was only indicated by traces of burning on the remains of structures, of which there were actually very few. In the area covered by the original site, only the traces of two buildings were recorded, a short one, Building 338, to the east and a larger one, Building 339, to the west. No remains were recorded in grid-square I10.

Building 338 (L10,I,II; M10,I) was only identified by some scattered remains. It may have been either a small one-roomed structure or a covered passage between Engelgården and Bugården. Its eastern limit was at 88.9y; the western limit was around 86.3y. Estimated length 2.5m; minimum width 4.6m, probably wider originally.



Building 339 (I10,II; K10,II; L10,II) comprised the disturbed remains of a burnt wooden floor with boards laid longitudinally. The boundary on the passage side was unclear. Eastern limit at c 85.5y; western limit at 72.2y. Length c 13.3m; width unknown.

North Row

The level which had burnt in the 1955 fire was on the whole clearly distinguishable from the fire layer of Fire I due to an intervening layer from the levelling up of the property. This consisted of brown soil, wood chippings and, in the vicinity of the stone building at the rear of the site, tile fragments and mortar. The fire layer itself was of varying thickness, ranging from a couple of centimetres to 20cm. Buildings 354, 355 and 356 belonged to this layer. Within the later eastern extension of the site a well was noted in grid-square O9 during the removal by machine of the upper layers in 1971. It was designated Well No.30. The square well-case consisted of horizontal timbers sawn from beams notched together at the corners. It must have been constructed in Period 8. Seventeenth-century finds in the filling show that it may have gone out of use as a result of the fire in 1702.

Well 30 was constructed within the well lining of two earlier wells, 31 and 32, the latter possibly constructed after Fire VI in Period 4. The wells represent a long and apparently unbroken tradition concerning the use of this area. The bottom of Well 30 was marked by a layer of stone slabs at the level of +70cm.

Building 354 (L9,II,II.1; L10,II) was a very short structure like its successor, Building 351 in Period 9, and it may have had the same function as a covered passage. The original floor was of longitudinal boards, later repaired with transverse ones. The eastern limit coincided with the stone building at the rear of the site; the western limit was at c 86y. Length c 2.2m; width c 5.7m.

Building 355 (L9,II; L10,II) consisted of the charred remains of a transverse floor and ground-walls. Eastern limit at c 86y; western limit at c 79y. Estimated length

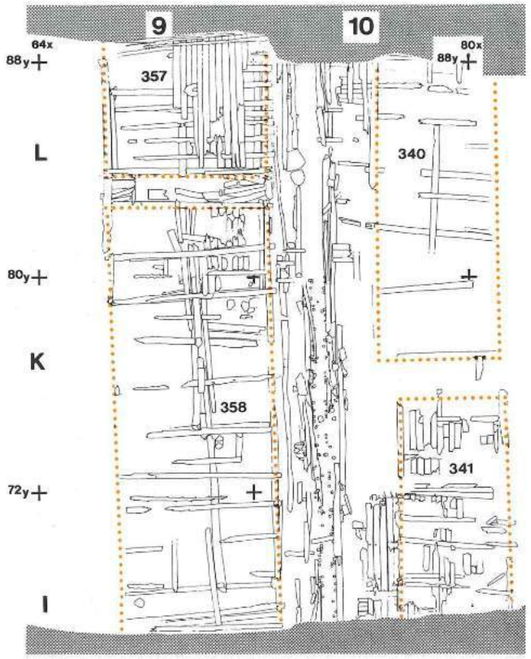
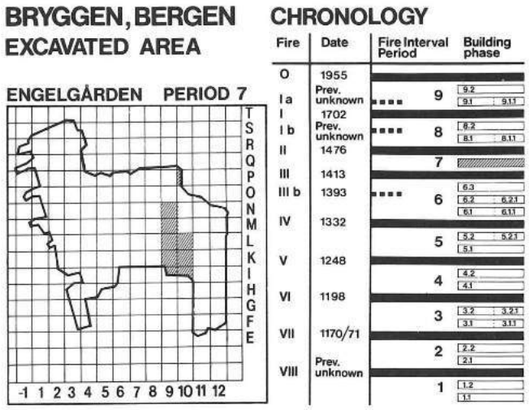


Fig. 34. Engelgården Period 7.



c 7m; width 5.5m. The building was the same width as its successor, Building 352 in Period 9, but lay c 20cm further south.

Building 356 (I9,II; K9,II,III) comprised the ground-walls and the charred remains of sill beams together with a floor laid longitudinally. Estimated eastern limit at c 79y; estimated western limit at 67y. Assumed length 12m; width 5.5–5.6m.

Tenement passage

Only a few scattered traces of a wooden pavement laid transversly on longitudinal joists were recorded. Some occasional stakes down the middle indicated a central drain.

Summary, Period 8

From the long time-span of Period 8, there were only the poorly preserved remains of a single building phase in the North Row with much the same structural divisions and width as the subsequent Period 9. In the South Row the situation was unclear, but the row was nevertheless generally narrower than the North Row.

In the eastern part of the North Row, Building 354 was interpreted as a covered cross-passage like Building 351 in Period 9.

The tenement passage was also poorly preserved with scattered remains. Occasional stakes placed down the centre indicated that there had been a drain lined with planks set on edge. The passage had the same width as in the following period.

During the removal by machine of the upper layers in the eastern extension to the site, a well was recorded in grid-square O9 which seemed to belong to this period. This particular area appears to have had a long tradition of being used for this purpose.

Period 7, burnt in Fire II (1476) (fig 34)

South Row

The fire layer had been removed in places, while elsewhere it merged into the thick layer of detritus from the following fire. Buildings 340 and 341 belonged to this period.

Building 340 (K10,III; L10,III; M10,II) comprised the square-sectioned floor-joists and here and there two courses of timber foundations. Part of the sill-beam of the north wall had survived. The building was limited to the east by the stone building at c 89y, and its western limit was estimated at 77y. Assumed length 12m; width 4.7–4.8m.

Building 341 (I10,III; K10,III) consisted of large areas of a burnt floor with boards laid longitudinally, floor joists, and parts of the north and south walls. Eastern limit at c 75.8y; on the western side it continued beyond the limit of the excavations at 67.2y. Maximum recorded length 8.7m, width 4–4.2m. The building was 60–70cm narrower than its neighbour, due to the recessed alignment of its north wall. It is unclear, however, whether the open space was occupied by a pentice or whether it had simply formed part of the passage.

North Row

Apart from the eastern section of grid-square L9, there was a continuous layer of detritus from the fire up to 30cm thick over the whole area. It was separated from the remains of Fire I by deposits 20–40cm thick. In contrast to the upper two fire layers which stopped at Building 107 (the stone-built basement or cellar beneath the tenement's communal building), the traces from the underlying Fire III continued underneath this structure (figs 35 and 36). It must therefore have been erected in Period 7.

A similar stone-built structure, Building 374, was revealed in grid-squares P9 and P10 at the far eastern end of the site during the removal by machine of the upper deposits in 1971. This must also belong to Period 7 and like Building 107 it is therefore commented on under this

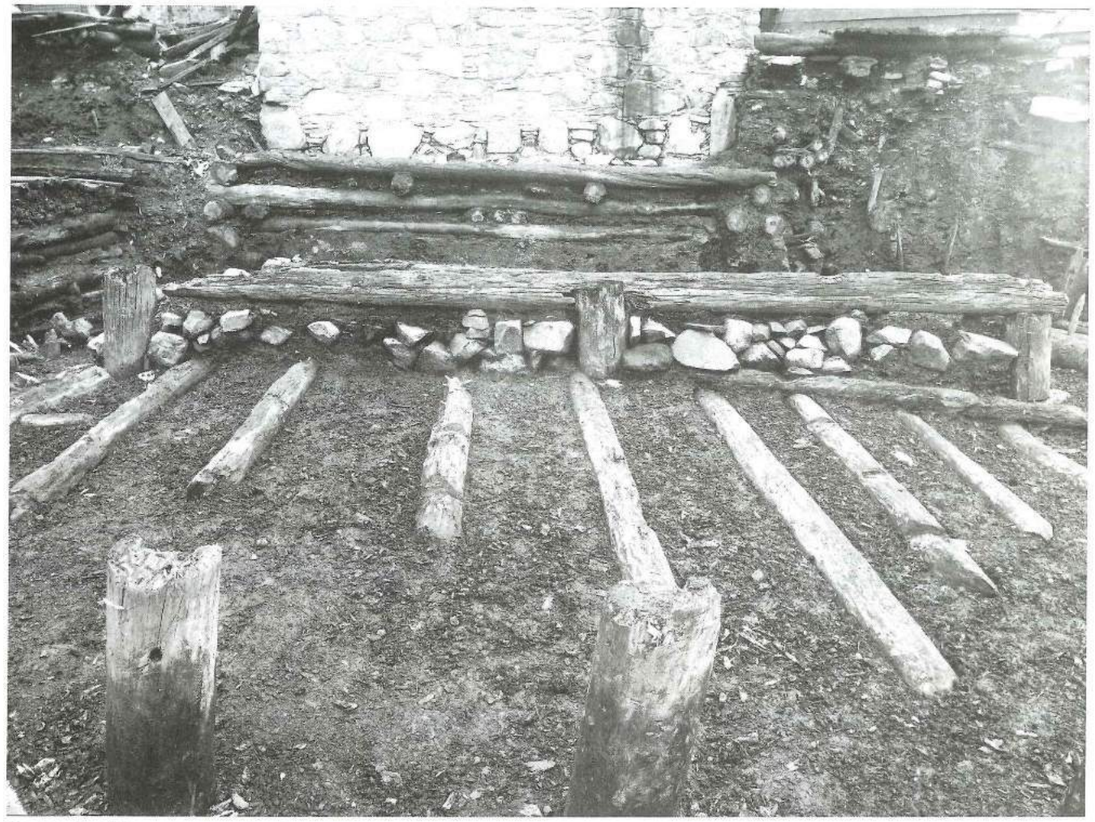


Fig. 35. Building 107 in Engelgården North, seen from the west. In the centre, foundations belonging to Building 189.

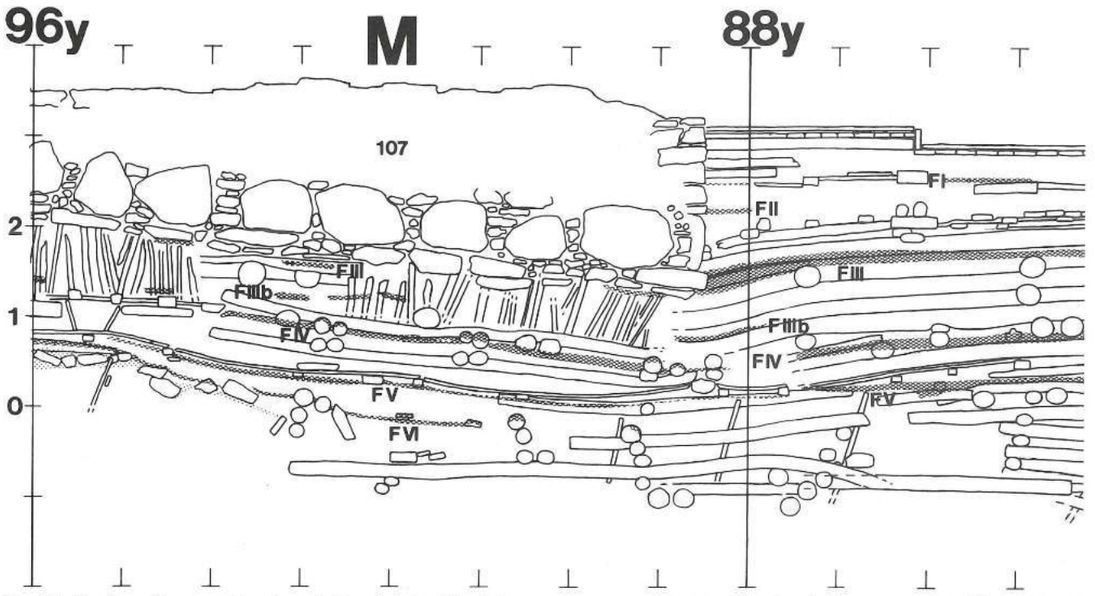


Fig. 36. Portion of long-section through Engelgården North between 84.00y and 96.00y, showing the lower part of Building 107 and the deposits from Fire III continuing beneath the building.

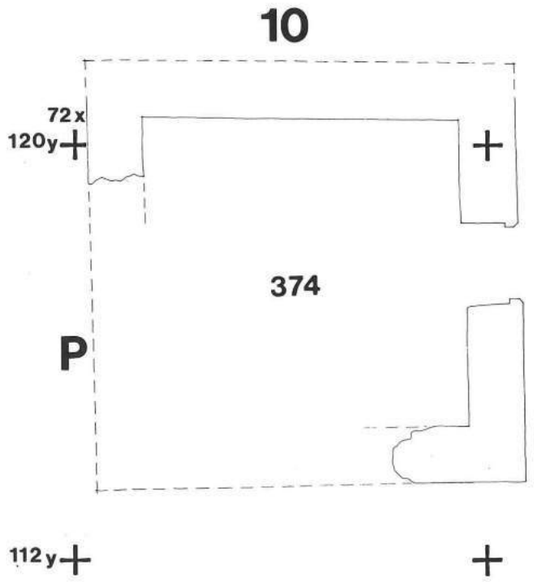


Fig. 37. Plan of the stone «cellar», Building 374, in Engelgården North with its entrance to the south.

period, which also included the remains of Buildings 357 and 358. In the south-eastern part of grid-square O9 lay Well 31, the forerunner of Well 30 constructed after Fire II (see p 65). Well 31 is discussed under Period 4 (p 85).

Building 374 (P9; P10; Q9; Q10) consisted of the continuous remains of the south and east walls and the adjacent sections of the west and north walls of a stone-built structure, which measured c 6 x 6m internally, with an average wall thickness of c 1.2m (figs 37 and 38). The building was erected on sunken stone-built foundations c 80cm thick lying just above the traces of a fire layer, which has been related to Fire IIIb. There was an entrance facing the tenement passage. The threshold lay 4–6cm below the remains of an external fire layer, which from its situation must be interpreted as the remains of Fire II. This means that the doorway was more or less on the same level as the building phase which followed Fire III and which was destroyed in Fire II, in other words Period 7. Within the building and slightly lower than the top of the surviving walls, the traces of an 8–10cm thick fire deposit were recorded, which must be associated with Fire I, thus providing a *terminus ante quem* for the building. It should also be noted here that even though Building 374 must have been erected at about the same time as Building 107, its foundations are remarkably different. While the latter stood on a raft of closely placed stakes, Building 374 was raised on a sunken, stone-built foundation wall. The natural explanation for this must be that the ground conditions beneath Building 374 were much more solid than the back-filled deposits on which Building 107 was erected.

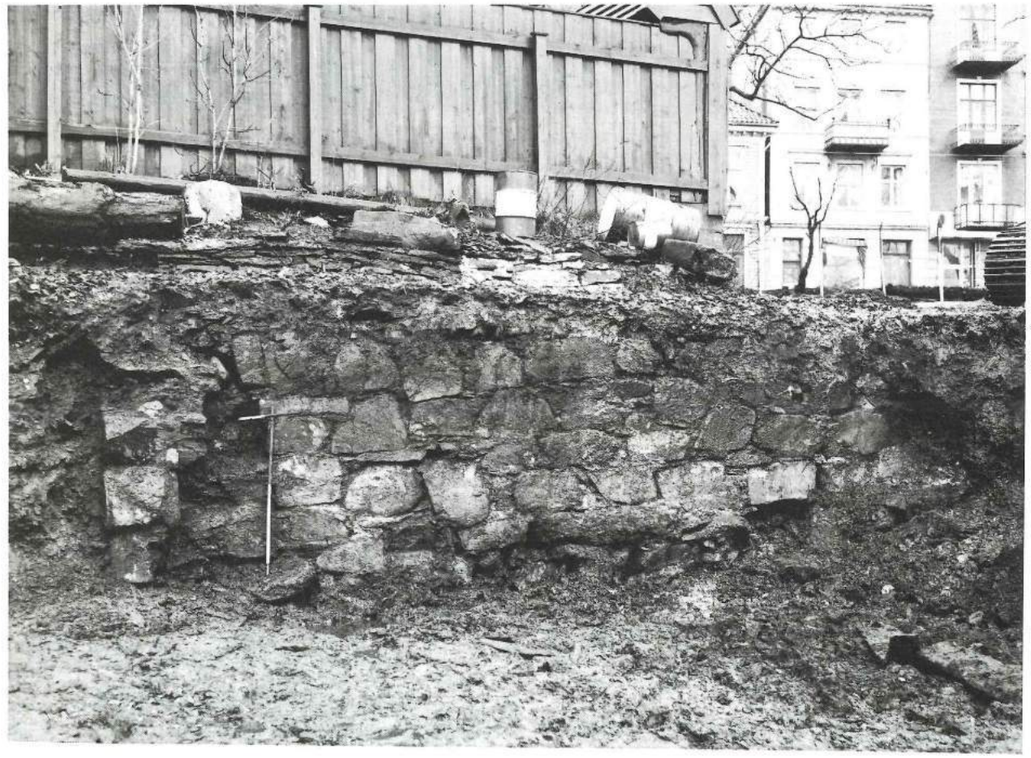


Fig. 38. The inner face of the east wall of Building 374 in Engelgården. Seen from the north-west.

Although known traditionally as a «stone cellar», Building 107 was actually erected above ground level. It was constructed with double skin walls standing on a foundation of closely-placed stakes with a large discarded mill-stone beneath each corner. At the time of the fire in 1955 it was functioning as a store-room beneath the log-built communal rooms which formed the upper storey. Our archaeological data suggests that it had always had some kind of storage function. It was 9.20–9.30m long and 4.70–4.80m wide externally, with walls varying in thickness from c 85cm to c 105cm. The masonry had withstood the great fires of 1476 and 1702 relatively well, but the building had also clearly suffered damage caused by fires restricted to the interior. The stratigraphy within the walls was different from that outside in that there were traces of four separate fires, whereas only two should have been expected. On account of the uncertainty caused by this lack of correlation between the internal and external stratigraphy, Building 107 is described only under Period 7. Owing to reasons beyond our control, it was only possible to record the stratigraphy in the southern half of the building (figs 39a–d).

Building 107 The lowest floor, Floor 1 (M9,IV; N9,IV), consisted of the remains of stone paving in the western part of the building and an irregularly laid wooden floor in the eastern part, with a sunken barrel forming a soakaway pit and twelve fragments of barrel bottoms (fig 39a). Two doorways opened on to the tenement passage, indicating that the building had been divided into two rooms. The level had been burnt, possibly in Fire II.

The next floor level, Floor 2 (M9,III; N9,III), had been laid on a 20–25cm thick layer of sand (fig 39b). That the building again had been divided into two rooms was shown by the remains of a cross wall. In the western room there were longitudinal floorboards over a transverse drain, while in the eastern part the floor had been laid transversely. Each room had its own external entrance. The level had been burnt.

A third floor level, Floor 3, (M9,II) was recorded which also indicated a two-room plan (fig 39c). The eastern room had a stamped sand and gravel floor; in the western room there was a c 80cm wide open strip against the south wall and between this and the north wall lay the remains of a

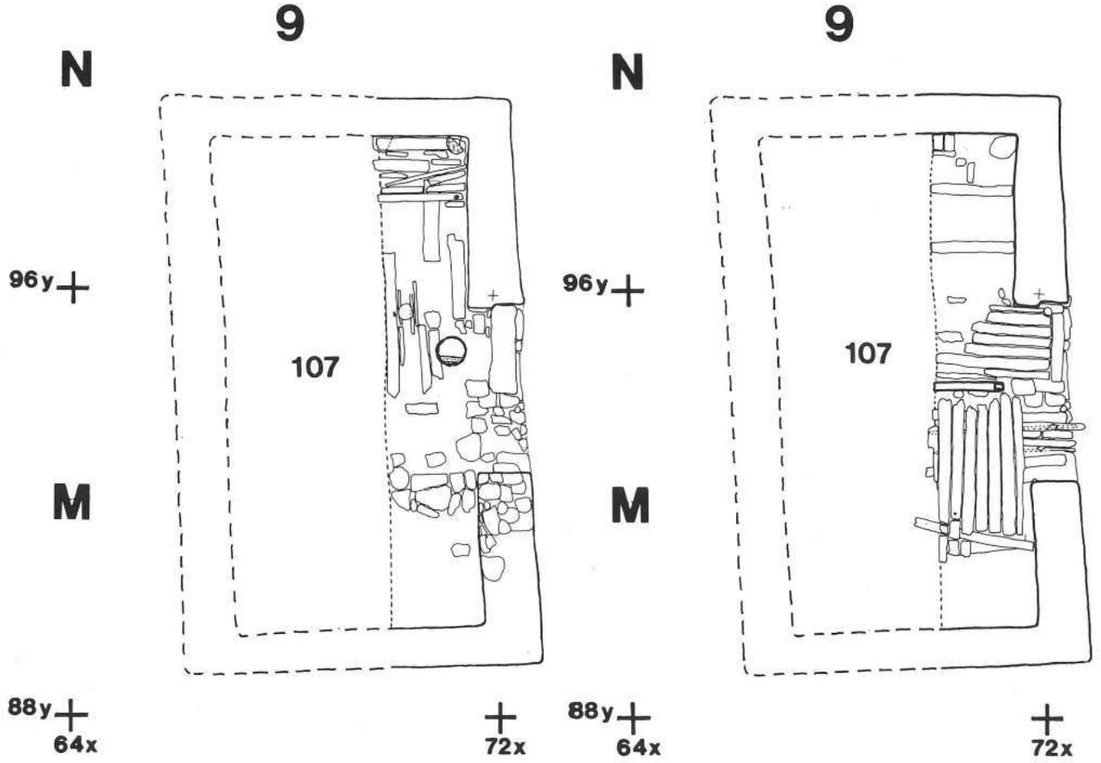


Fig. 39a–d. Sketch plan of the stone-built lower storey of the communal building in Engelgården, Building 107, erected after Fire III (1413) and demolished after the 1955 fire. a. (left) Earliest phase with two door-openings to the right, traces of a flagstone floor in the western part and a wooden floor to the east. b. (right) Second stage, also with two doorways and with the remains of an internal cross-wall. Wooden floor in both rooms.

floor with the boards laid transversely. At this level the building had a single wide doorway. The phase had burnt.

The highest floor level, Floor 4 (M9,I; N9,I), consisted of a brick floor in the western half and a sand floor in the eastern part (fig 39d). The sand may have been the bedding for a brick floor. There was a relatively narrow doorway in the south wall. The level had burnt.

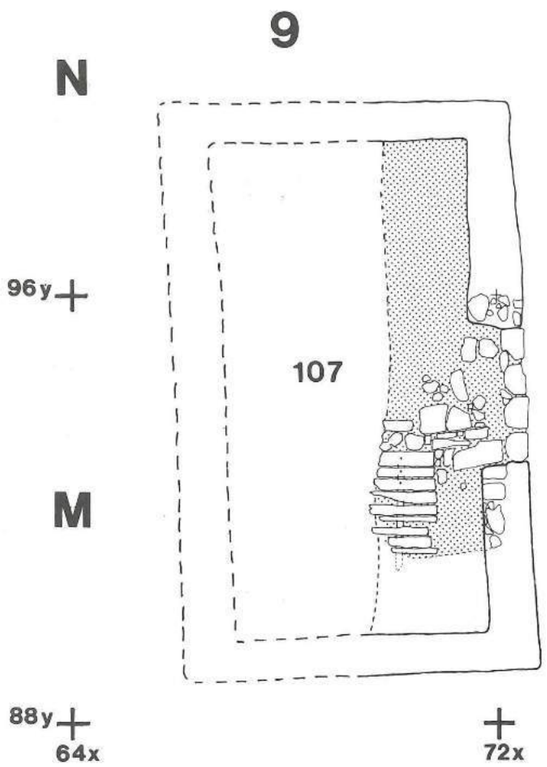
To the west of Building 107 in Period 7 lay Buildings 357 and 358.

Building 357 (L9,III,IV,IV.1; L10,III) had a well-preserved floor with boards laid longitudinally in the southern part and charred floor joists in the northern part. It was bounded on the eastern side by Building 107 at c 88.7y, and its western limit was at 83.8y. Length 4.9m; width 6.2m.

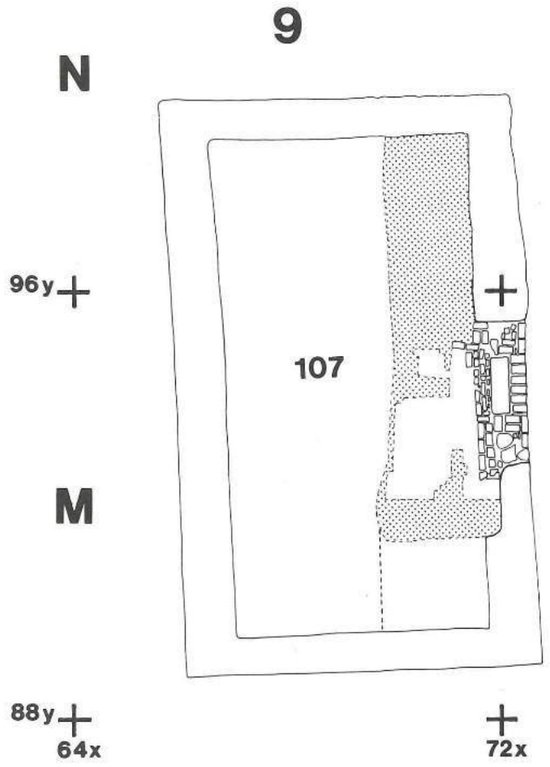
Building 358 (I9,III; K9,IV,V; L9,IV,V) consisted of the burnt remains of longitudinal floorboards and the ground-frame of the building. Eastern limit at 82.8y; western limit uncertain, probably beyond the edge of the excavated area, which lay at 67y. Estimated length 15–16m; width 5.8–5.9m.

Between Buildings 357 and 358 there was a metre-wide gap with disturbed planks overlying a brownish deposit. This may indicate a privy, but it was not recorded as such during excavation. The gap more likely indicated an unroofed communication link across the tenement. It is possible that this fulfilled the same intentions as structures 354 and 351 already described in the subsequent periods, which have been interpreted as covered passages. This could suggest that the need for access which these two structures indicate was already present at the time when the tenement's communal building with its cellars was erected after Fire III. It is known that at a later period the communal rooms in Engelgården were also used by the merchants living in Bugården and Søstergården, and that the stove was stoked from the northern side, ie from the neighbouring tenement of Søstergården. The transverse passage could therefore suggest that the communal arrangement known to exist in later times may be traced back at least to the early fifteenth century.

In Period 7 the south wall of both buildings was obviously a weak point, but particularly so in Building 358. After the structure had been levered or jacked up, a new sill-beam had been inserted against the old one under the south wall for a length of some 9m, above which short cross timbers c 1.5m long were driven in at regular intervals. In two places wedges were found *in situ* over these. Overlying the original sill, a packing of stones had been inserted both below and between these short cross timbers.



c. Third stage, with one wide doorway. Remains of a wooden floor in the western part and a stamped sand and gravel floor in the eastern part.



d. In its final stage, the building had just one relatively narrow doorway and a brick floor bedded in sand.

Tenement passage

The remains of a transverse wooden pavement were found in places, and occasionally also the longitudinal joists, but it was all in a poor state of preservation. The width of the passage varied from c 3.8m at the east end to 4.2m at the west end. Certain features in the passage beside Building 341 in the South Row indicated some kind of special use of the adjacent passage area, possibly as a pentice attached to the building.

Summary, Period 7

In the original part of the excavations two buildings were recorded in each row, those in the North Row averaging over 6m in width, while the two in the South Row were respectively 4.7–4.8m and 4–4.2m wide. The western building in the South Row, Building 341, stood back from the line of the passage and there was probably a c 1.3m wide pentice attached to the building.

There was an unusually wide gap between the two buildings in each row, the exact significance of which is not clear. These two gaps may have contained privies, but there was no evidence to prove this. In Periods 8 and 9, a tranverse access was recorded to the east of this point and it is not impossible that there was a similar arrangement also in this period.

Attention is drawn to the fact that the communal building belonging to Engelgården in later times was also used by the merchants living in Bugården and Søstergården, and that the stoking chamber for the stove in the common rooms was accessible from Søstergården on the north side. If our interpretation is correct, it could suggest that the use of the rooms by the three tenements in fellowship may be traced back to the early fifteenth century.

The passage had a wooden-lined drain and wooden paving laid transversely, but all the remains were in a poor state of preservation. The width varied from c 3.8m at the east end to 4.2m to the west, including the possible pentice attached to Building 341.

The buildings were erected after Fire III, the traces of which had survived as a thick deposit. This fire layer continued beneath the remains of the stone-built cellar, Building 107, which has therefore been placed in this period. Though traditionally known as a cellar, it stood above ground level. Unlike the other buildings from this period, which were destroyed in the 1702 fire, the cellar survived both this and the 1955 fire, but it was so badly damaged that it was later demolished to make way for new development. It was clear that it had functioned continuously as storage rooms with the communal rooms of the tenement forming the main storey above.

Four floor levels were recorded in the cellar, all of which had burnt, which must mean that the building had been affected by two local fires as well as the known fires of 1702 and 1955. Datable evidence was lacking, and it has proved difficult to identify the different fire layers and to date the floor levels stratigraphically. While there was only one entrance in the last two phases, the layout in the first and second phases indicated that it had been divided into two rooms, each with its own entrance.

The foundations of the cellar consisted of a raft of stakes set close together, with a large discarded millstone beneath each corner. The external dimensions of the building were 9.20–9.30m x 4.70–4.80m, and the thickness of the walls varied between c 85cm and 105cm.

The remains of a similar above-ground cellar were excavated at the eastern end of the site in grid-squares P9–10 and Q9–10. Stratigraphically this was shown to be contemporaneous with Building 107, but in contrast to the latter it stood on a sunken stone-built foundation, c 80cm deep. The difference in the type of foundations can be explained by the ground conditions, which were more solid here than in the area of back-filled deposits 16–20m further west where Building 107 stood. The south and east walls had partly survived, together with the adjacent sections of the west and north walls. The building was more or less square with sides measuring c 7.2m externally, and the average thickness of the walls was 1.2m.

Period 6

Phase 6.3, burnt in Fire III (1413) (fig 40)

South Row

As the actual layer of detritus from Fire III had mostly been removed, and both the floor level and the upper layer of foundation timbers were practically burnt through, it was very difficult to identify the individual buildings in the continuous foundations which remained. One Building No. has therefore been assigned to the whole layer in the South Row.

Building 342 (I19,IV; K10,IV; L10,III,IV) probably contained the remains of at least two buildings, with a total recorded length of 21.8m. The width of the foundations varied between 4.7m and 5m.

North Row

The remains of Fire III formed a continuous layer of up to 20–25cm in thickness right across the original site. It was clearly separated from the deposits from Fire II. As mentioned on p 66, it continued eastwards beneath Building 107 and could be followed with a few interruptions as far as 102.5y, or c 3.5m east of the building. At this eastern end the burnt remains of a building were recorded, Building 365. On the original part of the site there were only burnt foundations forming a continuous layer with no indication of separate structures, and as in the South Row, a single building number, Building 359, has been assigned to the whole layer within this area. In the area where the later Well 30 had been found, a well with horizontal revetting was recorded in Phases 6.3–6.1. It was designated Well No. 31 and is discussed under Period 4, p 85.

Building 365 (M9,VI; N9,VI) consisted of the badly burnt remains of a longitudinal floor and underlying joists. It was recorded between c 92y and 100y. Maximum recorded length c 8m; maximum recorded width 3.30m.

Building 359 (I9,IV; K9,VI; L9,VI) comprised only horizontal timber foundations in 2–3 courses running the length of the original site. Maximum recorded length 23m; width 5.90m. Eastern limit at c 88y; western limit beyond the edge of the excavations at 67y.

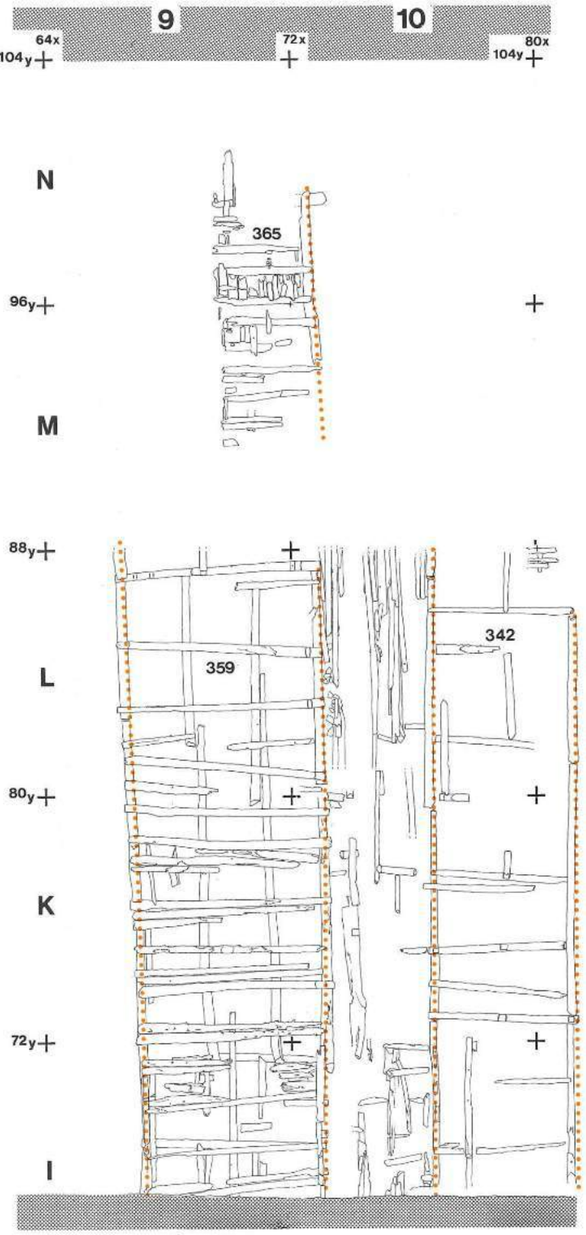
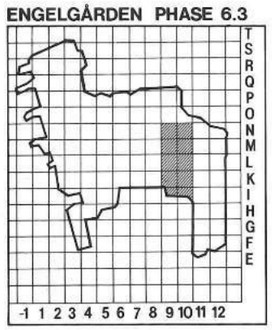


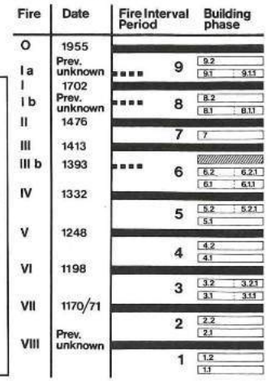
Fig. 40. Engelgården Phase 6.3.

Overlying the fire-layer which in the other tenements was related to Fire IV, there was a 90–110cm thick deposit, which from the situation in the South Row and in Bugården ought to contain three separate building levels, Phases 6.1–6.3, with evidence for the extra Fire IIIb at the end of Phase 6.2. Between six and eight courses of timbers were found, forming an apparently single foundation structure. In contrast to the South Row, where Fire IIIb was clearly distinguishable, there was only a greyish ash layer at the extreme eastern and western ends of the site, more or less

ENGELGÅRDEN PHASE 6.3



CHRONOLOGY



on the same horizon as timber course 3 beneath Fire III. That this ash layer was actually the remains of the fire layer was confirmed when the site was extended in 1972, for on the same level under Building 107, as well as in the eastern part of grid-square O9 and the whole of P9, there was a practically continuous fire layer and scattered burnt remains from buildings. Over the intervening area, this level had unfortunately been removed by machine in 1971.

The situation was further confirmed by the fact that in the original site there were the remains of two separate planked surfaces between the burnt levels related to Fires III and IV, one more or less on the same horizon as Building 343 from Phase 6.2 and the other corresponding to Buildings 345 and 346 from Phase 6.1, all in the South Row. Final confirmation was provided by the fact that immediately above the ash layer on the same level as the third course of timbers beneath Fire III, there was a continuous layer of greyish sand, which was interpreted as a deposit which had been laid to level up the site and to provide the basis for the redevelopment in Phase 6.3 after Fire IIIb.

Also during the work on the site, before the existence of Fire IIIb was suspected, it was clear that there was some distinction between the third and fourth courses of timbers beneath Fire III, but this was naturally related to Fire IV, the next fire which was expected in the chronological sequence.

There was also some doubt where the division between Phases 6.1 and 6.2 should be drawn in the western part of the tenement. From the situation in the South Row and in the tenement passage, the division should correspond to the sixth course of timbers beneath Fire III, since sections of the passage from Phase 6.2 were laid over these timbers. Alternatively, everything from Phase 6.1 may have been removed, so that the timbers of Phase 6.2 had been laid directly over the remains of the earlier Fire IV. Against this was the fact that the sixth layer of timbers did not seem to have been laid horizontally. Around the time of Phase 6.2, there must have been a subsidence along the whole of the north wall of the tenement and, in order to compensate for this, short timbers c 10cm thick had been laid at the same time as the fifth layer of timbers beneath Fire III. They had rounded notches cut into the upper side to receive the overlying timbers at right angles and cannot easily be interpreted as the top course of foundation timbers underneath the sill-beams of buildings, but rather as the first course of timbers laid to level up the site for the next phase.

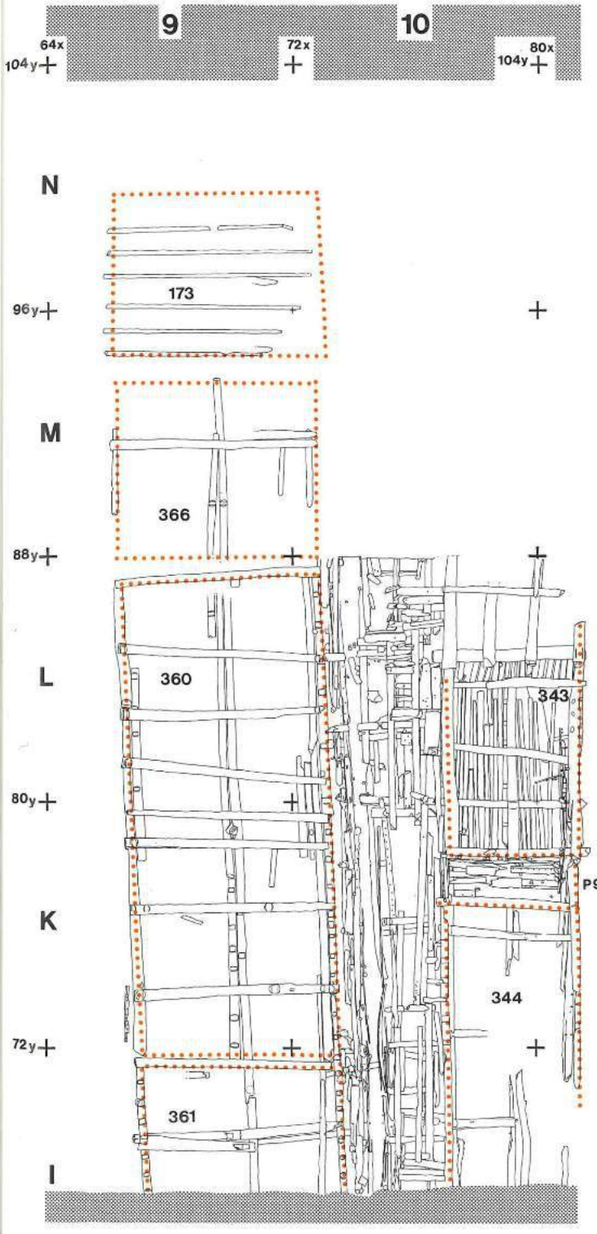


Fig. 41. Engelgården Phase 6.2.

Tenement passage

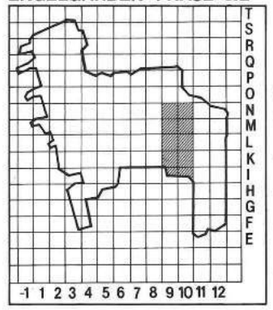
In the area of the tenement passage the deposits included the scattered remains of transverse boards and some longitudinal beams.

Phase 6.2, burnt in Fire IIIb (1393) (fig 41)

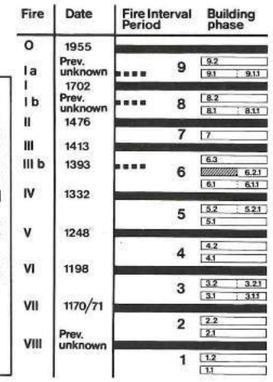
South Row

While the only evidence for Fire IIIb in the Bugården

ENGELGÅRDEN PHASE 6.2



CHRONOLOGY



tenement was limited to a couple of metres at the far western end, the South Row of Engelgården contained clear and unambiguous traces of this fire. The identification of the fire and in particular its relationship to Fire IV, which had left a significant deposit in the stratigraphy in both tenements, could be determined from the transverse sections at 88y, 80y and 72y. Buildings 343 and 344 belonged to this phase, together with Privy 9.

Building 343 (K10,V–VII; L10,V,V.1,VI) comprised foundation timbers of massive dimensions, which were probably cut through when the stone cellar, Building 107, was erected to the east. Eastern limit at c 89y; western limit at 78.2y. Maximum recorded length 10.8m; width c 4.5m.

Building 344 (I10,V,VI; K10,V,VI) consisted of burnt floor joists. Eastern limit at 76.9y; western limit beyond the edge of the excavations. Maximum recorded length 9.4m; width c 4.6m.

Between Building 343 and 344 there was a privy, Privy 9, in the «traditional» position entered from the tenement passage, with the privy itself at the southern end, close to the boundary with Bugården. It was bounded by a loosely constructed plank wall held with stakes, and traces both of planks and stakes were recorded.

North Row

From this level downwards, the grid-squares M9 and N9 from the 1979 excavations are included in the commentary of the North Row.

On p 72 it was pointed out that Fire IIIb was only identifiable from two separate areas of ash in the original part of the site, but that when the site was extended in 1972 continuous remains were found beneath the tenement's communal building, Building 107. The layer was separated from the overlying Fire III as well as from the underlying Fire IV by a deposit 30–40cm thick. In the original site there was no clear distinction between the courses of foundation timbers, but it has already been pointed out that an indication of the dividing point was provided firstly by the surviving remains in the tenement passage, which were related to the buildings in the South Row burnt in Fire IIIb, and secondly by the continuous layer of sand deposited over the ash layer on the same horizon as the third course of timbers and interpreted as the first

levelling up of the site after a fire. Finally, the burnt remains under Building 107 provided the definite evidence that the division between Phases 6.2 and 6.3 had to be on the same level as the third course of timbers.

There was no evidence for buildings in plan, but a division into separate buildings at c 94y, 88y and 72y was indicated by certain features in the foundations. Four buildings were therefore recorded in Phase 6.2: Buildings 173, 366, 360 and 361. Building 360 was probably actually two separate buildings.

Building 173 (M9,XI; M10,II; N9,VIII; N10,II) comprised only one course of foundation timbers between c 100y to the east and c 94–94.4y to the west. Maximum recorded length c 5.6m; width 6.85m.

Building 366 (M9,XI; M10,II) consisted of 2–3 courses of foundation timbers, which are thought to be from a single building whose eastern and western limits are uncertain. It was recorded between 93.8y and c 88y. Maximum recorded length 5.8m; width 6.7m. The dividing point between this phase and Phase 6.1 was not clear.

Building 360 (I9,V; K9,VII; L9,VII) consisted only of the timber foundation courses 3–4 beneath Fire III. Most of the longitudinal beams had notches cut into them at 40–50cm intervals, presumably from an earlier period of use. Eastern limit uncertain; western limit at c 72y. Maximum recorded length c 16m; width of foundations 6.6m.

Building 361 (I9,V,VI) consisted of the foundation beams in courses 3 and 4 beneath Fire III. At the eastern end they rested on short posts beneath the south wall, the north wall, and a longitudinal central beam. Estimated eastern limit at 71.7y; western limit outside the area of excavation. Maximum recorded length 4.5m; width of foundations 6.7m.

Tenement passage

Traces from the tenement passage were very fragmentary, but what had survived gave a much fuller picture than was provided by the remains found in Phase 6.3. It had transverse planking and a drain which was lined by boards set on edge and held in place by stakes both inside and out. The width of the passage varied from 3.4m to 3.6m, and the distance between the two rows of buildings was between 3.5m and 4.1m.

Phase 6.1, unburnt level beneath Fire IIIb (fig 42)

South Row

As in Bugården, there was an unburnt building phase between Fires IV and IIIb, which is designated Phase 6.1. From this level downwards, grid-squares M10 and N10 excavated in 1979 are included in the commentary of the South Row. In these grid-squares, foundation timbers were recorded which became more and more regular to the west. For practical purposes, these have been allocated a separate building number, even though they were only foundations without any distinct separation into individual buildings. The level included three buildings, 284, 345 and 346.

Building 284 (M10,III; M11,II; N10,II) consisted of foundations with no clear eastern or western boundary. Estimated position of the eastern wall at 99.3y and of the western wall at 88–85.5y. Maximum recorded length 10.7m; width c 4.6m.

Building 345 (K10,VIII,IX; L10,VII) consisted of foundations in continuation of Building 346 to the west, with slender, square-sectioned floor-joists. Eastern boundary against Building 284 unclear; western boundary at c 79y. Recorded length c 5.5m; width 4.4m.

Building 346 (I10,VII–IX; K10,VII–IX) was a continuation of Building 345, consisting of the remains of a floor preserved to varying degrees, with boards laid longitudinally over square-sectioned joists. The floor boards were grooved along the edge. There were three courses of foundation timbers underneath. Eastern limit at c 77.8y; western limit beyond the edge of the excavations at 67.5y. Maximum recorded length 10.3m; estimated width 4.2m, possibly 4.7m.

North Row

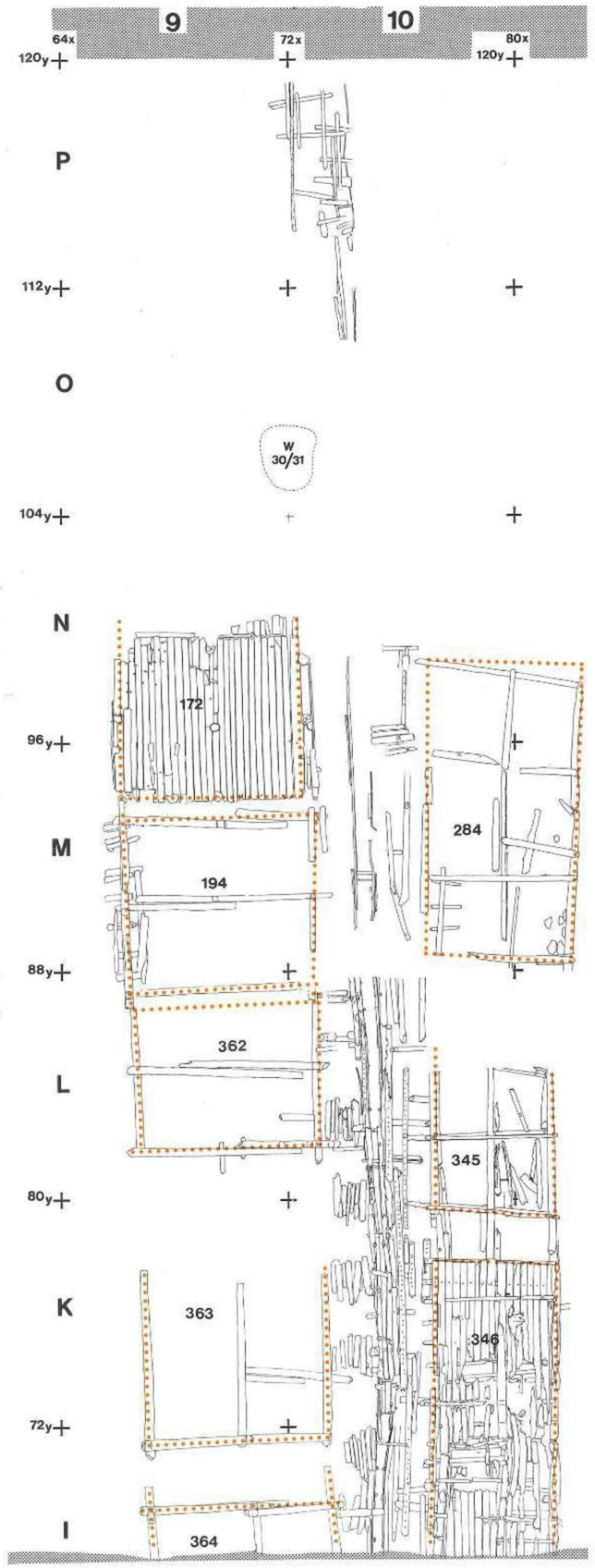
Apart from in the eastern part of the extension to the original site, where an almost intact floor was excavated in grid-squares M and N 9 and 10 (Building 172), there were again problems in identifying this level. In some parts of the site it almost appeared as if the area had remained undeveloped after Fire IV, while in other areas the finds suggested a significant northwards extension of the buildings at the expense of the earlier unusually wide eaves-drip gap. On p 72 we have attempted to give our reasons for placing the division between Phases 6.1 and 6.2 at the level of the fifth and sixth courses of timbers under Fire III. There was a structural separation in the courses, on the basis of which it has been possible to postulate the existence of five buildings in Phase 6.1: 172, 194, 362, 363 and 364.

Building 172 (M9,XI; M10,II; N9,VIII; N10,II) consisted of an almost intact floor with longitudinal planks within a timber-frame structure, of which the upright wall members and an east-west row of posts down the centre had survived. Eastern limit within a disturbance, probably originally at c 100.4y; western end-wall at 93.9y. Estimated length 6.5m; width c 6.9m.

Building 194 (L9,IX; M9,XI–XIII; M10,II) consisted of the foundation beams lying immediately above the fire-layer from Fire IV and the adjacent development in the eaves-drip gap on the north side. Eastern limit at c 93.7y; assumed western limit at c 87y. Estimated length 6.7m; width 6.4m.

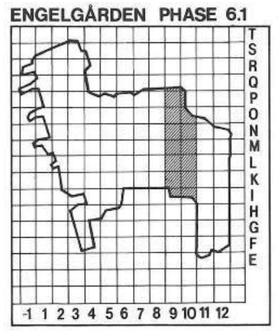
Building 362 (L9,VIII; L10,VII) consisted of two layers of foundation timbers. Eastern limit uncertain, possibly at c 87y; western limit probably at 81.5y. Estimated length 5.5m; width of foundations 6.7m.

Building 363 (I9,VI; I10,VIII; K9,VIII; K10,VIII) comprised between one and three layers of foundation timbers. Eastern limit possibly at c 77y; western limit assumed to be at 71.2–71.3y. Estimated length 5.8m; width of foundations 6.6m.



BRYGGEN, BERGEN
EXCAVATED AREA

ENGELGÅRDEN PHASE 6.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown		9
I	1702		
Ib	Prev. unknown		8
II	1476		7
III	1413		
IIIb	1393		6
IV	1332		5
V	1248		4
VI	1198		3
VII	1170/71		2
VIII	Prev. unknown		1

Building 364 (I9,VI; I10,VIII) comprised the eastern section of a foundation substructure which continued beyond the edge of the excavated area at the western end. Eastern limit at c 69.2–69.3y. Maximum recorded length c 2m; width of foundations 6.7m.

Tenement passage

In this phase sections of the passage had survived over practically the full length of site. It had been paved with transverse boards and had a drain almost down the centre, lined with planks set on edge and held in place by stakes. In the K and L grid-squares, this drain was practically intact, but this perfect situation proved to have several complicating factors which prevented a rational conception of its construction. Alternative suggestions have therefore been presented (fig 43).

The planked surface was preserved in places, or otherwise indicated by longitudinal joists (a) with regularly spaced plug-holes. The side boards (b) were either held up with stakes (c) on the inside, or by slender pieces of wood (d) originally placed horizontally but subsequently pressed down into the drain. The drain appeared to have been covered separately, generally with several plain parallel boards (e), which were laid loosely along the alignment of the passage. These boards were either laid on a level with the bottom edge of main joists on either side of the drain, or else rebated into them, which meant that the cover of the drain lay between 8 and 15cm lower than the wooden paving of the passage (f). But the stakes supporting the sides of the drain projected significantly above the level of the covering, and it is this factor which complicates the interpretation.

At the time of excavation, the stakes projected 30–40cm above the level of the covering planks and this cannot be explained solely by suggesting that the underlying foundation substructure subsided to a greater degree than the stakes. That the stakes had originally projected above the surface can also be seen by the fact that notches had been cut in the adjacent boards of the drain cover in order to accommodate the projecting stakes. To what extent the stakes originally projected above the boards remains an open question. It is really of little importance whether this relatively close row of stakes down the middle of the passage projected 10cm, 15cm or 30cm, since they would at any rate have formed a significant hindrance to any flexible use of the passage for traffic. As the transverse

Fig. 42. Engelgården Phase 6.1.

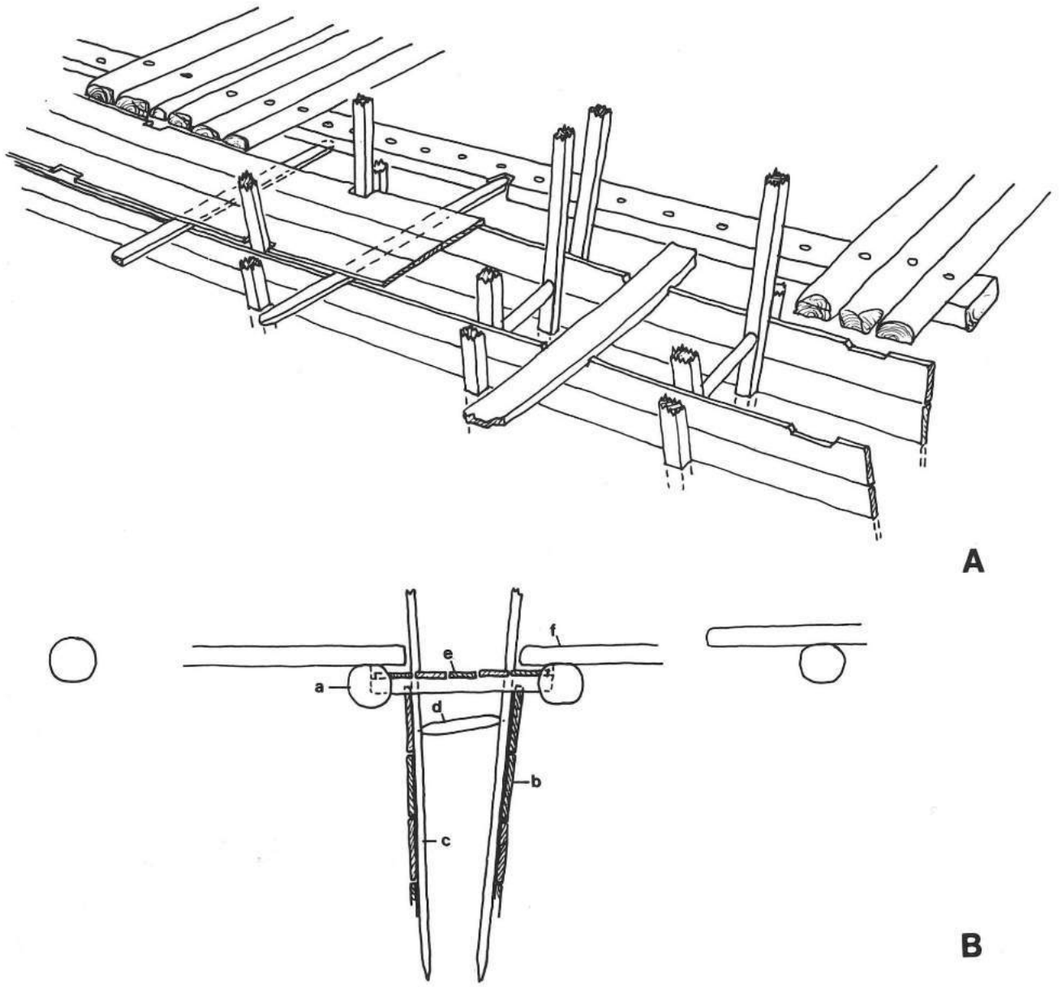


Fig. 43. Side-view and section through the drain in the tenement passage in Engelgården constructed after the fire in 1332. Joists (a) support the planked surface of the passage (f); the planks (b) lining the sides of the drain are held in place by long thin stakes (c) and short horizontal stretchers (d). The drain is covered separately by boards (e).

wooden pavement was represented solely by the existence of plug-holes in the longitudinal joists, the plank-covered drain with its double line of stakes forming a barrier down the middle of the passage may indicate that the wooden paved surface was limited to either side of the drain. It would otherwise appear somewhat unmotivated to have a separate but unusable planked cover to the drain (see (a), fig 43). There are thus two possible solutions, both of which seem strange, and to decide on one rather than the other would serve no purpose.

The drain was straight-sided in some places and slightly V-shaped in others, and its width at the top varied between 50 and 80cm. The width of the passage also varied. At 96.00y it was 4m, at 80.00y c 3.7m and at 72.00y 3.80m. The width of the paving on the north side of the drain was c 1.6m, and on the south side c 1.4m.

Summary, Period 6

As in Bugården, Period 6 consisted of three phases of development, an unburnt Phase 6.1, Phase 6.2 which was terminated by Fire IIIb, dated to 1393, a fire which was not expected to affect this part of Bryggen, and a final Phase 6.3 burnt in Fire III. In contrast to Bugården, however, where the level to the east could only be documented indirectly, Fire IIIb could be traced throughout most of the Engelgården tenement.

In the original site there were substantial and relatively well-preserved remains of buildings, but in the later extension there were only a few scattered remains from Phases 6.2 and 6.3. Phase 6.1 on the other hand was fairly well repesented, particularly to the west. Between Phases 6.1 and 6.2 the boundaries of the buildings often remained stable. In Phase 6.3 it was not possible to identify the actual limits of the various buildings in the foundation substructure which continued more or less unbroken down the two Rows.

In the North Row, the width of the buildings was fairly constant at around 5.9–6m, corresponding to the maximum widths in Periods 8 and 9. In the South Row, the width varied from 4.2m to 4.6m in Phase 6.1, from 4.5m to 4.6m in Phase 6.2, and from 4.7m to 5m in Phase 6.3. There was a privy in Phase 6.2 between Buildings 343 and 344 in the South Row.

The width of the tenement passage in Phases 6.1 and 6.2 varied between 3.4m and 4m, while in Phase 6.3 it was generally around 3.4–3.5m. The state of preservation varied from the well-preserved and detailed evidence in Phase 6.1, to somewhat poorer remains in Phase 6.2, and finally the scattered and poorly preserved traces in Phase 6.3. At each level the passage was paved with transverse boards and had a plank-lined drain. The suggested reconstruction in fig 43, which implies a separate pavement on either side of a covered drain, cannot be parallelled elsewhere in the excavations. The alternative would be that there had been a continuous wooden pavement the full width of the passage, in which case the existence of a separate planked covering to the drain immediately below this would be difficult to explain, so that the reconstruction as illustrated would seem the more likely.

Period 5

Phase 5.2, burnt in Fire IV (1332) (fig 44)

South Row

As mentioned previously, the deposits derived from Fire IV provided a distinctive layer, clearly identifiable over most of the site and relatable to Fire IV in Bugården. From the 1979 extension there was little evidence for buildings apart from the remains of a post-built structure, Building 199, and a well, Well 33/34 lined with barrels, in the middle of the site. Two other buildings were recorded, Buildings 347 and 348.

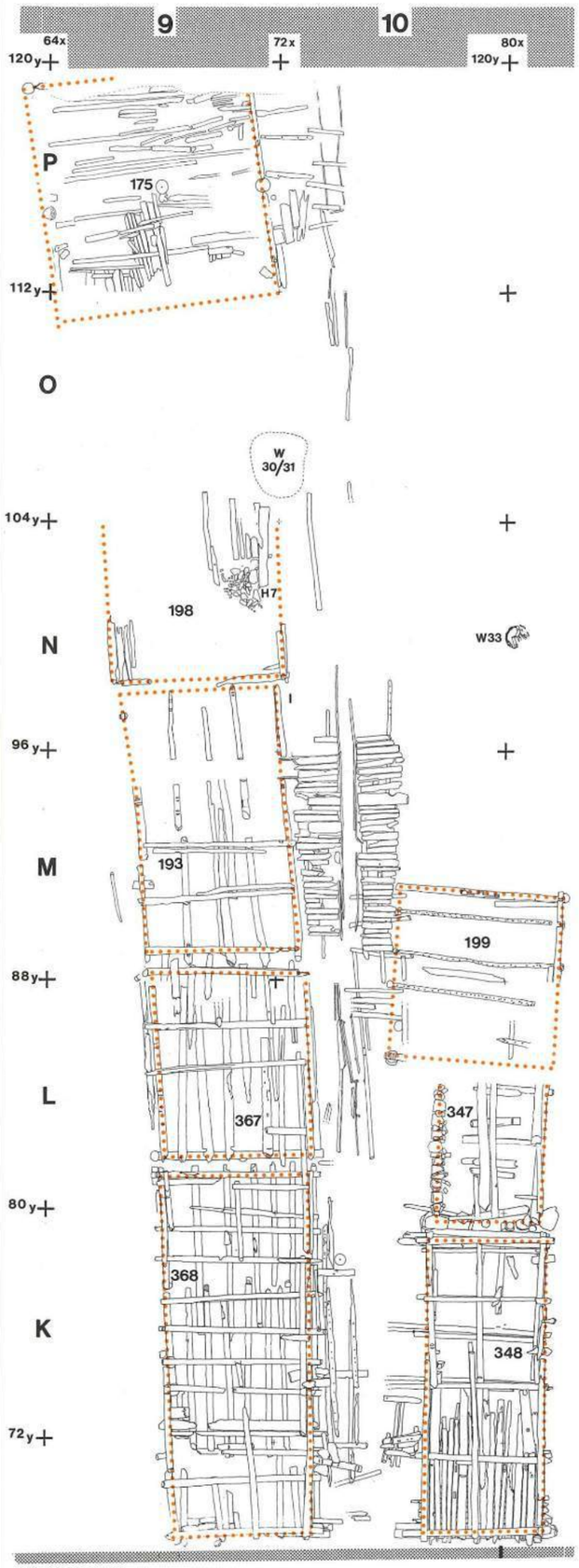
Well 33/34 consisted of two barrels placed one above the other with a c 10cm overlap, the bottom of the upper one (33) enveloping the top edge of the one below (34). This situation implies that the remains belonged to a single well, not two separate ones as recorded during excavation. Internally they measured c 75cm and c 80cm in diameter respectively and the height of the upper barrel could be measured as 92cm. The full depth of the well was from 1.70m to 1.75m, and its bottom lay at c 31cm below site datum. This barrel-lined well with its top just below Fire IV had apparently been cut through fire-layer V, and was presumably in use during the whole of Period V (1248–1332).

Building 199 (L10,IX; L11,I; M10,V; M11,III) consisted of the remains of the sill-beam from the east wall and three floor joists still partly in place on supporting posts. The western part had been removed by machine. Eastern limit at 91.2y; western limit probably at c 85y. Estimated length 6.3m; width 5.8m.

Building 347 (K10,IX,X; L10,VIII,IX) consisted of 2–3 courses of a ground-wall on the north side, while the west end-wall had been supported on a large stone under each corner and a post in the middle. The north wall lay 45–50cm inside the alignment of the north wall of the later Building 345. Eastern limit estimated at 84.5–84.6y; western limit at 79.6y. Maximum recorded length 5m; width of foundations 4–4.10m.

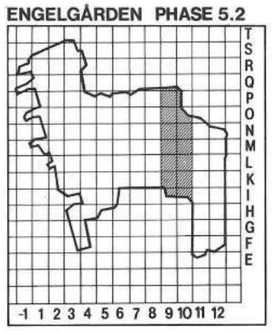
Building 348 (I10,X,XI; K10,X,XI) comprised several courses of timber foundations. Eastern limit at 79.16y; western limit of foundations at 68.70y. Length 10.44m; width c 4.2m.

Beneath the burnt building 348 lay a complexity of foundation timbers, which although they appeared to be contemporary belonged in fact to three different stages in the development of the tenement. The uppermost seven courses of beams have been associated with Building 348. They continued beyond the western edge of the site at c 67y, but from the long section in Bugården they could be traced as far west as c 53–54y with a separate wharf in front, supported on posts at c 49y. The associated depth of water is unknown. With some 15m between Building 348 and the front edge of the foundation substructure there would have been room in the South Row for another large building, or perhaps two medium-sized ones.



BRYGGEN, BERGEN
EXCAVATED AREA

ENGELGÅRDEN PHASE 5.2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
I a	Prev. unknown		9
I	1702		
I b	Prev. unknown		8
II	1476		
III	1413		7
III b	1393		6
IV	1332		5
V	1248		4
VI	1198		3
VII	1170/71		2
VIII	Prev. unknown		1

North Row

Fire layer IV was an important identifying feature also in the stratigraphy and chronology of the North Row. It was found as a 10–20cm thick continuous deposit, except in the eastern extension, where it had partly been removed in earlier times, and partly taken during the removal of the overburden by machine, so that only scattered traces remained there. Although it could not be followed into the neighbouring tenement, the continuity was clear from the similarity in levels. Five buildings were recorded in this phase, Buildings 175, 198, 193, 367 and 368, together with a fireplace, Hearth 7.

Building 175 (P8,VI; P9,II) consisted of most of the ground frame for the south wall, together with an upright and parts of the adjacent sill-beams in their original position. The building was slightly off the orientation of our grid system. Its south-eastern corner and most of the eastern end-wall lay beyond the limit of the excavation, but the north-eastern corner with the immediately adjacent part of the end-wall was probably identified, as well as one of the uprights in the north wall.

It was possible for various reasons to associate two posts which protruded in the centre of the building with the building, but they stood right in the middle of a stave wall from an earlier building, to which they presumably really belonged, even though they also really appeared out of context there. On the other hand, within the assumed limits of the ground frame of Building 175 there was a series of relatively slender logs running across the building and some plank fragments, which surely indicated a detached floor. This is the preferred interpretation. From the parts which had survived, Building 175 was estimated to be at least 7m long, and the distance between the centres of the posts in the middle of the side walls was 7.50m. The western boundary lay around 112y.

To the west of Building 175 there lay the scattered remains of structures disturbed by the mechanical excavator in 1971.

In the middle of grid-square N9 lay the remains of the western end-wall and adjacent parts of the two side walls of a log-built structure, Building 198.

Building 198 (N9,VIII,IX,XI; O9,I) comprised parts of the sill-beam of the western end-wall cut through by one of the drainage channels underneath the later Building 172. The logs of the side walls were burnt through c 1.5m from the west end. Eastern limit uncertain: the building may have covered most of the area between 105y to the east and 93y to the west. Maximum length c 12m; width at the west end 6m.

Fig. 44. Engelgården Phase 5.2.

Within the ground-frame of Building 198 lay the heat-fractured stones of Hearth 7. It contained a well-burnt fine calciferous deposit, which suggests that the hearth had been used in connection with lime-slaking. It is not clear whether it should be associated with Building 198, or whether it belonged to the preceding level, Phase 5.1. As there was no definite evidence for any buildings in this part of the site from Phase 5.1, this could suggest that the hearth was in use during that phase.

Immediately to the west of Building 198, the remains of a partly post-built structure, Building 193, were recorded. As with Building 198 it had been cut through in places by the drains beneath Building 172.

Building 193 (M9,XII,XIII; M10,III,III.1; N9,X; N10,III) consisted of 3–4 courses of horizontal beams forming the foundations and a partially intact row of uprights from the north wall. At the eastern end it was cut through by a drainage channel beneath Building 172. The wall at the eastern end probably lay at 98.6y, and the western wall at 89y. Probable length 9.5m; width 5.40m. The long axis of the building was orientated a little more in a north-east/south-west direction than the later buildings on this spot and it was also markedly narrower.

Building 367 (L9,VII–IX; M9,XII,XIII; M10,II,III, III.1) consisted of four courses of foundation beams which appeared clearly to delimit the area of the building. Eastern limit at 88.5y; western limit at 81.8y. Length 6.7m; width 5.9m. There was a slight overlapping of the foundations to the west, which may indicate that the building was actually longer, but a slight divergence of c 15cm in the alignment of the south wall is taken to indicate a division into separate buildings at this point.

Building 368 (I9,VII; K9,IX; L9,IX) comprised seven, possibly eight, courses of foundation timbers beneath the Fire IV level. Eastern limit at 81.4y; western limit uncertain, probably at c 68.7y. Estimated length c 12.7m; width c 5.3–5.5m.

To the west of Building 368 the foundations continued beyond the edge of the site. As there is reason to believe that there was a common waterfront for both rows, the comments concerning the South Row in this phase also apply here (see p 77). The long section on the Bugården side indicated a waterfront at c 49y in grid-square G10.

Tenement passage

In the M grid-squares lay the remains of the wooden pavement with transverse boards, cut through down the centre by a later drain. There were otherwise scattered remains, including some side planks of a drain, and some joists and other fragments. Both the width of the passage and the distance between the two rows varied somewhat, the latter ranging from c 3.9m to 4.5–4.6m.

Phase 5.1, unburnt phase following Fire V (fig 45

South Row

In grid-squares M10 and N10 and the adjacent areas of M11 and N11, the 1974 excavations revealed two successive building phases between Fires V and IV. In particular, there were two buildings, 199 and 201, which admittedly did not overlap but which nevertheless clearly succeeded one another. The surviving parts of the later one, Building 199, have been described under Phase 5.2, the phase which was terminated by Fire IV, but as it showed no direct evidence of burning, the building may already have been demolished some time prior to the fire.

The earlier building, 201, which lay further east, was a timber-frame structure whose northern sill-beam was burnt at its western end. No other structural evidence had survived. Within the limits of this building an extensive amount of lime-slaking had taken place, localized to some large lined hearths and some smaller unlined ones. As the traces of burning were very limited, there is reason to believe that Building 201 had been a relatively light structure, perhaps a partly open shelter over the lime-slaking activity, which had eventually caused the building to catch fire. It is not clear whether slaking of lime continued after Building 201 had gone, but it is most likely that it continued on a smaller scale. The activity caused the deposition of up to half a metre of burnt earth with a layer of lime uppermost. Building 201 had not been replaced by a new building by the time of Fire IV, but Building 199 was erected further west.

Building 201 (M10,IV,V,V.1,VI.1; M11,IV.3; N10,IV,IV.3; N11,III.1,IV) was a timber-frame construction of which the sill-beams and parts of the uprights had survived. Eastern limit at 99.4y; western limit at 91.4y. Length 6m; width c 5.3m.

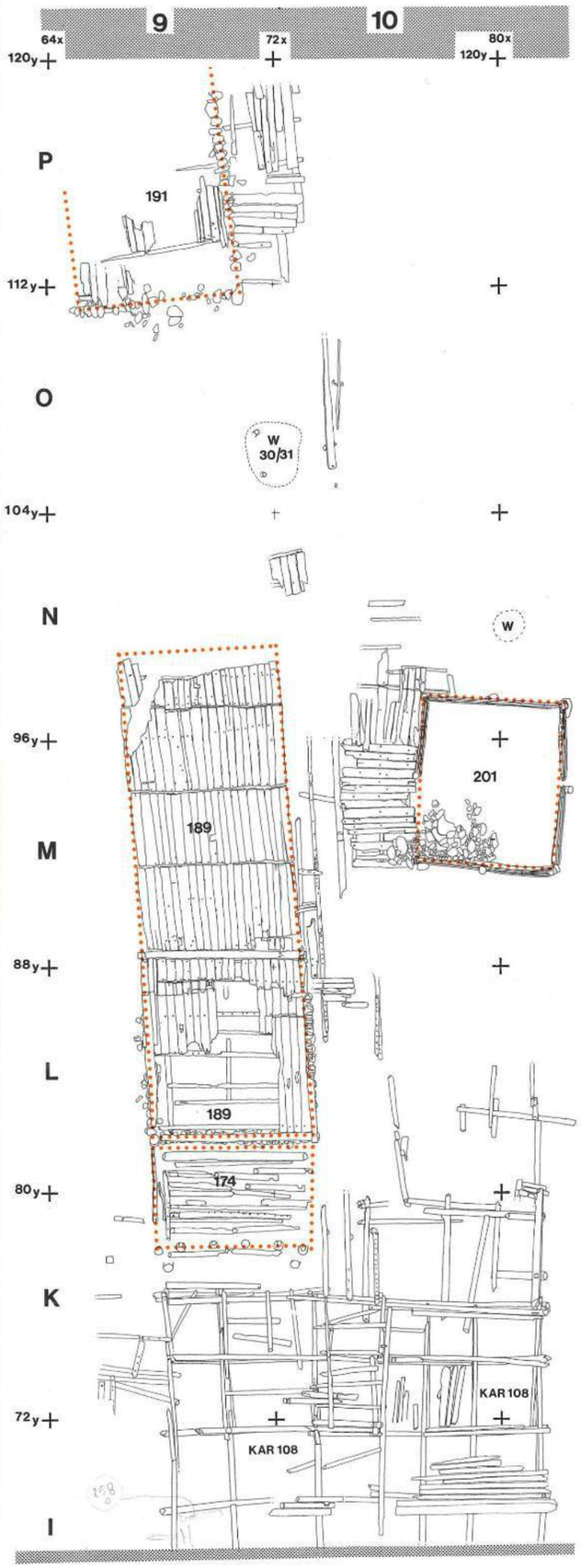
To the west of Building 201 there was no definite evidence for any other structures under Fire IV, but as discussed on p 77 the foundation showed a clear differentiation. The uppermost seven courses of timbers have already been associated with Phase 5.2, forming separate units beneath the buildings 348 and 368. Timber courses 8–17 on the other hand formed a continuous foundation substructure, Kar 108, c 13.5m wide, stretching the full width of the tenement. It continued westwards beyond the limit of the excavated area, but the long section on the Bugården side showed that it ended around 65y. Some posts at c 62y may indicate a contemporaneous waterfront. The depth of the wharf from front to back was at least 3m and the sea-bed at the front of the wharf was c - 3.5m.

In this phase there was c 21m between Building 201 and the waterfront, which would have allowed for three more buildings.

North Row

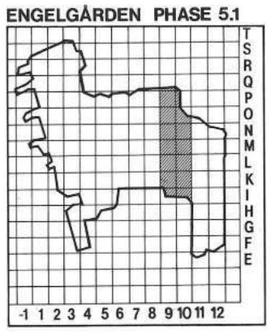
From the unburnt level between Fires IV and V there was evidence of three separate buildings in the North Row, Buildings 191, 189 and 174.

Building 191 (O9,I; P9,II-IV) comprised the ground-walls beneath the south and west walls and parts of a wooden floor laid longitudinally. It continued



BRYGGEN, BERGEN
EXCAVATED AREA

ENGELGÅRDEN PHASE 5.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
I a	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
I b	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332	5	5.2, 5.2.1
V	1248	4	4.2, 4.1
VI	1198	3	3.2, 3.2.1, 3.1, 3.1.1
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

eastwards beyond the edge of the site at c 119y, while the western limit was at c 111y. Maximum recorded length 8m; width c 5.8m.

In grid-square O9 and the eastern part of N9, this level had mostly been removed by the mechanical excavator in 1971, but it is reasonable to assume that the lime-slaking activity recorded in Phase 5.2 leading up to Fire IV could also have taken place in this phase. A stone-lined «hearth» (Hearth 7) was interpreted during excavation as a lime-slaking pit and this may be contemporary with Building 191 and the building which lay to the west, Building 189 (see comments to Building 198 in Phase 5.2, p 79).

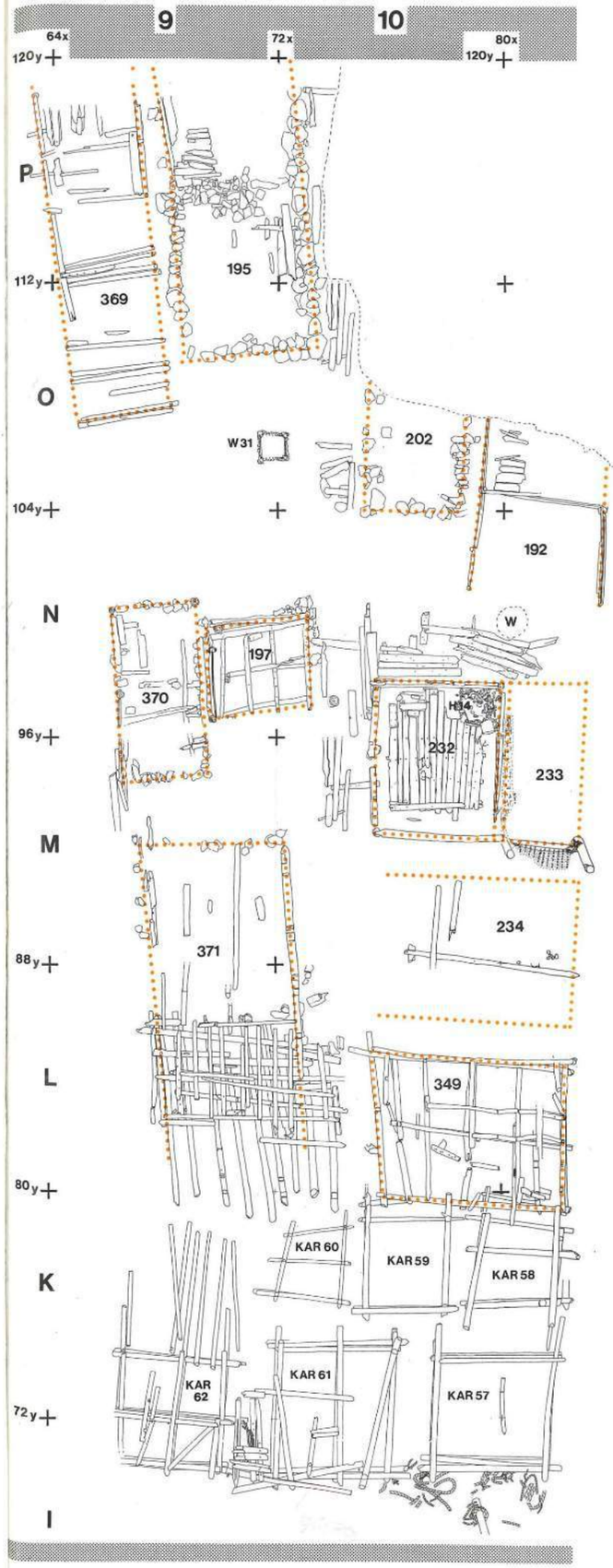
Building 189 (L9,X; M9,XIV; M10,IV; N9,XI; N10, III) consisted of a well-preserved floor with boards laid longitudinally, showing an unusually long structure which had probably been log-built. It continued at least as far east as c 98.8y where, like the later buildings 172 and 173, it had been disturbed. The existence of a contemporary lime-slaking pit set the maximum eastern limit of the building at c 100y, and this was confirmed by the southern sill-beam whose remains were recorded at c 100y. The western limit was clearly marked by both ground-wall and sill-beam at 81.9y. Maximum recorded length 16.9m; probable length 18m. Width 5.85m.

Building 189 extended as far as the front edge of the earlier supporting foundation at c 82y. Just to the west of this there was a row of five posts, each about 1m high, running across the tenement and each containing a rebate for horizontal beams laid longitudinally from the east. The posts were arranged on a bed of stone deposited after Fire V (Period 4) and had no contact with the foundation timbers belonging to the subsequent Building 368. As the seating for the horizontal beams came at the same height as an adjacent ground-wall underneath Building 198, the posts must be regarded as indicating the western end wall of an extension to Building 189. It is designated Building 174.

Building 174 (K9,IX,X) was 4m in length and must have been over 4.5m wide, judging from the rebates cut to receive the floor joists.

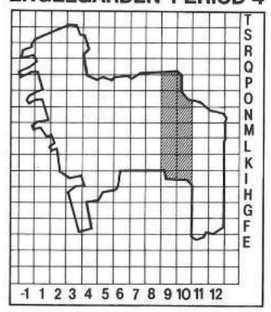
To the west of Building 174 the foundation substructure from Phase 5.1 had been laid as a single construction

Fig. 45. Engelgården Phase 5.1.



BRYGGEN, BERGEN
EXCAVATED AREA

ENGELGÅRDEN PERIOD 4



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
I a	Prev. unknown	9	9.2, 9.1, 9.1.1
I	1702		
I b	Prev. unknown	8	8.2, 8.1, 8.1.1
II	1476	7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.2.1, 6.1, 6.1.1
IV	1332	5	5.2, 5.2.1, 5.1, 5.1.1
V	1248	4	
VI	1198	3	3.2, 3.2.1, 3.1, 3.1.1
VII	1170/71	2	2.2, 2.1
VIII	Prev. unknown	1	1.2, 1.1

continuous with the large substructure beneath the South Row, Kar 108, and the reader is therefore referred to the commentary on p 79. Between Building 174 and the waterfront there could hardly have been room for more than one large wharf-side building.

Tenement passage

In grid-squares N10 and P10 there were relatively well-preserved sections of a wooden pavement laid partly longitudinally, partly with overlapping transverse boards. In sections of the passage there were the side planks from a drain, and in the western part also some joists for a transverse deck. The distance between the buildings on either side varied from c 3.7m at the west end to c 4.5m to the east. The passage could be traced with some interruptions over a distance of 51m.

Summary, Period 5

This period contains two phases of development. There were few traces of the South Row from either phase in the later extension to the site, but the North Row was relatively well documented with generally good remains from three buildings in Phase 5.1 and five in Phase 5.2.

Once again there was a marked difference in the width of the two rows. Moreover, the width of the individual buildings in each row varied more than in the later periods, the buildings in the South Row ranging from 4m to 5.8m, and in the North Row from 5.3m at the west end to as much as 7.5m at the east end. This tendency also seems to be reflected in the tenement passage, whose width varied from c 3.9m at the west end to c 4.6m to the east. In this period the tenement seems generally to have been fan-shaped in plan, both in Phase 5.1 and 5.2.

In the later phase the tenement passage had survived to varying degrees, except in the middle of the tenement where there was an almost intact section with transverse boards. These had been cut through by a later drain. A well was recorded at the eastern end of the South Row.

In Phase 5.1 there were only traces from one building in the South Row and the remains of three in the North Row. Of these, Building 189 in the North Row had an unusually well-preserved wooden floor. At the western end there was a large foundation substructure, Kar 108, running right across the tenement, and from observations made on the adjacent tenement of Bugården to the south it could be

Fig. 46. Engelgården Period 4.

seen to terminate at c 65y, just beyond the western edge of the excavated area. There were also indications of a wharf carried on posts at c 62y.

Also in Phase 5.1, parts of the passage had survived intact at the eastern end and in the middle of the site, sometimes with transverse boards, sometimes with longitudinal boards, the latter probably the result of repairs. The width of the passage varied between 3.7m at the west end and c 4.5m in the middle of the tenement.

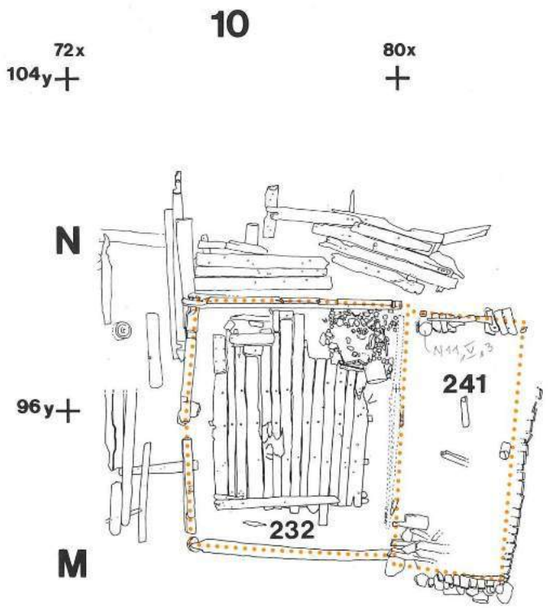


Fig. 47. Building 232 with Privy 241.

Period 4, burnt in Fire V (1248) (fig 46)

South Row

Evidence for Fire V was recorded over a distance of 21m from c 83y to c 104y with a few gaps. It was generally encountered 30–40cm below Fire IV. Seven buildings were identified in this period, 192, 202, 232, 241, 233, 234 and 349, most of them in grid-squares M10, N10 and O10 in the rear part of the site. Period 4 also included two examples of a tenement layout which was exceptional in that two buildings had been erected side by side within one row. In one instance it was a large privy placed alongside the main building, a layout which had a forerunner in the preceding period, prior to Fire VI (cf p 86). There was a complicating factor in Period 4 in that the main building in question, Building 232, was apparently demolished some time before Fire V, while the privy, Building 241, which had been erected at the same time as the main building, had been replaced at an earlier date by a new privy, Building 233. The replacement building was then presumably pulled down at the same time as the main building.

Building 192 (N10,IV,V; N11,II.1; O10,II,V; O11,I,II) consisted of a timber-frame construction with the sill-beams for the north and south walls supported on posts and a cross sill from an internal wall. The building continued to the east beyond the edge of the excavations at 106–107y, while the west end lay at c 101.2y. Maximum recorded length 5.80m; width 4.40m.

Building 202 (N10,IV.1,V; O10,II,V) lay adjacent to the tenement passage on the north side of Building 192 and consisted of ground-walls from the north, west and south walls. It continued eastwards beyond the boundary of the site at c 108y. The west wall lay at 104y. Maximum recorded length c 4m, estimated width c 3.5m.

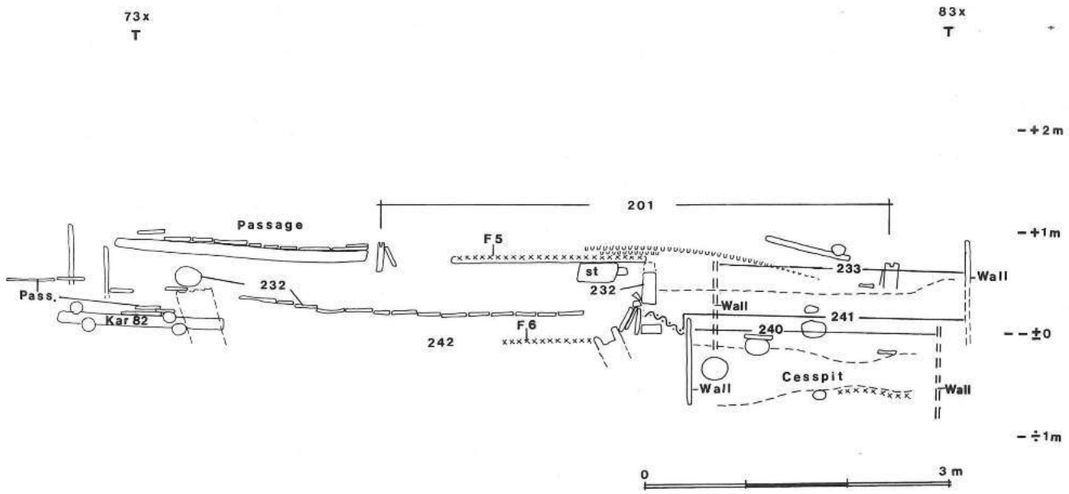


Fig. 48. Cross-section through Buildings 242 and 232 in Engelgården South with their associated privies 240 and 241/233.

The South Row at this point measured 8.4–8.5m in width.

West of Buildings 202 and 192 there was a partly undeveloped area stretching for 10–11m, to the west of which was the situation referred to above, with a main building, Building 232, and a privy, Building 233, lying parallel to it. The latter had replaced an earlier privy, Building 241 (fig 47). Both Building 232 and the privy 233 seem to have been demolished before Fire V. The two privies were covered with a layer of moss and lime, but some of the structural elements projected through this to such an extent that they had burnt in Fire V.

Along the east end of Buildings 232 and 233/241 a wooden-paved passage ran across the tenement and both the main building and the privies opened on to it. In the main building, the rebate for the door was recorded in the east sill-beam.

Of the three buildings it is only Building 233 which can be tied with any degree of certainty to the level which was destroyed in Fire V, but for the sake of clarity they will all be commented on here. Their mutual relationship is indicated on the schematic cross-section (fig 48).

Building 232 (M10,VI; N10,V) was probably a log-built construction with one room. Its remains consisted of the entire ground-frame and a well-preserved detached floor with longitudinal boards. It probably also had fixed wall-benches, since there was a gap of between c 50cm and c 75cm between the floor and the wall on the south, west and east sides (fig 49). In the south-east corner were the remains of a stone-built fireplace, Hearth 14 (fig 50). The door, which was in the east wall, had opened outwards. Eastern wall at 79.96y; western wall at c 92.4y. Length c 5.5m; width 4.50m.

Fig. 49. Building 232 from Period 4 in Engelgården South seen from the west, with a relatively intact plank floor and sill-beams for the north, east and south walls. A fireplace (Hearth No. 14) lies in the south-east corner. The gap between the floorboards and the wall on the north, west and south sides indicates the existence of earth-filled wall-benches. The doorway was in the east wall.

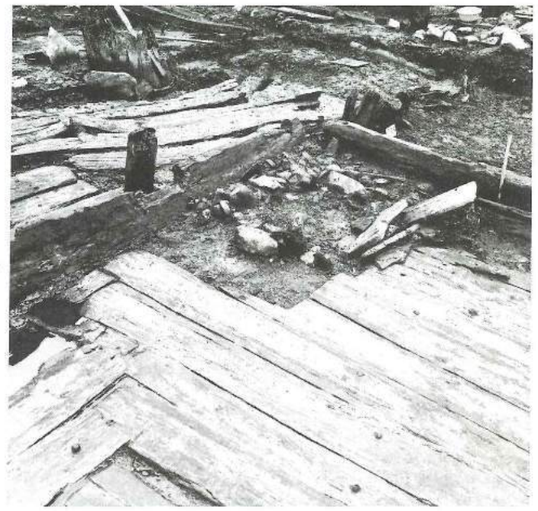


Fig. 50. South-eastern corner of Building 232, showing the remains of the fireplace (cf fig 49).

Building 233 (M10,VI.3; M11,IV.2,VI; N11,IV,V) was a privy. It was a timber-frame construction, the wall spaces being filled with thin vertical planking on the east, south and west sides and with wattling on the north side. Eastern wall at c 97.6y; western wall at c 91.8y. Length c 5.8m; width c 2.6m at the east end and 2.4m at the west end.

Building 241 (M10,VI; M11,VII.1; N10,V) was also a privy, which was later replaced by Building 233. Its west end-wall was marked by two corner posts, and the western and northern walls were made of wattles. Eastern and southern limits assumed to be the same as for Building 233; western wall at 92.1–92.2y. Estimated length c 5.4m; width at the west end c 2.5m. The privy is drawn on a supplementary plan to Period 4 (fig 47).

The width of the South Row at this point was c 7.8–8m.

Access to Buildings 232 and 233/241 was *via* the cross-passage at the east end of the buildings, which would indicate that the area immediately to the west must have been occupied by a building, but there are few fragments which can reasonably be related to any structure. A burnt beam supported on posts which was found *in situ*, a group of nine warp-weights, and the handle of a weaver's sword-beater made from a whale bone which was found in the detritus layer from the fire, indicate the existence of a building here, and it has been numbered Building 234.

Building 234 (M10,VII; M11,V) was mainly indicated by the group of finds, and by an assumed floor joist which was carried on posts. Assumed eastern limit at c 91y; western limit around 86y. Assumed length 5m; width uncertain.

The western part of Building 234 lay within an area which could not be excavated archaeologically, but at c 85y in grid-square L10 there were clear signs of the eastern limit of a new building, Building 349, the wharf-side building for this phase.

Fig. 51. Part of the Period 4 foundation substructure Kar 61 in Engelgården, seen from the south-east. The structure was prefabricated: the marks on the logs were for guidance when reassembling it.

Building 349 (K10,XII,XIV; L10,X,XI; L11,XI) consisted of foundation timbers and fragments of floor joists. Eastern limit at 84.70y; possible western limit at around 79.5y. Estimated length 5–5.2m; width 6.40m.

Between the estimated position of the west end-wall of Building 349 and the assumed waterfront from this period at c 69y, only foundation timbers were found. These comprised the lowest, original sections of the cellular substructure arrangement beneath Fire IV, which had been constructed after the sea-bed had been raised and levelled following Fire VI. The units were of various sizes, ranging from 2.5m x 3m to 4.20m x 4.70m, and they formed the support for the upper beams which linked the whole arrangement together (figs 46 and 51). In the I and K grid-squares six units were recorded, in two groups of three. The front group of three consisted of the larger substructures, Kar 57, Kar 61 and Kar 62, regularly placed across the full width of the tenement, while the back row, Kar 58, Kar 59 and Kar 60, were generally smaller and only covered the southern and central part of the tenement. It would seem that there ought to have been at least one more substructure unit under the North Row, but the deposits from after Fire VI seem to suggest that there was only a compact layer here.

After the units had been constructed to a certain height, they were covered with a layer of timbers which held them together, forming a single continuous foundation right across the tenement. This part, however, had subsequently been removed, as the front group of units appear to mark the termination of a separate building phase. Just in front of these units, which ended at 70.30y, an amount of ropework and hawsers were found, and rope was also found coiled round a post at c 69y. It is therefore not possible to link this situation to the timbers of the overlying unit, Kar 108, since the post with the rope coiled around it must at some point have been standing on its own in open water. This must have been at the same time as the primary substructures and would have preceded the laying in Phase 5.1 of the timbers making up the foundation substructure Kar 108. In other words, the post and the substructures must be interpreted as the remains of a wharf, and they must have belonged to Period 4, which burnt in Fire V. As the post would have been standing on the sea-bed at that time, it cannot be regarded as a mooring post, but rather as part of an otherwise missing wharf construction.

The base of the front of the wharf was at -3m when excavated and the post stood at -2.60m. Allowing for the sinking and compression of the deposits, the sea-bed in front of the wharf may have been c 2–2.2m below site datum.

North Row

Fire layer V was continuous over the central area of the tenement, being recorded through the L, M and half of the N grid-squares, where it ended underneath the eastern part of Building 189 from Phase 5.1. Only scattered traces of it were found further east. To the west it ended at c 80y.

In this period, the eastern part of the North Row was divided down the middle with a long building apparently divided into two rooms alongside the passage, Building 195, and a narrower building, Building 369, adjacent to the eaves-drip gap separating Engelgården from the neighbouring tenement of Søstergården on the north side. The construction recorded as Building 369 may possibly have comprised two separate outbuildings, but they are treated under a single number as there was no direct evidence for a dividing wall.

This period also included Buildings 370, 197 and 371, and Well 31 may also have been constructed in this period.

Building 195 (O9,I,II; O10,I,II; P9,V,VI; P10,V,VI) consisted of ground-walls and parts of a wooden floor. It was probably divided into two rooms with floorboards laid longitudinally in the western part and a transverse floor in the eastern room. It continued eastwards beyond the edge of the excavated area at 118.80y. The west wall lay at c 109.2–109.4y. Maximum recorded length 9.4–9.6m; width c 5m.

Building 369 (O9,II; P8,VI; P9,V,VI) ran parallel to Building 195 along its north side and comprised foundation timbers and remains of a longitudinal floor. Like Building 195 it may have been divided into two rooms. Eastern limit outside the excavated area, possibly at c 118.6–118.7y. Western limit recorded at 110.50y, but the building probably continued to c 109y. Maximum recorded length c 8m, assumed length c 9m; width 3.50m.

Between Buildings 195 and 369 there was a 70–90cm wide gap. It is reasonable to assume that the access to Building 369 was on the north side, since it lay adjacent to the tenement passage of Søstergården. At this point Engelgården North was 9.20m wide.

Over a distance of 5m or 6m immediately to the west of Buildings 195 and 369, there were no remains which could be associated with Period 4. This need not imply that this area was not developed; it simply means that the surviving traces did not provide enough evidence to draw any definite conclusions. It is this area which was traditionally used for a well. As mentioned above on p 68, the finds show that the final period of use (Well 30) was in post-medieval times. There were no clear indications of the date of the earliest period of use (Well 32), but it may go back to

Phase 3.2, which was terminated by Fire VI. We should perhaps mention that during the 1979–80 season of excavations this area was constantly waterlogged, and more recent investigations have disclosed the existence of deltaic deposits from a brook which used to run into the bay here in the pre-Roman period.

Well 31, which may date from Period 4, was lined with horizontal planking slotted into corner uprights. All four sides were preserved in the bottom section, the north and south sides surviving to a greater height than the other two sides. The longest side measured 2.10m and reached to a depth of -50cm. There was an insulating layer of birch bark around the outside of the wooden lining, and the well itself was filled with sand. The finds included shoes of a late-medieval type, which confirm that the well was in use up to the time when Well 30 was constructed, around 1500, or until Fire II in 1476.

Just to the west of Well 31 the buildings continued, once again with a lengthwise division of the Row, with a narrower building, Building 370, alongside the eaves-drip gap on the north side and a somewhat wider one, Building 197, running alongside the tenement passage.

Building 370 (M9,XIV,XV; N9,XII,XIII) was a narrow outbuilding with upright posts and the remains of longitudinal floorboards and of floor joists. Eastern limit at 100.5–100.6y; western limit uncertain, possibly at c 94.5y. Assumed length 6m; assumed width 3m.

Building 197 (M9,XVI; M10,VI; N9,XII–XIV; N10,V) was a small post-and-beam structure erected on a ground-frame, of which the eastern and northern sill-beams were partly intact. The ground-walls under the western, southern and eastern walls, and uprights at the north-eastern corner and in the north wall had also partly survived, as well as a longitudinal floor joist by the north wall which was apparently supported on posts. Eastern limit at 100.00y; western limit at 93.80y. Length 6.20m; width c 3.8m.

The longitudinal division of the North Row did not continue beyond Buildings 370 and 179, at which point the row was 7m wide. With the transition westwards to a single row of buildings the width was reduced on both sides.

Building 371 (L9,XI; L10,X; M9,XV,XVI) comprised four uprights and a padstone for a fifth post from the north wall of the building, some isolated and badly burnt fragments of the floor, and parts of two layers of foundation timbers from beneath the building. Assumed eastern limit at c 92.5y; western limit uncertain, perhaps at c 87y where the sills terminated. The upper layer of foundation timbers was almost totally destroyed by fire on the west side, and the lower level was also burnt on this side, but it continued for a further 3m, as far as c 83y. It is therefore tempting to suggest that the building extended to the western limit of the supporting timbers at c 83y, in which case it would have been 9.5m long, as opposed to 4.5m which was the maximum surviving length of the sill-beams.

The burnt fragments overlying Building 371 continued for a further 2–3m in front of the supporting foundations which had carried an earlier wharf. There were features here which were identical to those at the same level in the Bugården tenement: the foundation timbers from Period 4 terminated with nothing to stabilize them at the front and consequently lacked any ability to support a structure. It is therefore assumed that sections of the foundations to the west must have subsequently been removed, as the underlying foundation substructures, Kar 57–Kar 62, continued westwards as far as c 73.3y. The reader is referred to the description of the South Row on p 84, where these structures are commented on.

Between the assumed western limit of Building 371 and the front of the substructure units there was a distance of c 12.5m, which would allow for a spacious wharf-side building in the North Row.

Tenement passage

Apart from a short stretch to the south of Building 195 and to the north of Building 232, there were no definitely identifiable traces of the tenement passage. The surviving remains showed that it had been paved with longitudinal boards and was very narrow. By the eastern part of Building 232 at 96.00y, the distance between the two Rows was 1.70m.

Summary, Period 4

The period contained only one building phase, but a large privy in the South Row had been replaced by a new one during the course of the period (Buildings 241 and 233). These two privies had both been c 2.5m wide and formed an outbuilding along the full length of the main building. The South Row, in other words, was divided longitudinally, a feature which continued to the east with Buildings 192 and 202, and which was also repeated in the North Row with Buildings 197/370 and 195/369. Even though the tenement passage was reduced to a width of c 1.7m, this doubling of structures could not fail to influence the overall width of the tenement. The fan-shaped ground plan of the tenement was accentuated towards the rear of the site. The width of the built-up part of the tenement was c 15.5m towards the front around 80y, increasing to c 20m around 112y, while the full width of the property was at least 1m more.

The western part of the tenement comprised six foundation substructure units of varying sizes. They all terminated along a straight line at c 70–70.5y, with a single post and considerable remains of rope in front, all of which points to this being the wharf front.

Period 3

Phase 3.2, burnt in Fire VI (1198) (fig 52)

South Row

The eastern part of the site had to be abandoned as soon as the level which had burnt in Fire V had been documented. East of c 100y there was therefore only sporadic evidence from the lower layers. In grid-squares M10 and N10 structural remains from the lowest levels have been drawn in on the basis of measurements taken after the building contractors had begun working on the site. Buildings 242, 240 and 244 belong to this phase. As mentioned on p 83 we

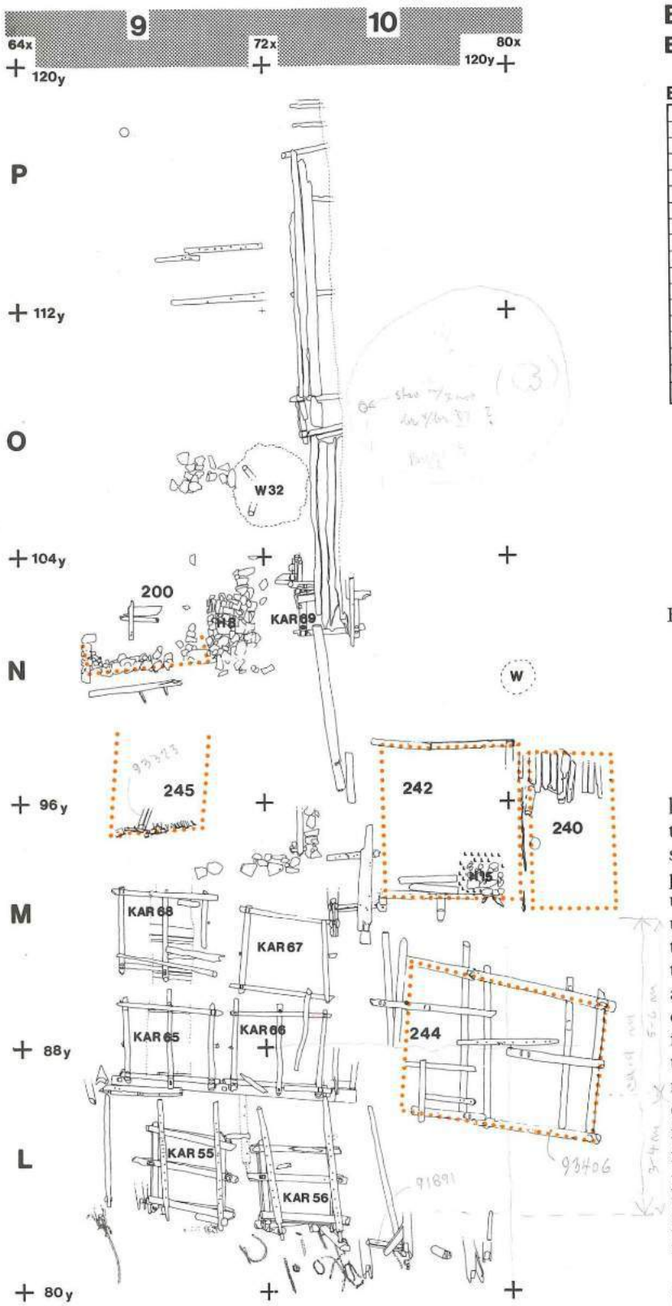


Fig. 52. Engelgården Phase 3.2.

have a parallel situation to that which had been recorded in the following period, Period 4, where a main structure had a privy standing alongside it (Building 232 and Buildings 233/241) (cf cross-section fig 48).

Building 242 (M10,IX.1,IX.2; N10,VI) is documented basically by the existence of a rectangular fireplace, Hearth

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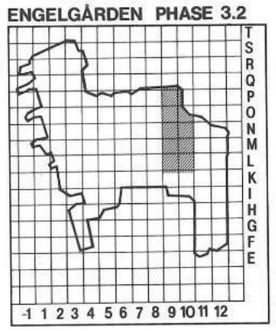
ENGELGÅRDEN PHASE 3.2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.11
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III b	1393	6	6.3, 6.2, 6.21, 6.1, 6.11
IV	1332		
V	1248	5	5.2, 5.21, 5.1
VI	1198	4	4.2, 4.1
VII	1170/71	3	3.21, 3.1, 3.11
VIII	Prev. unknown	2	2.2, 2.1
		1	1.2, 1.1

15, located in the south-west corner, but other fragments of wood presumably belong to the eastern sill-beam, parts of the south wall and some transverse floorboards. Access to the building was from the east, just like Building 232 in Period 4. Eastern limit at c 98y; western limit at c 93y. Length c 5m; width at the east end 4.65m.

Building 240 (M10,IX.1; N11,VI) had been constructed with walls of vertical edge-to-edge planking. Evidence for corner uprights was lacking. It had been used as a privy. Eastern limit at c 79.6–79.7y; assumed western limit at 93.2–93.4y. Estimated length 4.4–4.5m; maximum recorded width 2.50m.

The width of the South Row at this point was c 8.5m.

To the west of Building 242 only the foundation timbers had survived, consisting of beams uniting what had initially been separate substructure units. Two of these were scarfed together to form a single massive beam, or sole-plate, rectangular in section and containing two rebates for uprights. There were clear pressure marks left by the uprights. The sole-plate, which lay at a slight angle to the tenement, is interpreted as belonging to the east wall of the tenement's wharf-side building. This has been designated as Building 244 in the South Row. Its minimum width was c 5m. The sole-plate with its marks from two uprights forms the only tangible indication of a building here, but the interpretation is supported by other evidence. Both the main building 242 and the privy, Building 240, had their doors on the east side. If they had been the front buildings in the row, it would be natural to have expected access from the seaward side. It would also be remarkable if a privy with its flimsy walls faced the wharf. Moreover, there was reasonable room for a separate wharf-side building here, since the front of the wharf lay c 9m further forward.

Between c 81.5y and c 83y there were two, or possibly three, rows of posts (fig 53). The foremost and tallest row stood at 81.50y and is considered to be the latest of the three. It ought to be the front row in the phase which burnt in Fire VI, in other words Phase 3.2. The next row seems to be associated with the locking beams carrying the plank deck of a quay, while the back row has been difficult to interpret. It may represent an initial stage in the development of the tenement in Period 3, but it is difficult on the whole to associate it with any definite structure. The question of its function must therefore be left open. The front two rows on the other hand must be associated with Phases 3.1 and 3.2 respectively.

Our interpretation of the front – and tallest – row of posts as the wharf-front in Phase 3.2, burnt in Fire VI, is only a hypothesis, but whichever way they are interpreted makes no real difference to the total picture. The wharf-front in Phase 3.2 must in any case have been around 81.5–82y, which would have given a gap of c 4m back to the nearest foundation substructure. The depth of water in front of the wharf was over 1m. The distance from the front of the wharf to the recorded remains of the rear wall of the first building was c 9m, which should allow room for a wharf of 3–4m and a wharf-side building of 5–6m. We thus end up with a separate wharf-side building, Building 244.

Building 244 (M10,VI; M11,VI) was post-built. Eastern limit at an angle to the site grid; mid-point at c 90.6y. Estimated western limit at 84.5–85y. Estimated length 5–6m; assumed width at least 5m.

North Row

Evidence of this phase was found over an extent of c 25m with continuous deposits from Fire VI covering 9m in grid-square M9 and the adjacent parts of N9. To the east there were only sporadic deposits with occasionally no more than a layer of blackish grey ash and charcoal. The fire-layer was separated from the deposits of the overlying Fire V by 30–40cm in the western part but by only a couple of centimetres in the eastern part. In some places, therefore, the identification of this phase was based on very thin evidence, as there were no remains of actual buildings. Within the easternmost 13m there was in fact just a single find which could suggest the existence of a building here in Period 3: a post was recorded on approximately the same line as the north walls of Buildings 195 and 196 from Periods 4 and 2, but as it could not belong to either of these buildings, it must be from a post-built structure belonging to Period 3, although any closer dating within the period is impossible. This is also insufficient for it to be given a separate Building No.

The situation was not clear in the O9 grid-square, where there were several posts which defied interpretation, but which probably belonged to this level. This part of the tenement was not totally excavated, and the bottom levels and certain structural features could only be documented by trenching. Since the bases of the foundation posts could not be determined stratigraphically, it was not possible to suggest any definite date for the posts, and we must limit ourselves to suggesting a probable continuity of structures, at least in the southern part of the North Row. Clearly identifiable traces of buildings first occurred in the eastern part of N9. From this point on, the remains of two buildings were recognized, 200 and 245, but there was also room for a third. The remains of Well 32 in the area which was subsequently occupied by Well 31 probably belonged to this period. Like the later well, it was revetted with horizontal planking, but only the north-east and north-west corner posts had survived to the height where the posts of Well 31 took over.

Building 200 (N9,XII–XIV; O9,III,IV) had the clear traces of a ground-wall on the west side and the adjacent parts of the north and south sides, possibly also on the east side. There was also a stone-built fireplace (Hearth 8) in the south-west corner and the remains of a transverse floor. Eastern limit uncertain, possibly around 107y; western wall along 100.4y. Assumed length c 6.5m; width c 4.5m.

Two or three slanting planks supported by relatively slender stakes ran across the North Row 20–30cm west of Building 200. Presumably they had originally been part of some kind of revetting, but it is not clear whether they should be associated with Building 200, or with Building 245 immediately to the west, or whether they had been part of a drain.

Building 245 (M9,XVI,XVII) comprised only 2.70m of the west wall, consisting of one, or possibly two, posts with associated vertical planking. It had been an elevated structure like Building 196 in Period 2, a post-built structure with a space beneath the floor which was enclosed with vertical plank walls. A layer of moss was concentrated within the limits of the building. Eastern limit uncertain; western limit at 95–95.2y. Maximum recorded length 4–4.5m; width uncertain, but over 3.5m.

Between the remains of Building 245 and the front of the wharf at c 83y, only the remains of the foundation substructures were recorded. The excavation was not taken

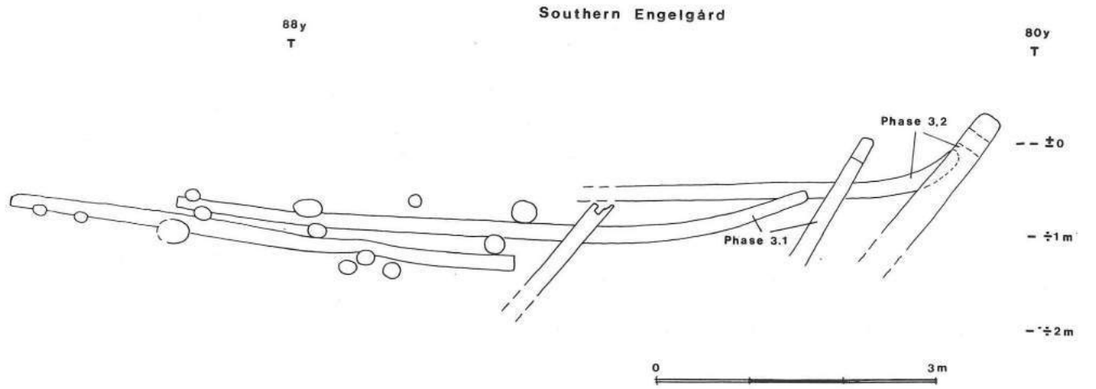


Fig. 53. Simplified long-section through the Period 3 waterfront in Engelgården South, 1170/71–1198.

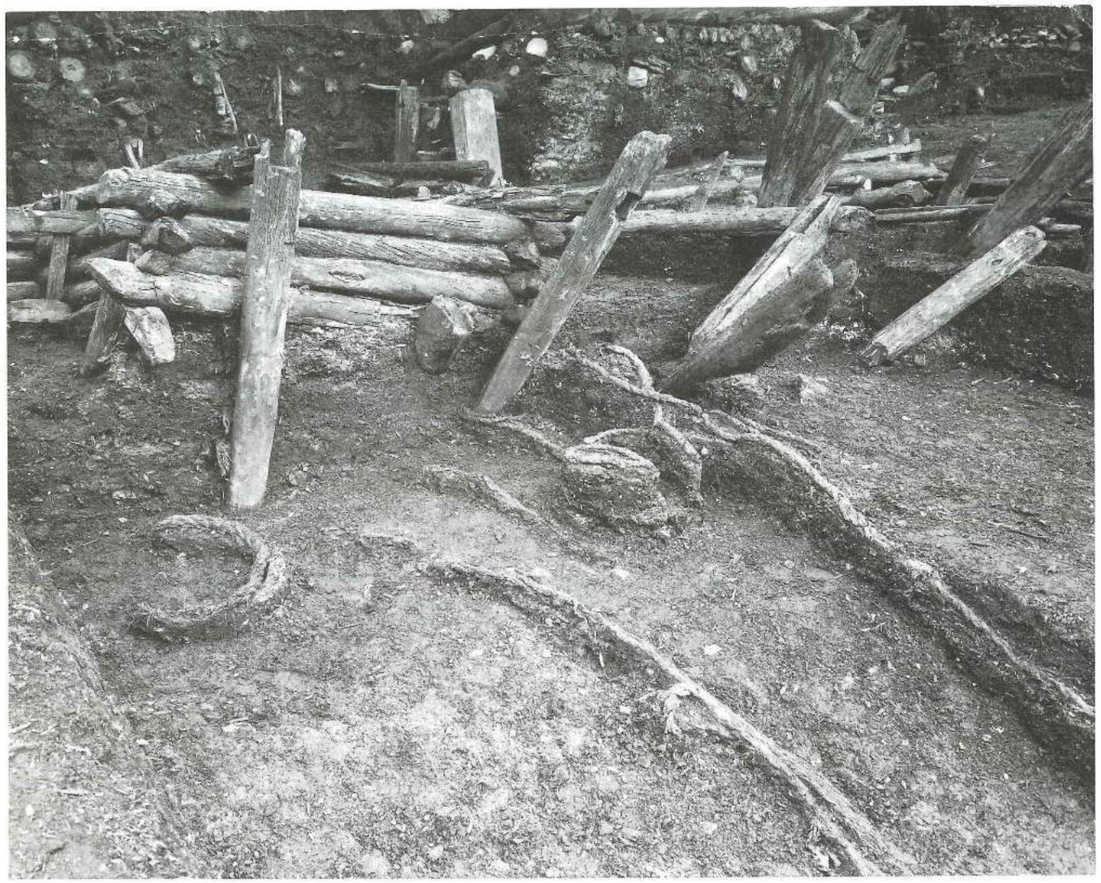


Fig. 54. The front substructures, Kar 55 and Kar 56, in Engelgården North, burnt in Fire VI (1198). The pieces of rope lie on the contemporary sea-bed. Looking towards the south-east.

any deeper than c 1.5m below site datum, but it was clear that the foundations here consisted of relatively small log-built structures, measuring 2.5m x 3m at the most (Kar 67–68, 65–66, 55–56). The horizontal members linking them together at the top had been either destroyed by fire or else removed, as all the foundation units were badly burnt at the top. There were six units in all in the North Row, placed in pairs. The two at the back, Kar 68 and Kar 67, were not connected in any way, but the middle pair, 65 and 66, were united with a relatively massive beam. The front pair, 55 and 56, which had clearly supported the wharf, were strengthened at the front with vertical posts with rebates for the horizontal joists which had carried the deck (fig 54). These joists were all burnt at their eastern end, but they had all been connected with Kar 65 and Kar 66 at the rear. They also contained plug holes which indicated the length of the wharf from front to back. All the units were also stabilized with external vertical locking beams (cf fig 52). The distance from the rear of the wharf to Building 245 must have been 9–9.2m, which means that there could have been a wharfside building of this length. The wharf foundations (Kar 55 and Kar 56), which comprised 6 and 8 courses of timber respectively, were rather special in that there were no timbers joining them together: the planked surface of the wharf would have provided the only structural connection between them. The front posts went down to -1.47m, but the bottom of the foundation units lay at only c -0.8m. Lying in front of the wharf were several ships' hawsers made from bast.

Tenement passage

Apart from a limited addition to a pre-existing passage between Buildings 242 and 245 in the eastern part of M10, there were no definite remains of the tenement passage belonging to this phase. There is much to suggest that the earlier passage, which consisted of massive longitudinal boards laid over stone-filled caissons, had continued in use. The maximum recorded width of the passage was 1.80–1.90m.

Phase 3.1, an unburnt phase beneath Fire VI (fig 55)

South Row

As already stated, there was evidence in Engelgården

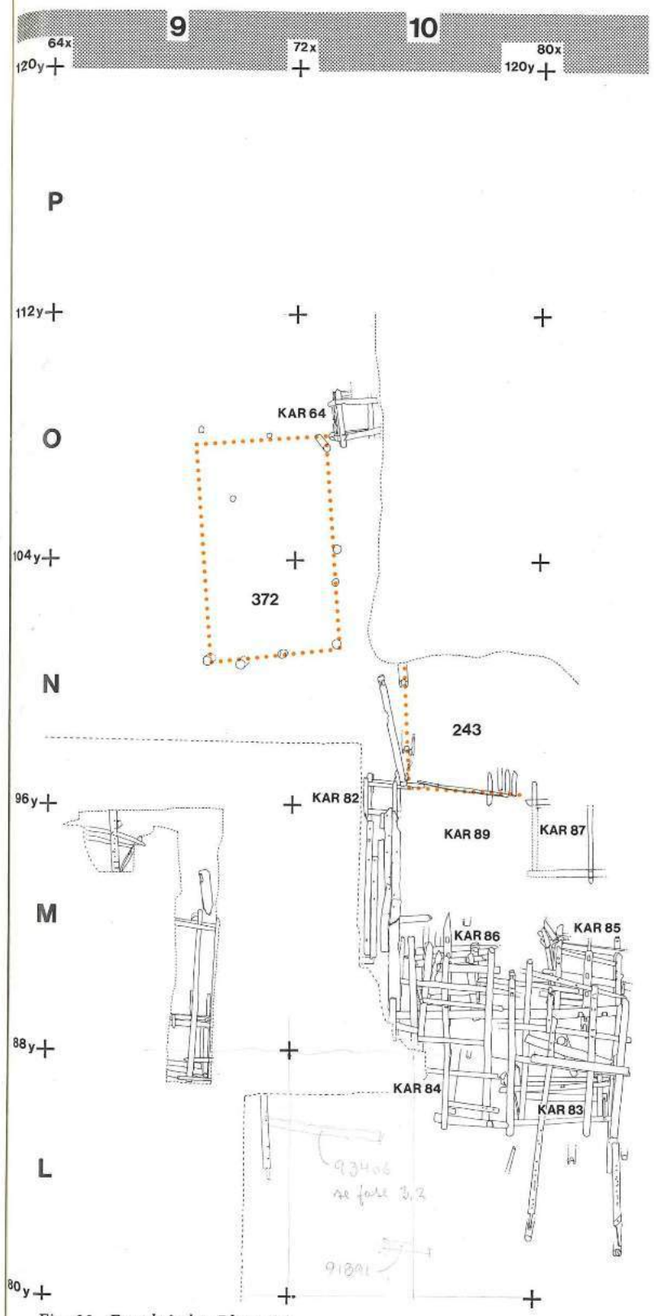
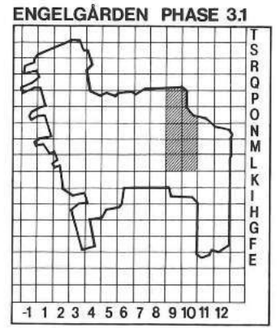


Fig. 55. Engelgården Phase 3.1.

South for several building phases earlier than Fire VI, and it would appear that the development followed the same rhythm as in Bugården. Apart from a single structure, Building 243, the remains consisted only of various types of foundations and wharf structures. Their separation into distinct phases has proved difficult, since not only the buildings but also the upper courses of the foundation

ENGELGÅRDEN PHASE 3.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.1i
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.1i
II	1476		
		7	7
III	1413		
III b	1393	6	6.3, 6.2, 6.2i, 6.1, 6.1i
IV	1332		
		5	5.2, 5.2i, 5.1
V	1248		
		4	4.2, 4.1
VI	1198		
		3	3.2, 3.2i, 3.1i
VII	1170/71		
		2	2.2, 2.1
VIII	Prev. unknown		
		1	1.2, 1.1

substructures had been removed during the course of redevelopment.

The earliest building phase, Period 2, was fairly easy to recognize, as the posts marking the front of the wharf were on the same alignment as the presumably contemporary posts in Bugården.

The next phase, Phase 3.1, consisted of Building 243 with three groups of foundation substructures in front, Kar 87 and Kar 89 at the rear (89 only located approximately and not planned), 85 and 86 in the middle, and 83 and 84 at the front (84 identified on the north side of 83 but not excavated). The presence of two posts in front of Kar 83 suggests that the front substructures were strengthened with a row of posts in front. Even though the evidence was not as comprehensive as in the contemporary phase 3.1 in Bugården, it seems clear that the development was directly parallel. The front of the foundation units should therefore also be interpreted here as a primary stage in the development of the waterfront, consisting of a single layer of deck-bearing joists locked to the front posts along 82.80–83y. However, there was no possibility of verifying whether there had been a partial rebuilding of this wharf structure, such as was found in Bugården. The Phase 3.1 wharf in Engelgården must have measured 2.80m from front to back, judging by the plug holes in the joists.

Building 243 (N10,IX) comprised posts carrying the sill-beams and sections of the edge-to-edge vertical planking which enclosed the area beneath the floor on the north and west sides. It continued eastwards beyond the limit of the excavations at c 101y. Western limit at c 97.2y. Maximum recorded length c 4m; maximum recorded width c 3.8m. Southern edge uncertain.

The distance from Building 243 to the front of the wharf was c 14m, which would have allowed room for at least one more building as well as a wharf with the usual length of 3–4m, but no traces of a building had survived.

North Row

In the northern half of the tenement it was only possible to excavate a trench 1m wide over a distance of c 15–16m. Definite traces of buildings were not recorded, apart from 10 posts, some of which must have belonged to Phase 3.1. They were found in the southern part of the North Row

and suggest the existence of a post-built structure, which for practical reasons has been allocated a Building No.

Building 372 (N9,XIII; N10,VI; O9,IV; O10,III) seemed to consist of 9 posts, the two easternmost along c 108.2y, and the three westernmost along 100.8y. This would indicate a length of c 7.4m. Width c 3.8m.

Within the western part of the row, in grid-squares L9 and M9, the trial trench produced evidence for partly continuous foundation timbers, which from internal criteria should belong to an unburnt phase prior to Fire VI. The basis of this interpretation was a locking beam, which had supported a planked surface and which from its position must have been part of the waterfront related to Phase 3.1 in the South Row. The waterfront ran in a NNE–SSW direction at a slight angle to the tenement, thus forming a direct continuation of the corresponding phase in Bugården. It lay along 84y in the North Row and 83y in the South Row, while in Bugården it straightened out along 81.50y.

As mentioned above (p 89) one of the contemporary front posts which supported the planked surface in the South Row had plug holes for the planking over a distance of c 2.8m. The length of the wharf from front to back in the North Row could therefore have been around 2.8–3m in Phase 3.1. The depth of water in front of the wharf in this phase is unknown.

Tenement passage

Of the tenement passage, sections of the surface had survived in grid-square M9, consisting of relatively massive boards laid longitudinally. In the eastern part of the grid-square they were supported on a small earth-filled foundation unit, Kar 82. The remains of a similar structure, Kar 64, were recorded c 11m further east, which may date to Period 2. It had probably been heightened in Phase 3.1.

Summary, Period 3

The period comprised two phases, but only a few random traces were recorded in the rear part of the site before construction work prevented further excavation.

The existence of Buildings 242/240 in the South Row in Phase 3.2 provided a chronologically earlier example of the combination of a main building and privy which had previously been recorded in Period 4. The main building 242 had a fireplace in the south-western corner and both buildings were entered from a transverse passage at the east end. In the North Row, there were the remains of two buildings, one of which, Building 245, was an elevated structure with its sill-beams supported on posts and the space beneath the floor enclosed with edge-to-edge vertical planking. In most of the buildings of this type the sub-floor area, which was actually at contemporary ground-level, contained a thick layer of moss, often as a pure concentration, but sometimes mixed with excrement. In the first case it had probably been a storage room containing moss intended for sanitary use, whereas in the latter case, it would indicate that the building had been used as a latrine.

The waterfront area in the South Row was not excavated. In the North Row it consisted of six small foundation substructures placed in pairs, the front pair being strengthened with posts in front and serving as the wharf. The front of the wharf ran at an angle from c 82y to the south-west to c 83y to the north-east. The phase burnt in Fire VI.

From Phase 3.1 only two buildings were identified, one in each row. From a trial trench the impression was gained that the waterfront had been built up from several small foundation substructures with a c 2.8–3m wharf carried on posts in front. As in the subsequent Phase 3.2, the front of the wharf ran at a slight angle, generally c 1m further east. The depth of water in front of the wharf could not be ascertained, and the total width of the tenement is also difficult to suggest. This phase was unburnt.

Period 2, burnt in Fire VII (1170/71) (fig 56)

South Row

As in Bugården, the waterfront in the earliest recorded phase was indicated by two deep and massive posts along c 95.4–95.6y, which are interpreted as the front posts of a wharf construction. Fixed to the lower part of each post was a cross beam up to 30cm wide set on edge, and where it could be measured, the bottom edge of these anchoring beams was at -2.80m, indicating that the level of the seabed was at c -2.5m.

A stone-filled log structure, Kar 88, which lay c 3m to the east would appear to be a foundation substructure contemporary with the two posts, this interpretation being based on a similar structure, Kar 71, in the North Row. The length of the wharf from front to back would therefore have been at least 3m.

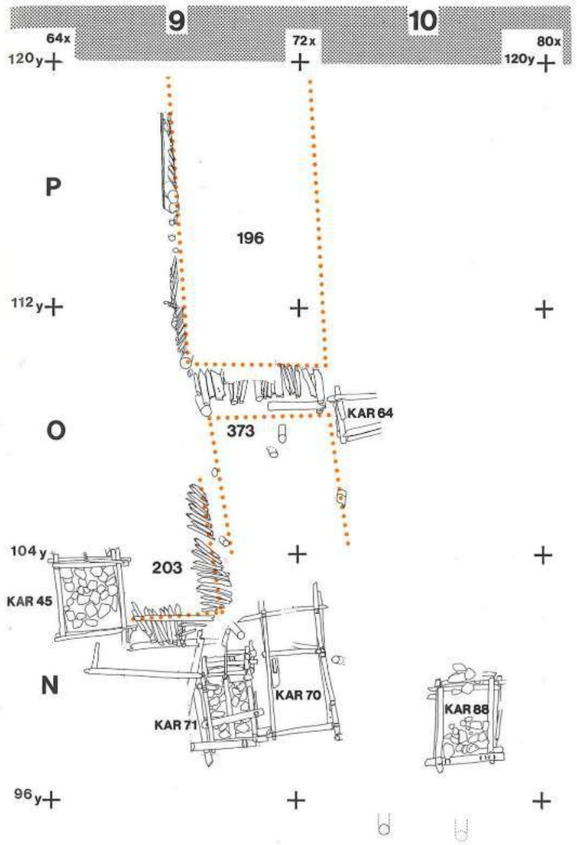
In Engelgården South traces of the fire layer and some burnt structural remains from this phase were recorded, which are therefore interpreted as having burnt in Fire VII. The date of these foundation substructures is discussed in more detail in connection with the North Row (see below).

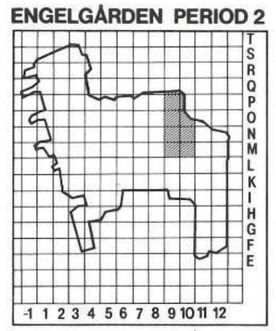
North Row

The conditions of the excavation at this level were the same as those for the level above, but the burnt remains of structures just at or slightly above the natural beach gravel made it easier to identify the phase. The remains of two relatively long and narrow buildings were recorded. Building 196 to the east ran adjacent to the tenement passage, while Building 203 to the north lay nearer Søstergården. They were both post-built, and the space between the ground and the raised floor was enclosed with vertical edge-to-edge planks, whose bottom ends were pointed.

There were no traces of structures to the north of Building 196, while to the south of Building 203 only trial trenching could take place. Partly in the trench and partly outside it some burnt posts were recorded, which are difficult to place in any context, but which would appear to belong to Period 2, indicating a building lying alongside Building 203. It has been numbered Building ~~273~~. 373 ae

Building 196 (O9,II–IV; O10,II–IV; P9,VII,VIII) comprised parts of the west and north walls beneath the floor level, and parts of the sill-beam of the west wall. Both the vertical planking, which had survived to a height of 1.60m in places, and the posts went to a depth of between 15cm and 20cm above natural.





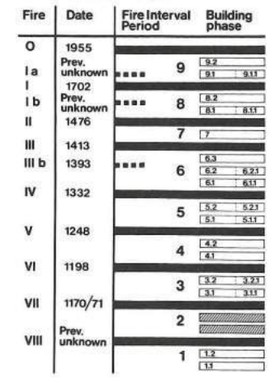


Fig. 56. Engelgården Period 2.

The building continued eastwards beyond the limits of the excavated trench at 118.30y. The western limit was along c 110y. Maximum recorded length c 8.3m; estimated width 4.7m.

Building 203 (N9,XIII–XV; O9,III,IV) comprised parts of the south and west walls enclosing the space beneath the floor level of an elevated structure. Like the vertical planking in Building 196, the wall posts were pointed at the base and had probably been pressed or driven into the pre-existing occupation deposits, partly penetrating natural. Inside the limits of the building at a point approximately halfway between natural and the maximum surviving height of the burnt wall planks, there lay a 5–6cm thick layer of juniper branches, which must obviously have been part of the structure. Eastern limit of the building unknown; western limit along 102.10–110.20y. North wall removed, but probably contiguous with the edge of the foundation caisson, Kar 45. Maximum recorded length c 4.1m, assumed length c 6m. Maximum recorded width 2.20m, maximum possible width 2.40m.

Building 373 (N9,XV; N10,IV; O9,IV; O10,III) was indicated by nine burnt posts between Building 203 and the tenement passage. Presumed eastern limit at c 108y, presumed western limit around 100.80y. Estimated length c 7m; estimated width 3.5–4m.

Fire-layer VII ran westwards *via* Building 203 across the top of the foundation substructure, Kar 70, which lay parallel to Kar 71 and would appear to have been contemporary with it. These two structures therefore extended the level for a further 4m to the west, to c 98y in the western part of grid-square N9. Unfortunately, it was not possible to follow it any further to the west. Before considering these features in more detail, we must first retrace our steps.

Building 203 ran just up to the stone-filled caisson, Kar 45, which continued in use in the following Period 3 as the basic foundation for the passage alongside the neighbouring tenement of Søstergården. It is therefore reasonable to assume that this structure performed a similar function in Period 2. It was the southernmost of a long row of caissons stretching northwards marking the edge of the underwater shelf. Circumstances to the south prevented us from following this important feature, but it is not unreasonable to believe that the row of caissons continued further south. Moreover, it is tempting to regard Building 203, the elevated structure with an enclosed sub-floor area, as contemporary with the initial period of use of caisson 45, but it is difficult to imagine this structure as the wharf-side building in Period 2, with or without a wharf in front of it. It is therefore natural to regard the stone-filled caisson 71 – and 88 in the South Row – as a natural extension of the tenement in Period 2, even though they lay on back-filled deposits 5–6m beyond the edge of the underwater shelf. One detail which supports the argument for associating them with Period 2 is their form and the stone filling, a feature which was restricted to this and the earlier stages.

On the strength of this we have interpreted the caissons 70, 71 and 88 as elements in a single development phase and not as a secondary stage within Period 2. To what extent there was a separate wharf in front of the caissons in the North Row is unknown, but in the South Row there were two massive posts in front of caisson 88 which were

on alignment with corresponding «wharf» posts in Bugården.

Tenement passage

There were no identifiable remains of a wooden paved surface in the tenement passage, but the foundation substructure, Kar 64, is assumed to have been erected in this phase – cf comments to Phase 3.1 on p 90.

Summary, Period 2

In contrast to Bugården, where this period was only indicated by posts at the front of the wharf, there was evidence in Engelgården for three buildings as well as the remains of stone-filled caissons, or foundation substructures. Of one of the buildings there were only foundation posts surviving, but the other two also had the remains of vertical plank walling at the sub-floor level. They all belonged to a category of elevated buildings with an enclosed area beneath. The position of Buildings 203 and 373 parallel with each other suggest that the Row was divided longitudinally.

The stone-filled caissons, which were encountered for the first time here, proved to be the southernmost examples of a long row placed along the break in slope of the original sea-bed. They formed the front foundation units in this period. Two posts on the same alignment as corresponding posts in Bugården indicated the contemporary waterfront.

Summary, Engelgården

As we have already pointed out, Engelgården followed more or less the same rhythm of expansion as Bugården. In that tenement, Period 2 was associated with a wharf whose front row of posts lay between 93.00 and 96.00y, roughly 8m beyond the edge of the underwater shelf, the sudden break in slope of the original sea-bed. In Engelgården South, corresponding posts from a wharf were also found at c 96y, but they were supplemented here with a stone-filled log caisson (Kar 88) c 3m behind. In Engelgården North the existence of a wharf erected on posts could not be proved, but there were two caissons, Kar 70 and Kar 71, in line with the caisson Kar 88 to the south, and it is therefore reasonable to assume that there was a homogeneous waterfront across the whole tenement.

In Period 3 the line of the wharf as well as the front of the substructures seemed to run at a slight angle compared with the contemporary structures in Bugården. The front of the wharf converged northwards on the beach by c 2.6m in Phase 3.1 and by as much as c 3m in Phase 3.2. Even though the foundation substructures both in Period 2 and in Phase 3.1 were individual log-built caissons, it is assumed that they were joined together by layers of overlapping timbers. In Phase 3.1 it could be seen how all the foundation structures of the tenement were integrated, and this pattern was followed in the subsequent development. But in Phase 5.2, the «tenement fellowship» was broken: after the foundation units were established and combined, the top seven courses of timbering in the South Row, were added separately, and in all the subsequent phases the two rows had separate foundations.

The buildings from Period 2 extended across the beach right out to the edge of the underwater shelf, but they were not built directly on the surface of the beach. They were erected on posts and in two of them the gap between the floor and the ground level was enclosed with vertical planking. In this phase, which burnt in Fire VII, a longitudinal division of the North Row was definitely encountered, a feature which was found again in the South Row in Phase 3.2 and in both rows in Period 4. In fact, in Period 4 there were four buildings standing side by side in some places towards the rear of the tenement. At 101.00y the total width of the tenement excluding the eaves-drip gap was 17m, of which the North Row took up 7.5m, the South Row 7.6m and the tenement passage c 1.9m.

Access to the buildings which lay side by side was achieved in one case by laying out a transverse passage leading from the central passage. In the North Row access would also have been possible from the north side *via* a passage in the neighbouring tenement of Søstergården. There were no definite remains of a passage in Engelgården in the earliest phase, but judging from the situation in the tenements to the north it is reasonable to assume that the foundation substructure, Kar 64, dates back to the first phase of development across the beach, our Period 2. This caisson continued to be used as a foundation for the passage in Period 3, when a surface of relatively massive, longitudinal boards was added to it. In Phase 3.2 posts were also used to support the front section of the passage. From Phase 5.1 onwards, ie after Fire V, the passage was paved with transverse boards and had a drain. The Phase 6.1 passage was particularly well preserved with some unusual structural details (cf fig 43). The drain clearly had a separate cover of longitudinal boards separated from the transverse planking along either side by projecting stakes whose primary function was to hold back the boards lining the sides of the drain.

Period 2

The waterfront was marked by two massive posts at c 96y in the South Row. Belonging to the period was a relatively small, stone-filled log structure, or caisson, Kar 88, in the South Row, and in line with this in the North Row were two similar log structures, Kar 70 and Kar 71, the latter also being filled with stones. The distance between the caissons and the posts indicated a wharf measuring c 3m from front to back. The depth of water in front was recorded as 2.8m, which gives a corrected sea-depth of c 2.1–2.2m. The estimated minimum width of the tenement was c 13m, its actual width being most likely 3m or 4m wider. The period ended with Fire VII.

Period 3

Phase 3.1

This level was investigated by means of trial trenching as building work was about to commence. Buildings 243 in the South Row and 372 in the North Row belonged to this phase, the former being an elevated structure with an enclosed area beneath the floor. There was room for a further building, or possibly two, in each row between these buildings and the wharf, which in this phase ran at an angle with its front running from c 82.5y on the south side to c 84y on the north side. This would have given a wharf measuring c 2.8–2.9m. from front to back. The depth of water in front of the wharf is unknown. The basic foundations beneath the front part of the tenement consisted of six small timber substructures joined at the top by courses of timbering laid in alternate directions.

Phase 3.2

This next phase was only represented by two buildings in each row, but in the South Row Building 242 had a large privy built alongside. The row can therefore be regarded as being divided longitudinally, an arrangement which became very common in Period 4. In the South Row the waterfront was extended seawards by c 1m with horizontal timber foundations stabilized by massive front posts along c 81.5–82y. The depth of water in front of the wharf is unknown.

In the North Row, six new foundation substructures were erected in three rows of two, the front pair probably forming the front of the wharf along 82–83y, indicating a minimum width from front to back of c 3.3m. The base of the substructures was recorded at -0.80m. Towards the front, the width of the tenement was c 17m. The remains of a passage were also recorded with boards laid longitudinally over small rectangular timber substructures. In the North Row, Well 32 may have been built at this time. The phase ended with Fire VI.

Period 4

This period covered the time between Fires VI and V (1198–1248) and really consisted of several phases, since a couple of the buildings could already have been demolished before Fire V, and a large privy, Building 241, was definitely replaced in the course of the period by a new one, Building 233. The period is otherwise characterized by a longitudinal division of both rows of the tenement.

Twelve buildings were recorded in all. In the North Row, Buildings 369 and 195 stood side by side at the rear of the tenement, with 370 and 197 a little further forward. In the South Row, Buildings 202 and 192 stood beside each other, the former lying adjacent to the tenement passage and possibly forming a side-annexe to 192. A little further west, Building 242 from Phase 3.2 with a corner fireplace was replaced in this period by Building 232, also with a corner fireplace, as well as a well-preserved wooden floor and possible evidence for traditional earth-filled box-benches against three walls. The Period 3 privy, Building 240, was replaced by a new one in Period 4, Building 241, which was subsequently replaced by a third one, Building 233, before the end of the period. Building 232 was demolished some time before the fire, but was not replaced. Lime-slaking activities were also carried out in the tenement during this period.

Access to the buildings standing side by side in the North Row was either from the passage or, in the case of the northermost building, probably from the passage in the neighbouring tenement of Søstergården. In the South Row a transverse passage led from the central passage past the east end of Buildings 241/232.

The width of the tenement here was 16.6m, becoming narrower at the point where there was only one building in each row: 15.2m at 88.00y and 14.1m at 80.00y.

Well 31 in the North Row was probably constructed in this period.

At the seaward end, the period began with the deposition of material in order to raise the sea-bed, after which separate foundation substructures were erected. These were joined together at the top with layers of timbering, but the upper courses were later removed in Phase 5.1. The substructures ended at c 70.3y, presumably with a wharf in front erected on posts. The actual length of the wharf measured from front to back is uncertain. The depth of water in front of the wharf was recorded as c.2.6m, which gives a corrected depth of c 2.1–2.2m.

The period ended with Fire V.

Period 5

This period covers the time between Fires V and IV (1248 and 1332) and consisted of two separate phases.

Phase 5.1

In the South Row only one building was recorded, which had a fireplace, while in the North Row, the remains of three buildings were found, including a very large one, Building 189, parts of which were remarkably well preserved. At this level the plan of the tenement was fan-shaped with the broadest part at the rear, but otherwise it had a standard layout with two rows of buildings.

In the western part a continuous timber foundation, Kar 108, stretching right across the tenement, was built on to the separate substructures of Period 4. It continued westwards beyond the limit of the excavated area, but from the adjacent long section in Bugården North it could be seen that it ended around 65–65.5y, apparently with a c 3m long wharf on posts in front. The depth of water in front could be recorded as c 3.2m, which would give a corrected reading of c 2.4m.

At 96.00y the total width of the tenement was c 17.3m, excluding the eaves-drip gaps; at 88.00y it was reduced to 14–14.4m; while at 72.00y it was 13.4m, but if half of the eaves-drip gap on each side is added, the width of the tenement here becomes 15.7–16m.

This phase was unburnt.

Phase 5.2

Phase 5.2, which followed, comprised the remains of eight buildings, five in the North Row and three in the South. The rear 25m of the South Row were not accessible for excavation. The tenement had a marked fan-shaped plan, clearly recognizable in both the North Row and the tenement passage, which was relatively well-preserved in the central area. The width of the tenement excluding the eaves-drip gaps was 14.7m at 80.00y, c 14.6m wide at 88.00y, and c 16m at 98.00y, becoming even wider further east.

To the west the structures continued into the unexcavated area, but to judge from the adjacent long section in Bugården the South Row ended with a line of posts along c 48.8–49y as in Bugården. It is not clear, however, whether the posts stood close up to the log foundation construction or whether the foundations ended at c 52–54y. The length of the wharf from front to back is therefore uncertain. The height of the wharf was over 4m, which when corrected gives an estimated depth of 3–3.5m.

This phase was destroyed in Fire IV.

Period 6

This period consisted of the building phases between

Fires IV and III (1332 and 1413). Once Fire IIIb had been identified with the burnt remains of buildings covering the whole of the South Row and large areas of the North Row, the conclusion which had been tentatively arrived at for Bugården was confirmed – that this fire had in fact been fairly extensive in this part of Bryggen. Its relationship to Fires III and IV as defined in our chronological system could be clearly seen from both the transverse and the long sections at a number of places in the tenement.

From this level upwards, the excavation was limited to the 9–10 grid-squares in rows I, K, L and M, and the western part of N9–10, as the upper levels in the area to the east were removed by machine.

Phase 6.1

This phase included the timber foundations and the remains of three buildings in the South Row (284, 345 and 346) and five buildings in the North Row (172, 194, 362, 363 and 364). Apart from Building 172, whose floor was practically intact, the structures in the North Row consisted solely of timber foundations, and in some places it proved difficult to distinguish these from the following building level. How far west the tenement went in this phase is unknown. Its width at 88.00y was c 16.4m, at 80.00y c 14.7m, and at 72.00y c 14.1m.

This phase was unburnt.

Phase 6.2

Two buildings were identified in the South Row in this phase, Buildings 343 and 344, with a privy between them, Privy 9. Only timber foundations were found in the North Row, but these seemed to indicate the existence of four buildings, 173, 366, 360 and 361. The western extent is again unknown. The width of the tenement at 80.00y was recorded as 15.6m, which is fairly representative for this level within the area investigated.

The phase was terminated by Fire IIIb (1393).

Phase 6.3

In this phase there were continuous and relatively well-preserved foundations, but the identification of individual buildings was not possible, apart from an isolated example in the eastern part of the North Row, which was numbered Building 365. Otherwise, a single building number was used for each row, 342 in the South Row and 359 in the North Row. The western limit is unknown. The tenement was 14.3m wide at 72.00y, and 15.1m wide at c 88y.

The phase ended with Fire III.

Period 7

From this period onwards the systematic investigation of the original site was confined to grid-squares I, K and L 9–10, but a stone structure, Building 374, which was revealed in 1971 during the removal by machine of the upper layers at the extreme eastern end of the North Row, was also recorded. A similar stone structure, Building 107, was recorded a little further west in the same row, which had formed an above-ground cellar beneath the tenement's communal building. It continued in use throughout the following periods and was not finally demolished until 1972. Although one would only have expected Fires II and I to have left their traces in the interior of this stone building, four distinct burnt floor levels were recorded. The cellar was apparently divided into two rooms, reflecting the situation which Koren-Wiberg described as the «two store-rooms of the merchant offices» *(handelstuernes to grydeboder)* (Koren-Wiberg 1921). At the earliest two levels, each room had its own door giving direct access from the tenement passage. In the third phase, these two openings were combined into one large doorway, which was then made narrower in the final phase (destroyed in Fire I).

The other buildings from Period 7 in the North Row, Buildings 357 and 358, were badly burnt at their gable ends. In the South Row the badly burnt remains of two buildings were recorded in the original site, Buildings 340 and 341. The width of the tenement at 72.00y was c 14m.

The period terminated with Fire II in 1476.

Period 8

This period contained a single building phase, of which the very poor remains of two buildings could be identified in the South Row, Buildings 338 and 339, and three in the North Row, Buildings 354, 355 and 356, in addition to the stone cellar, Building 107. The width of the tenement at 76.00y was c 15m.

The period ended with Fire I.

Period 9

Within the excavated area of the South Row two separate building phases were identified between the fires in 1702 and 1955, Buildings 337 and 350, with the latter being replaced in the second part of the period. In the North Row there were three buildings, 352, 353 and 351, covering the whole period, which terminated with the fire in 1955.

With each row being divided longitudinally in several of the phases prior to Fire V, Engelgården provides an example of a layout and density of development quite different from the more regularly planned Bugården. This subdividing of the rows, however, was always within the external boundaries of the double tenement. Moreover, at the seaward end there were never more than single buildings in each row. The development was otherwise remarkably similar to that in Bugården with the extension of the tenement out into the waters of the harbour basin taking place at the same pace and to the same extent. The only deviation was in Phases 3.1 and 3.2, where the subsidence of the wharf and subsequent heightening which was noted in Bugården is lacking here.

The expansion of the tenement out from the edge of the underwater shelf is shown in the following table:

Table 5.

Period/ Phase	Bugården North		Bugården South	
	Expansion	Total	Expansion	Total
Period 2	?	?	c 96y	c 8m
Phase 3.1	c 84y	20m	c 83y	c 21m
Phase 3.2	c 83y	21m	c 82y	c 22m
Period 4	c 69y	35m	c 69y	c 35 m
Phase 5.1	?	?	c 62y	c 42m
Phase 5.2	?	?	c 49.00y	c 55m

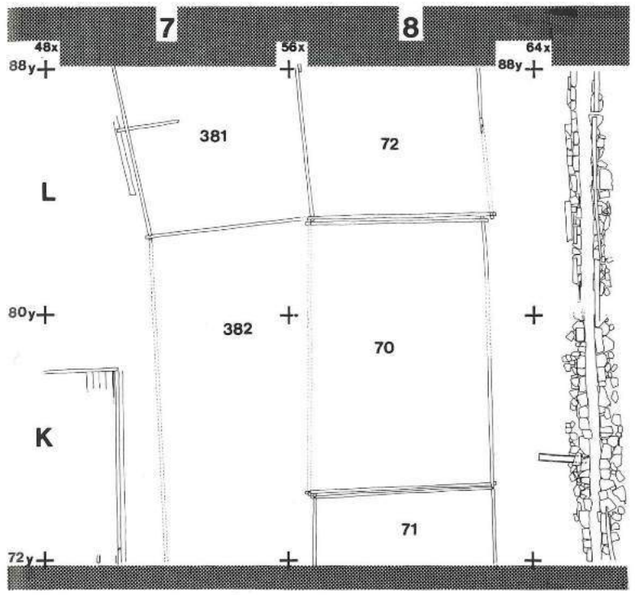


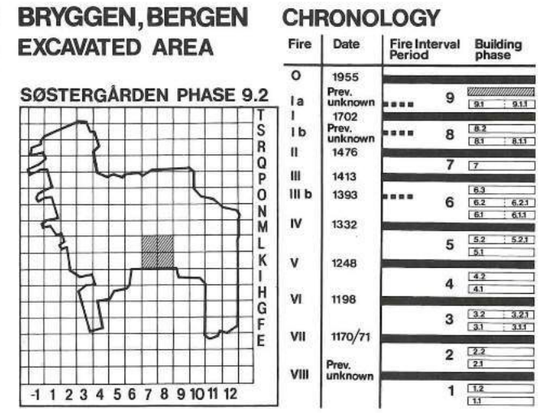
Fig. 57. Søstergården Phase 9.2.

Søstergården

Both the layout of Søstergården and the cnanges it underwent in the course of time were different from those recorded in Bugården and Engelgården. In the High Middle Ages it is possible that it only consisted of one row of buildings, corresponding to the southern row of the later tenement. Although it had two rows in more recent times, it is usually found referred to as a single row with a side-annexe (Norw *enkeltgård med taske*), no doubt because the buildings down the northern half of the tenement had roofs with a single slope. A lean-to or pentice roof is the characteristic external feature of a side-annexe in Bryggen. Perhaps it was a consequence of this construction that the side wall between the main row and the annexe was shared by both buildings. In recent times, however, Søstergården gave the appearance of being an ordinary double row, since the front buildings in both rows had standard ridge roofs, but there was nevertheless a marked difference since the south row was much wider than the north row. A closer investigation would have shown that apart from a few roof-bearing elements, the north row lacked a separate wall along its entire south side. In other words, it was only its outward appearance which had been adapted: the north row was otherwise a traditional side-annexe.

Up to the fire in 1955 the tenement passage ran along the south side of the main row, separating it from Engelgården, but as we shall see, its position had changed in the course of time.

The excavation of this tenement was also carried out in several stages. The primary excavation in grid-squares K and L 7–8 took place in 1956–61 under the direction of the writer. In 1971 the upper levels in the part of the tenement to the rear were removed by machine and the excavation continued under the leadership of Edward Harris.



Period 9

Phase 9.2, burnt in 1955 (fig 57)

South Row

In grid-squares K8 and L8 in the original part of the excavation, the floor of one entire log-building (Building 70) and parts of two others (71 and 72) had survived. At Building 72, ie c 83y, there was a change in the alignment of the row, the eastern part turning to the north-east.

Building 72 (L8,I) consisted of part of a structure with two layers of flooring laid longitudinally. The east wall was just on the edge of the excavation. Length along the north wall 4.80m; width 6.90m.

Building 70 (L8,I; K8,I) comprised a building with a transverse floor laid over a longitudinal one. The south wall was in alignment with the south wall of Building 72, but the north wall lay further out. The adjacent end-walls were almost touching. Eastern limit at c 83y; western limit at c 74.2y. Length along the north wall 8.88m, and along the south wall 8.72m. Width 5.80m.

Building 71 (K8,I) consisted of the eastern part of a building with a transverse floor. Maximum recorded length 2.30m; width 5.90m.

Tenement passage

As already mentioned, the tenement passage ran along the south side of the South Row. It was paved with solid planks laid longitudinally on three courses of beams, which were laid in alternate directions. Beneath the southern part of the passage there was a well-built drain with a wooden base and side walls of broken stone slabs. The width of the passage was 3.9–4m.

North Row

The North Row, or Side-annexe, shared the dividing wall with the main row of buildings (see above). On the original part of the site there were the remains of two structures, Buildings 381 and 382, the former continuing beyond the eastern edge of the excavated area and the latter

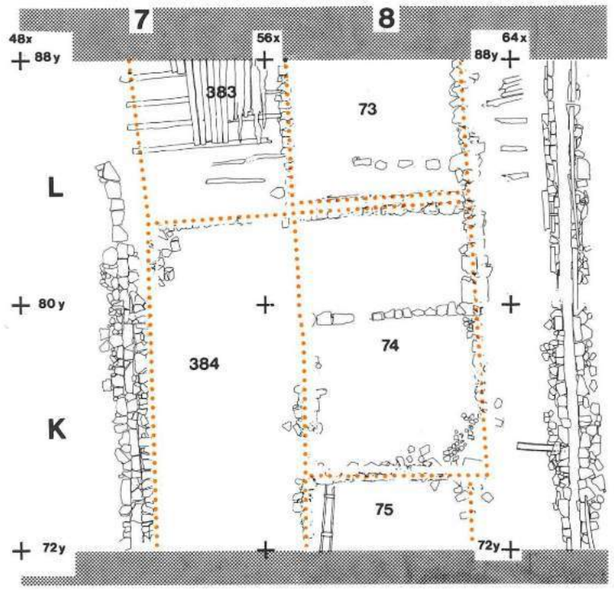


Fig. 58. Søstergården Phase 9.1.

going on beyond the western edge. The row lay within the southern part of grid-squares K7 and L7 and the adjacent areas of K8 and L8.

Building 381 (K7,I; K8,I; L7,I,II; L8,I) had been a partly log-built structure and the remains consisted of longitudinal floorboards laid over transverse floorboards, logs from the north and west walls, and open studwork adjacent to the main row on the south side. It stood on good foundations, consisting of three layers of timbers and a ground-wall beneath the north wall with several courses of roughly hewn stone. There was a more simple ground-wall of smaller stones under the west end. Maximum recorded length 5–5.4m (total length c 6.5m); width ranging from 5.3m at the west end to 5.8m at the east end.

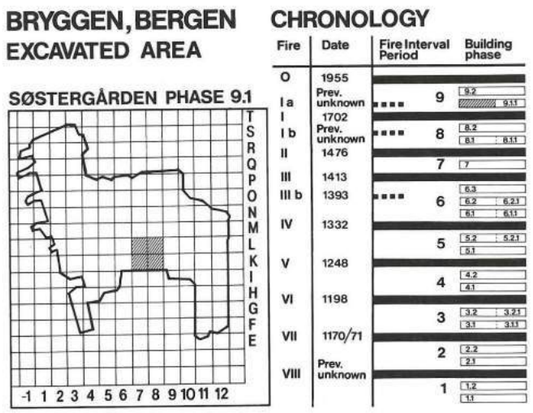
Building 382 (K7,I; K8,I; L7,I; L8,I) consisted of parts of a transverse floor laid over a longitudinal floor, a log-built north wall and open studwork against the South Row. It had relatively well-preserved foundations consisting of three courses of timbers. Eastern limit at 82.5–83y; western limit at c 66y in the unexcavated area. Maximum recorded length 9m, total length c 16.5m; width 5–5.9m.

Total width of the tenement buildings in the middle of the K7 grid-square was c 10.7m, while the total width of the tenement including the passage and half the eaves-drip gap was c 15.5m.

Phase 9.1, unburnt phase above Fire I (fig 58)

South Row

Under the relatively well-preserved timber foundations belonging to the level which burnt in the 1955 fire lay the clearly identifiable ground-walls in grid-squares K8 and



L8 from buildings with the same dimensions as those from the level above but situated c 50cm to the south. Again, there was evidence for a complete building, Building 74, in the centre, with parts of the adjacent buildings, 73 and 75, to the east and west.

Building 73 (L8,II) comprised the ground-walls beneath the south, west and north walls with up to two courses of stones. The building continued beyond the eastern limit of the excavation. The maximum length recorded along the north wall was 5.00m and the width along the west wall was c 6m.

Building 74 (K8,II; L8,II) consisted of continuous ground-walls beneath the east, south and west walls with a single layer of stones, and discontinuous remains beneath the north wall. There was also a single row of stones running across the building a little to the east of the centre, which may indicate that the building had been divided into two rooms of unequal size. The eastern boundary ran at a slight angle at 74.4–74.5y. Length 8.50m; width as recorded at the east wall 5.90m. The building was displaced half a metre to the south with respect to Building 70, which replaced it in the following phase.

Building 75 (K8,II) comprised the ground-walls beneath the east wall and the adjacent part of the north wall with a mixture of large and small stones. Just inside the line of the north wall a wood-lined drain ran out from the eastern end-wall, which lay close up against the western end-wall of the neighbouring Building 74. The building continued westwards beyond the edge of the excavation. Maximum recorded length along the north wall was 2.3m; estimated width 5.6–5.8m.

Tenement passage

The tenement passage consisted of the remains of transverse joists and the original section of a stone-built drain, which had been added to in the following phase (cf fig 57, plan of Phase 9.2).

North Row

The ground-wall beneath the northern side-wall of Building 381 in Phase 9.2 consisted of 6–7 courses of stones of irregular thickness to a total surviving height of 70cm. It

would appear that this was all built at the same time, and that parts of the joists and floorboards from a pre-existing building, Building 383, had been cut through when it was built. The north end of the joists were not connected with anything, whereas on the south side they rested on the ground-wall belonging to the South Row. While the position of the north wall of this earlier building cannot therefore be determined with certainty, a contemporary ground-wall further west ran c 50cm inside the line of the north wall of the later Building 382. This might suggest that Building 383 was also narrower than Building 381, which replaced it. After Fire I, therefore, there were two separate building phases also in the North Row, with Buildings 383 and 384 belonging to the earlier phase, 9.1.

Building 383 (K7,II; L7,II,III; L8,II) consisted of the rather poorly preserved remains of a longitudinal floor resting on a single layer of foundation timbers, and a ground-wall along the south side, which the building shared with Building 73 in the South Row. The north ground-wall had probably been removed during the laying of the foundations and drain of Building 381 in the following phase. Eastern limit beyond the edge of the excavation; western limit around 83y. Maximum recorded length c 5m; width recorded as c 5.2m.

Building 384 (K7,II; L7,II,III; L8,II) consisted of the remains of a more or less continuous row of single stones in two or three courses forming the ground-wall beneath the east wall. Eastern limit along 82.6–83y; western limit outside the excavated area. The position of the south wall was uncertain. Maximum recorded length 2.6–3m; width c 5m.

As Building 383 in the North Row and Building 73 in the South Row shared a common ground-wall along one side, it is reasonable to assume that also at this level the North Row took the form of a side-annexe built up against the main row of buildings to the south.

In the eaves-drip gap on the north side of the buildings a relatively well-built stone drain with flat stones in the bottom was uncovered in grid-square K7 and the western part of L7. In K7 the drain had been laid out right on top of the remains of the north wall of the demolished stone building 386. In the adjacent part of grid-square L7 it ran just above the detritus from a fire, most likely from Fire I.

Summary, Period 9

Between Periods 5 and 9 the investigation of the Søstergården tenement was limited to the area covered by the original excavations, in other words grid-squares K7–8 and L7–8. It is therefore not feasible to demonstrate the pattern of development from this restricted area, but as we shall subsequently see in the earlier levels, it is reasonable to assume that the back part of the tenement had the same fan-shaped layout as Engelgården, perhaps even more marked in the North Row. We shall also see that this row structurally, and probably also functionally, falls into a special category with regard to the neighbouring tenement of Gullskoen to the north, being separated from the latter throughout the whole of the Middle Ages by a thoroughfare subsequently known as The Old Church Road (Norw *Den gamle kirkevei*). This may have contributed to some extent to the orientation of the buildings down the north side, as well as to the tenement's unusual layout.

Period 9 consisted of two phases, 9.1 and 9.2, in each of which were recorded the remains of three buildings in the South Row and two in the North Row, with more or less identical boundaries in the two phases. The two rows also shared a common dividing wall in each phase. The buildings were relatively wide, their width ranging in Phase 9.2 from 5.80m to 6.90m in the South Row and from 5m to 5.9m in the North Row, and in Phase 9.1 from 5.6m to 6m in the South Row and from 5m to 5.2m in the North.

Around 83y there was a break in the alignment of the tenement towards the north-east.

The tenement passage ran along the south side of the South Row and filled up the entire space between Søstergården and Engelgården, but the drain, which was built up with large stone blocks like the contemporary drains in the tenements to the south, ran close against the north wall of Engelgården. It is reasonable to assume that the boundary between the two tenements therefore followed the midline of this drain instead of the middle of the «eaves-drip» as was more usual. In this case it would have meant the central line of the passage. The passage was 3.9–4m wide.

Period 8

Phase 8.2, burnt in Fire I (1702) (fig 59)

South Row

The ground-walls of the buildings belonging to Phase 9.1 were lying in a layer of fire detritus, which contained debris from a glazier's workshop. The greatest concentration of broken glass lay beneath Building 74. The level was relatively easy to understand with the remains of one entire building, Building 77, in the middle of the site and parts of buildings on either side, Building 76 to the east and Building 78 to the west.

Building 76 (L8,III) comprised the ground-walls beneath the west wall and western part of the north wall. They consisted of a single row of stones, which were approximately half a metre across. The building continued to the east beyond the edge of the site. Maximum recorded length 2.80m; estimated width c 6m.

Building 77 (K8,III; L8,III) comprised the ground-walls of the north wall and adjacent part of the east wall, consisting of a single row of stones measuring half a metre across, together with the scattered remains of burnt foundation beams. The boundary between this building and Building 78 to the west was not clear, and the separation into two distinct buildings is conjectural. Eastern limit at 84.5y; western limit at 78.3y. Assumed length 6.2m; width presumably 6m like Building 76 to the east, but this building was displaced c 50cm to the south.

Building 78 (K8,III) comprised the ground-wall beneath the north wall, parts of foundation timbers in two layers and a scattering of stones suggesting the line of the south wall. There were the remains of vertical elements which no doubt indicate some special but unknown function. Eastern limit at 77.4y; western limit outside the excavated area. Maximum recorded length c 5m; estimated width c 6m.

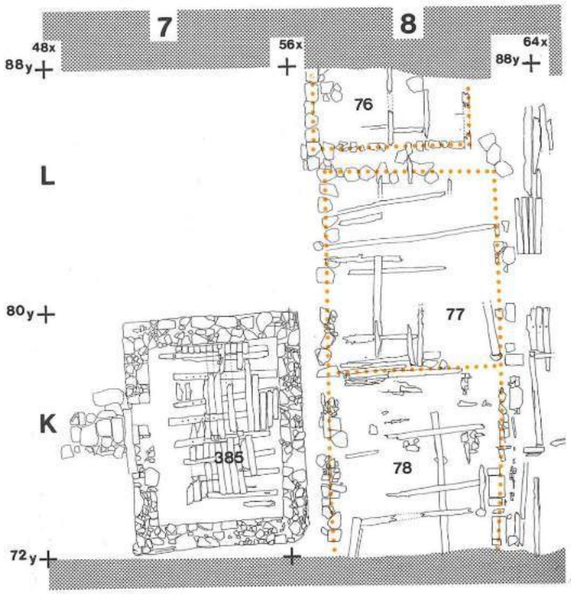
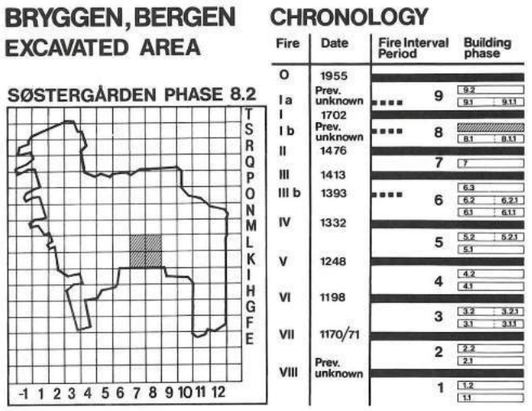


Fig. 59. Søstergården Phase 8.2.



Tenement passage

The passage on the south side of the South Row consisted of the partially surviving remains of longitudinal boards, the southernmost of which had been removed during the construction of a stone drain after the fire.

North Row

Beneath Building 383 from Phase 9.1, the situation was exceptionally complicated as far down as the level which had burnt in Fire IV. One, possibly two, construction phases must have been removed at some time and the sequence of fire layers was interrupted, creating a major problem in the identification of the various layers.

In the L7 grid-square, the deposits beneath Building 383 consisted of dark sandy earth and peat containing twigs and some charcoal, all apparently mixed together. There did not appear to be any remains of buildings surviving from Fire I in L7.

In K7 on the other hand, a badly burnt floor surrounded by a c 80cm thick rubble-core wall bonded with mortar was recorded 20–30cm below the level of Building 384 (fig 60). The floor, which has been designated Building 385, was quite detached from the masonry and had most likely burnt in Fire I. The walls belonged to the final period of use of a stone building, Building 386, which must have been erected in Phase 6.3, in the late fourteenth century, and which probably underwent alterations after Fire II in 1476.

The completely burnt-out floor of Building 385 would suggest that the walls of Building 386 had either been pulled down after 1476 and used as the foundations for a log building, or that the stone vault of Building 386 had been replaced by an uninsulated wooden roof. Lacking a stone vault or some other kind of protection, the stone building could hardly have fulfilled its original function as a fire-proof strong-room, a cold store or a wine cellar, and it is therefore reasonable to assume that it no longer existed as a standing building and that Building 385, which had replaced it, was an entirely wooden structure.

Alternatively, of course, the stone walls may have continued to stand with a certain – indeed significant – raising of the entrance threshold. Considering all the remarkable structural features which have been encountered in the local building tradition, this alternative cannot be dismissed, even though the partly demolished walls would have provided a most unsuitable foundation for sill-beams. However, this would seem to be the more likely explanation on the basis of the archaeological data. On the other hand, the analysis to date of the development and layout of this tenement provides no indication of the existence of a stone building in the seventeenth century. The interpretation must therefore remain hypothetical. The stone building is described under Phase 6.3, pp 101–02.

Building 385 (K7,III,IV) consisted of the burnt-out remains of a detached floor laid longitudinally and surrounded by the walls of an earlier stone building re-used as wall-foundations. Alternatively, the walls may have belonged to a building which must be regarded as the final period of use of the earlier stone building. Eastern limit at 79.90y; western limit at 72.40y. Length externally 7.50m, internally 5.80m. External width uncertain, possibly 5m. Internal width 4.25m at the east end, 4.00m at the west end.

The Old Church Road

The passage on the north side of Søstergården has been known in more recent times either as *Mariakirkens almenning* (ie the thoroughfare leading to St Mary's) or as *Den gamle kirkeveien* («The Old Church Road»). The latter name will be used here, as it has been shown that the former designation was based on a misinterpretation of the location of the «St Mary's thoroughfare» (cf further comments under Gullskoen in vol 3, part 2).

After Fire II, the traditional log surface of The Old Church Road was covered by a new surface of sand and gravel. In front of the entrance to Building 385 a step was built up with medium-sized flagstones. Between the two rows there was an open gap of c 50cm.

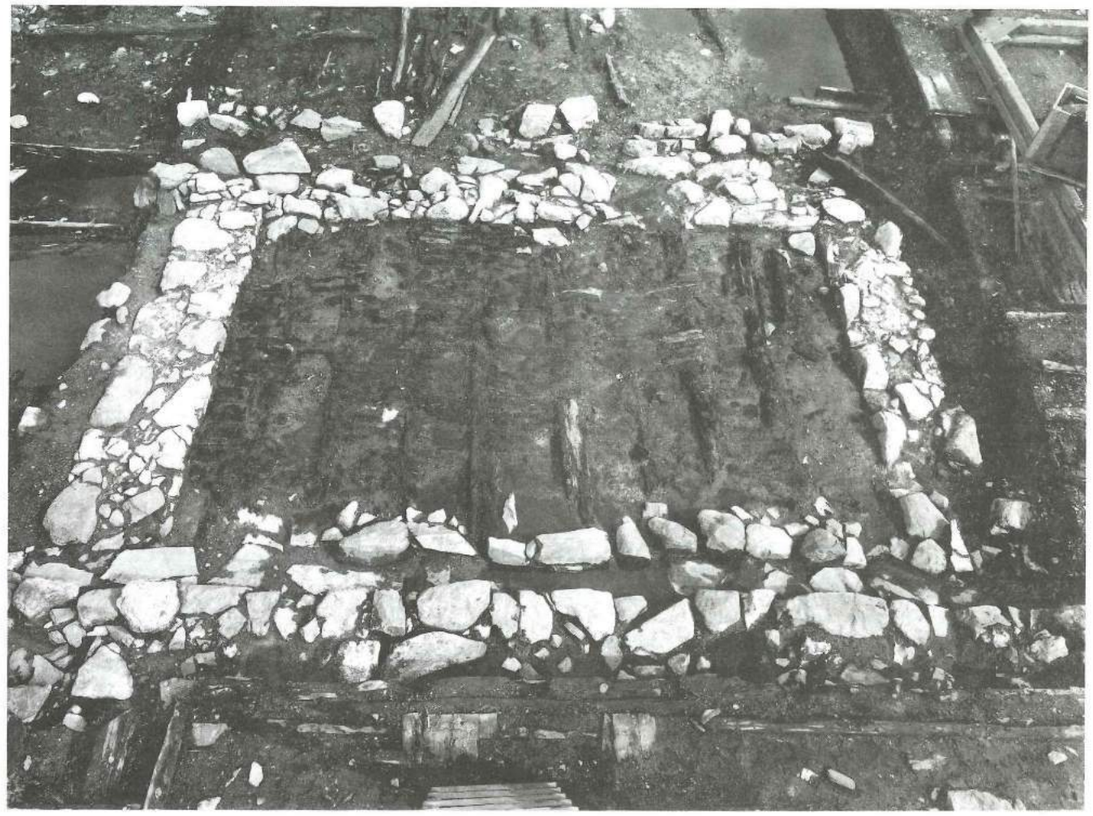


Fig. 60. Burnt floor of Building 385 in Søstergården North enclosed within the walls of Building 386. Looking south. The relationship between the two buildings is unclear.

Phase 8.1, unburnt level beneath Fire I (fig 61)

South Row

Beneath Buildings 77 and 78 in the western part of the area excavated initially there were indications of a ground-wall consisting of irregular stones belonging to a building, Building 79, from an unburnt phase preceding the phase which had burnt in Fire I. It is therefore feasible that Building 76 to the east also had a predecessor in this first phase, but there was no evidence for either an earlier structure or a separate passage surface in the L8 grid-square.

Building 79 (K8,IV) consisted of the major section of the ground-wall beneath the north wall and scattered stones beneath the south wall. In the south-eastern part a continuous layer of clay covering c 7 sq m abutted a clay-lined rectangle of stones forming a hearth (No.4). Eastern limit of the building uncertain; western limit beyond the boundary of the excavations. Maximum recorded length c 8m; width c 5.4m.

Summary, Period 8

Apart from the remains of one earlier building in the western part of the South Row, which has been placed in Phase 8.1, there was only one phase of development in Period 8.

On the site of the North Row a thick layer of disturbed deposits was encountered in the eastern part. This layer contained no remains of any structures, which could be related to this period. Further west the remains of a building were recorded, Building 385, which, however, proved difficult to interpret. A badly burnt wooden floor was surrounded by the irregularly surviving remains of an earlier stone building. The uneven height of the walls, plus the lack of any tangible remains which might offer some connection with the flooring, such as traces of sill-beams, make it difficult to accept that the demolished walls had been re-used as ground-walls for a wooden building. The floor and ruined walls should perhaps be regarded as parts of a single structure, in which case the stone building, which had been erected in Phase 6.3 and burnt in Fire II at the latest, could not have been vaulted at this stage. If it had been, the floor would not have burnt so thoroughly. Assuming that the floor and the walls were associated with one another, the level of the floor and the threshold would have been raised to such an extent after Fire II that it would also have necessitated a heightening of the roof, and any original fire-proof vaulting could have been replaced at that time by a wooden roof. Nevertheless, with some

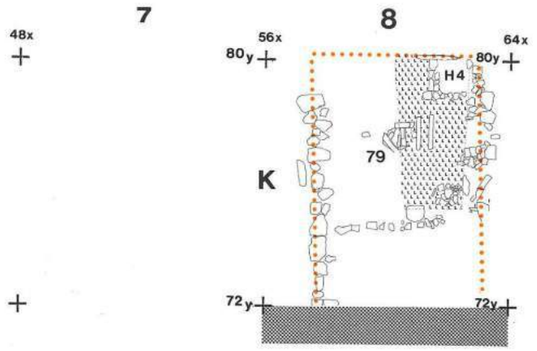


Fig. 61. Phase 8.1 in Søstergården, an unburnt level overlying Fire II with the remains of Building 79.

reservation, we have chosen to regard the burnt floor as belonging to a wooden building with the ruined walls of the stone building forming its ground-wall.

In the South Row the remains of three buildings were recorded, Buildings 76, 77 and 78, whose boundaries were completely different from the buildings which replaced them in Period 9. Their widths lay around 6m. Building 385 in the North Row is estimated to be c 5m wide externally.

Of the tenement passage there were only interrupted sections along its northern side.

The adjacent parts of the thoroughfare known as The Old Church Road to the north were surfaced with sand and gravel in this period. This is dealt with more fully under Gullskoen (see vol 3, part 2).

Period 7, burnt in Fire II (1476) (fig 62)

South Row

The debris from Fire II, which was thin and had been removed in places, was recorded 25–30cm below Fire I. Of structural remains, mostly fragments of foundation timbers and sill-beams and parts of the tenement passage had survived. Two buildings could be identified, Buildings 80 and 81, and possibly also a third.

Building 81 (L8,V–VII) consisted of 3–4 courses of foundation timbers and a longitudinally-laid floor, which it was just possible to identify. The building continued into the unexcavated area to the east. Its western boundary was also unclear, but at the time of excavation it was thought to be at c 78y. Maximum recorded length c 10m; width at 80.00y c 5.3m.

Building 80 (K8,VI,VII) consisted of 3–4 courses of foundation timbers and the remains of badly burnt floorboards to the west. The sill-beam for the north wall had started to slip out of place and was supported by stakes. The eastern limit was assumed to be at c 77y, but the western limit lay outside the excavated area. Maximum recorded length 5m; width c 5.2m.

Tenement passage

The passage along the south side of the South Row had been paved with transverse logs laid side by side, and the surface was well preserved in the L8 grid-square but fragmentary in K8. The width of the passage at 80.00y was c 3m.

Just below the level which had burnt in Fire II lay the remains of an unburnt surface to the passage. As no separate structural remains corresponding to this level were recognized in either of the two rows, it is assumed that this surface represents an initial stage in Period 7 contemporary with the construction of the buildings which were destroyed in Fire II. The log surface which had burnt with the buildings at the end of the period represents a secondary stage.

North Row and The Old Church Road

Two buildings belonging to this period were recorded in the North Row, Building 387 and the stone building 386. As mentioned previously, the disturbed deposits beneath Building 383 were up to 80cm thick and contained fragments of charcoal. They clearly belong to the level which burned in Fire I. Below these deposits were the badly decayed remains of a building, Building 387, which showed no signs of burning, but judging from the circumstances in the South Row and from the evidence in the transverse section along 88.00y and the adjacent passage, it must be associated with Fire II.

North of the row lay the decayed remains of the log pavement in The Old Church Road, which according to the site note-book was partially covered by a «thin fire-layer, which had no contact with any layer in Søstergården North», but which nevertheless must be connected with Fire II, judging from the adjacent circumstances in Gullskoen to the north. Both the log surface and Building 387 must be placed in Period 7. The stone building 386 is commented on in Phase 6.3.

Building 387 (L7,IV,V) consisted of the badly preserved remains of a longitudinal floor lying underneath a few transverse beams to the east. There were five courses of foundation timbers. Eastern limit outside the excavated area; western limit close up against the stone building 386. Maximum recorded length 8m; width 5.5m.

Summary, Period 7

In this period there was again only one phase of development in Søstergården, and it followed the same layout as that recorded in the following Period 8 with its two clearly separate rows of buildings, the southern row with its own passage along the south side and the northern row lying adjacent to The Old Church Road. No physical communication between the two rows was observed or documented.

In both rows parts of two buildings were recorded, 5.2–5.3m wide in the South Row and c 5–5.5m in the North. There was a stone building in the North Row, which had been erected in Phase 6.3 and had been badly damaged in Fire III at the end of that phase, after which it had been subject to partial rehabilitation including the addition of soapstone doorjambs. In the centre of the building there was a place for collecting water, from which a covered wooden overflow channel ran out beneath the flagstones at the entrance and under the adjacent wooden pavement of The Old Church Road to the drain in the road.

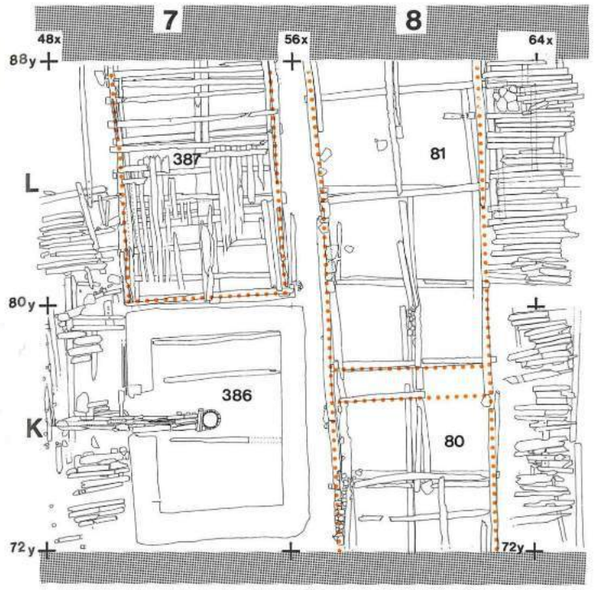


Fig. 62. Søstergården Period 7.

The surface of the road adjacent to Søstergården was poorly preserved.

The tenement passage on the south side had retained a relatively well-preserved surface of transverse logs, and at 80.00y it was c 3m wide.

Period 6

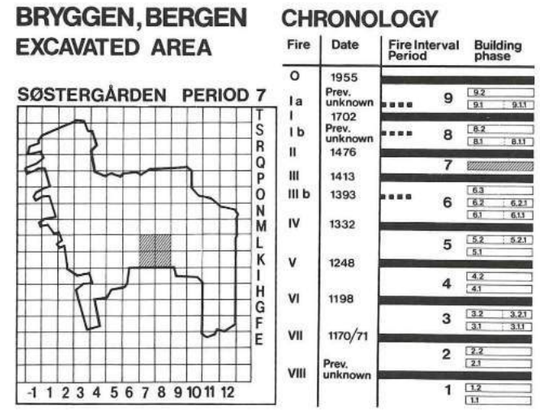
Phase 6.3, burnt in Fire III (1413) (fig 63)

South Row

The evidence for Fire III consisted of a 25cm thick layer of burnt detritus to the east and west, but all traces had been completely removed in the central area of the site. The fire had clearly had a severe impact, for all the remains of buildings, as well as the upper layers of the foundation timbers, had been removed, making it difficult to distinguish between the phase burnt in Fire III and the preceding level, Phase 6.2. Apart from a few burnt ends of beams in the western part, only one building was identifiable.

Building 82 (K8,VIII; L8,VIII,IX) consisted of some randomly surviving foundation timbers, which by themselves could provide little evidence for the extent of the building. Eastwards it appeared to continue beyond the eastern edge of the site, while its western boundary was probably at c 75y. Probable length c 13m; width c 5m.

Like the rest of the tenement at this level, the passage along the south side was severely burnt and had for the most part been removed. A few traces of charred transverse logs remained. Width uncertain.



North Row

This level contained evidence for two buildings, Building 388 and the stone building 386.

Building 387 from Period 7, described above, stood on top of a thick fire-layer, which in grid-square L7 varied in thickness from 10cm to c 40cm. In places it was reddened with the heat of the fire and included concentrations of clay, lime, crushed soapstone, shattered slate and schist, and fragments of stone and flagstones of various sizes, mostly probably from a collapsed fireplace (Hearth 27) which had been situated on the upper floor of the building. Some of the flat stones from the base of the fireplace were still more or less intact, lying on top of burnt floorboards with an intervening layer of grey clay. Beneath these floorboards, which were from the floor of the upper storey, there were further deposits of burnt detritus covering the remains of the floorboards and joists of the lower floor. The best preserved parts of the fireplace lay right in the centre of the building.

Some of the other stone recorded in this layer probably came from the stone building to the east, which would also have been damaged in the fire.

The association of the primary, or lower, floor with the rest of the structural fragments clearly indicated that this must be one building and not the remains of two partly interlaced levels.

Building 388 (L7,VI) consisted of the badly burnt remains of a building, which must have had a stone fireplace in the upper storey located in the centre of the room. Sections of the floor from both the lower and upper storeys together with the remains of the fireplace had survived, as well as two courses of massive foundation timbers and some thinner floor-joists. The eastern limit lay in the unexcavated area, while the western limit coincided with the edge of the stone building at 80.00y. Maximum recorded length 8m; width c 5.3m.

Building 386 (Phase 1) (fig 64) (K7,VIII,IX,X,X.1) was a stone building which continued in use in Period 7. The surviving stone walls were c 1m high and averaged 85cm in width. They stood on a plinth course which projected inwards, and this had been laid on a pile foundation consisting of slender stakes 1.8–2m long placed closely together. The rubble-core walls were faced with large stones bedded in lime mortar.

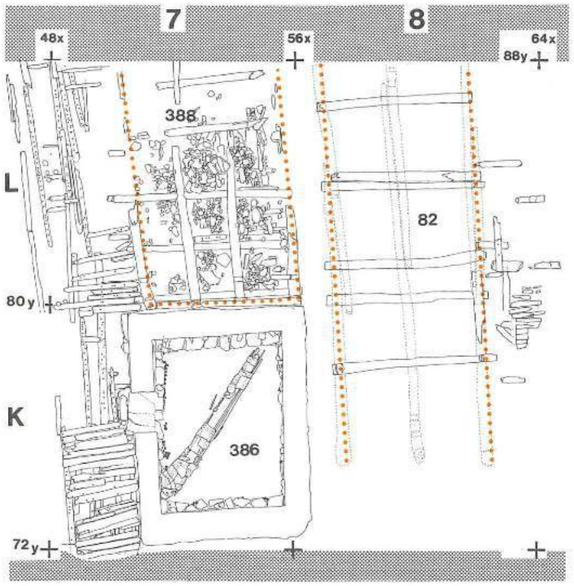
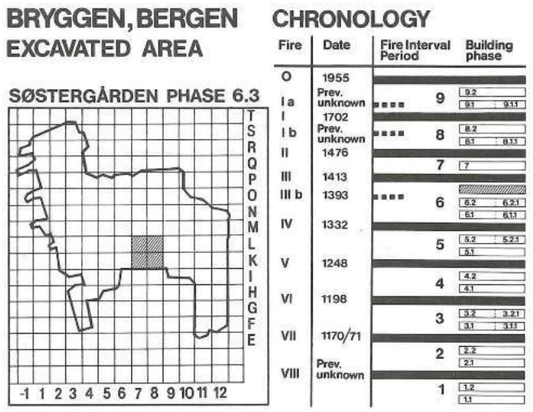


Fig. 63. Søstergården Phase 6.3.



The contemporary log-paved surface of The Old Church Road ran right up to a 40–50cm wide flagstone step in front of the entrance to the building, whose threshold was formed by a single large stone slab. The surface of the road lay at 1.07m above site datum, the top of the step at 1.15m and the threshold stone at c 1.4m.

Internally, the building was filled with clay up to the level of the threshold and a layer of birch bark 7–8cm thick had been laid on top. It is not clear whether the bark layer belonged to this phase or whether it was an initial stage in building up the level for the next phase. Buried in the clay layer was a relatively intact wooden-lined drain running diagonally in a SE/NW direction. It was covered with boards overlain with birch bark, but the base of the drain was unlined. It seems natural to link the drain and the layer of clay to the first phase of the stone building.

The building most likely suffered considerable damage from Fire III at the end of Period 6 and the exfoliation of the stonework inside is probably due to heat.

Building 386 (Phase 2) (fig 65) (K7,VIII.2) in Period 7 underwent some alteration, including the insertion of soapstone doorjambs. The door opening was 1.20m wide.

After a new log pavement had been laid in the road, possibly as part of the same redevelopment operation, a covered wooden drain was laid, leading out through the doorway and linking up with the main drain in the road. It was cut down through the joists supporting the log paving and its cover seems to have been at the same height as the surrounding log surface. The intact section of the drain lay entirely outside the building (cf fig 64). Presumably it had originally run out beneath the flagstones in the doorway from a water-collecting device in the centre of the building, but no internal features had survived.

The road surface had been raised from 1.07m to c 1.5m above site datum, and the surface of the step from 1.15m to 1.52m. The height of the corresponding floor and the type of floor construction is uncertain.

A layer of birch bark over the primary filling of clay inside the building may represent the initial stage of this phase, and a couple of slender transverse beams may have functioned as floor joists. Over the internal drain belonging to the preceding Phase 6.3 an earthy layer had been deposited.

Building 386 (Phase 3) (fig 66) (K7,VI,VII). Some time after Fire III, a new road surface was laid outside the building. The underlying surface appears to have sloped steeply down to the west at an early stage, and outside the entrance to Building 386 the surface was raised c 35cm from 1.45m to c 1.8m above site datum. In the new log pavement a wooden-lined drain was laid, constructed like the first drain following Fire III. This drain, however, was practically intact throughout its entire length. It conducted the overflow from a barrel sunk in the floor in the middle of the room out under the flagstones in the doorway to the drain in the road. The cover of the drain lay at the same height as the log surface of the road, and the barrel, which had survived for its full height, must have been buried with its top just below the level of the floor.

The road surface corresponded to one, or possibly two separate, floor surfaces on the same level. One consisted of scattered flagstones laid in sand, while from the other, three transverse beams were recorded. It is difficult to connect this drainage system with a floor consisting of flagstones resting on sand and gravel, unless the top of barrel stood higher than the sand and gravel layer. Alternatively, the latter may represent a later raising of the floor level after the barrel had gone out of use and its associated floor removed.

With regard to the use of the stone building after Fire II, see Building 385, p 98.

It is difficult to accept that the ruined walls, as they were found and recorded, functioned as the foundations for the sill-beams of a wooden building, particularly on account of their uneven height. However, tradition is silent about the existence of any stone building in Søstergården in the seventeenth century. Although we have chosen to interpret the surviving remains as foundations for a timber building, Building 385, we feel we should point out that

the walls may still have been standing at the time of the fire in 1702 and that Building 385 in Phase 8.2 may represent the final phase of use of the stone building 386.

The Old Church Road

The log paving along the southern section of The Old Church Road in the western part of grid-square K7 was generally well preserved, but the remaining area of K7 and L7 contained only fragmentary remains over longitudinal joists. In the adjacent areas of these grid-squares, the surface had apparently been partially replaced some time before Fire III: sections of the original surface seem to have been removed and a new surface laid on joists raising the level 8–10cm. In L7 parts of this surface survived, but in the eastern part of K7 it had been removed.

Phase 6.2, upper unburnt level beneath Fire III (fig 67)

South Row

The surviving foundation beams belonging to Phase 6.3 were found lying directly on relatively massive timbers in a good state of preservation but clearly separated from them by unusually well preserved sections of a wooden pavement of transverse logs in the passage. In theory, this could have been laid in Phase 6.3 at the time of the construction of Building 82 and then replaced at a later date by the pavement which burnt together with the building in Fire III at the end of that phase. Against this theory is the fact that the surviving sections of the passage surface were well preserved and even intact in places, and also the fact that some of the foundation timbers beneath Building 82 from Phase 6.3 overlapped the logs of the pavement. This pavement must therefore be interpreted as a separate phase, Phase 6.2. Buildings 84 and 83 also belonged to this phase.

Building 84 (K8,VIII,IX; L8,IX,X) consisted of two courses of foundation timbers with rebates which may have held floor joists. Eastern limit outside the excavated area; western limit at c 75y. Maximum recorded length 13m; width 5m.

Building 83 (K8,VIII,IX) consisted of the remains of a longitudinal floor laid on slender joists and a layer of massive foundation timbers overlapping the foundation beams of Building 84. Eastern limit at c 74.8y; western limit outside the excavated area. Maximum recorded length 2.8–3m; width c 5.1m.

Tenement passage

The tenement passage had an unusually well preserved log surface which was unburnt. Some of the logs were broken at the south end in the eaves-drip against Engelgården. The passage was 4m wide.

North Row

There were two buildings in this phase in the North Row, Buildings 389 and 390.

The 7–8 courses of foundation timbers beneath Building 388 in Phase 6.3, which burnt in Fire III, indicated no clear

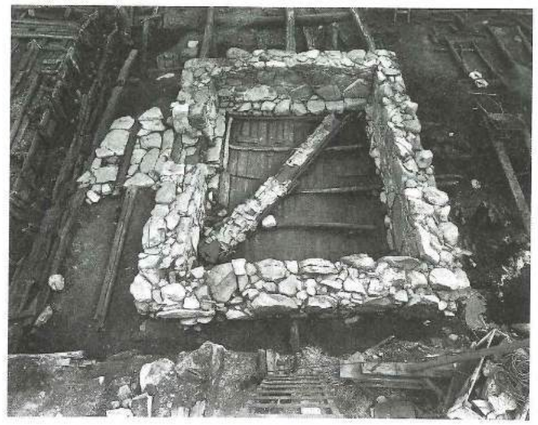


Fig. 64. The surviving walls of Building 386 in Søstergården North, seen from the west. This stone building was originally built in Phase 6.3 following Fire IIIb (1393). The exposed wooden floor belongs to an earlier building (Building 390, Phase 6.2).

separation of the building phases, except in layer 3, where the timbers had regular rebates, distinguishing them from the other timbers associated with Building 388. In the row itself the top two layers of timbers beneath Building 388 could be associated with the building, while the fourth layer from the top overlapped a pavement surface below the Phase 6.3 level in The Old Church Road, thereby indicating a dividing point in the building phases. The possibility cannot be excluded, however, that the lower level in the road also belonged to Phase 6.3, as it was found to do in the Gullskoen tenement. The reason for ignoring this possibility and interpreting this level as a separate phase is that in grid-square K7 to the west there was clearly a separate building, Building 390, associated with this level in The Old Church Road. The third and fourth layers of foundation timbers in grid-square L7 below Building 388 have therefore also been interpreted as belonging to a separate building, Building 389, in Phase 6.2. The fifth layer of timbers has also been included in this phase on subjective grounds.

In grid-square K7 there was a well-preserved floor overlying three courses of foundation timbers. The building thus indicated, Building 390, was the immediate forerunner of the stone building 386; its floor had in fact been partly removed during the erection of the stone building.

Building 389 (L7,VI.1,VII,VIII) consisted of two, or possibly three, courses of timber foundations, which probably included the sill-beam for the north wall. Eastern limit lay outside the excavated area; western limit at 80.00y. Maximum recorded length 8m; width 5.10m, possibly 5.30m.

Building 390 (K7,IX,X) consisted of a well-preserved floor laid longitudinally over relatively closely placed rectangular floor joists and three courses of foundation timbers. The limits of the building on the eastern, northern and southern sides could be identified in between the stakes of the pile foundations of the stone building 386. To the west it ran beyond the edge of the excavations at 72.40y. Eastern limit at 79.8–80y. Maximum recorded length c 7.6m; width c 5m.

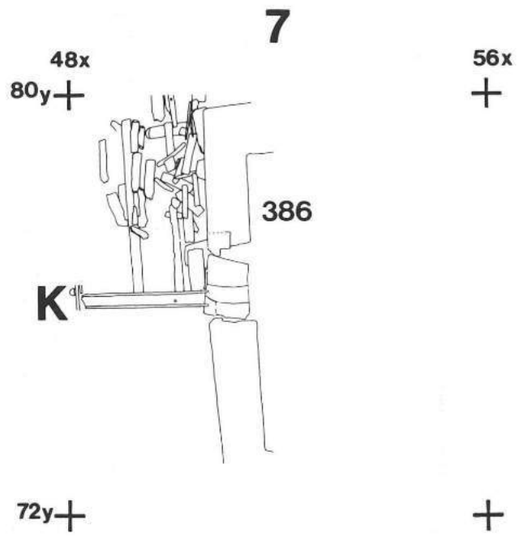


Fig. 65. Detail of the doorway in Building 386 (cf fig 64), seen from the west with a section of the drain running from inside the building to join the main drain in The Old Church Road.

The Old Church Road

Apart from a small area in grid-square K7, the regular log road surface was well preserved alongside both buildings, together with the longitudinal joists supporting the logs.

Phase 6.1, lower unburnt level below Fire III (fig 68)

South Row

Beneath Phase 6.2 there were several layers of well-preserved timbers with no clear evidence for actual buildings, but the transition between Phase 6.2 and the preceding one was nevertheless clearly distinguishable. In the third course below Building 84 the longitudinal timbers had regular rebates at relatively close intervals for receiving floor joists, a few of which were found *in situ*, while fragments of others lay scattered among the deposits. A well-preserved surface of the tenement passage running the whole length of the excavated area also belonged to this level, which otherwise included Buildings 375 and 85.

Building 375 (K8,IX,X; L8,X,X.2) consisted of parts of floor joists found *in situ* over four courses of foundation timbers. Eastern limit lay outside the area excavated; western limit at c 76y. Width at 80.00y was 5.50m.

Building 85 (K8,IX–XI) consisted of five courses of foundation timbers of the same type as those recorded beneath Building 375, which they partly overlapped. Eastern limit at c 75.4y; western limit outside the excavated area. Maximum recorded length 3.40m; width 5.10m.

Tenement passage

The surface of the passage was in an exceptionally good state of preservation and consisted of split logs 20–25 cm wide laid with their flat side uppermost. The underlying joists contained at least two sets of plugholes, which may explain the excellent degree of preservation of the surviving surface. The passage was c 3.2m wide.

Fig. 66. The final stage of the overflow drain leading from a sunken barrel in the middle of Building 386 in Søstergården North (cf fig 62).

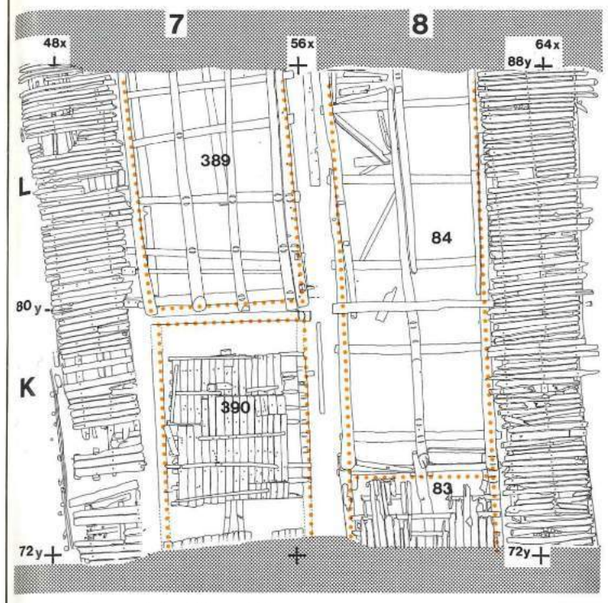


Fig. 67. Søstergården Phase 6.2.

North Row

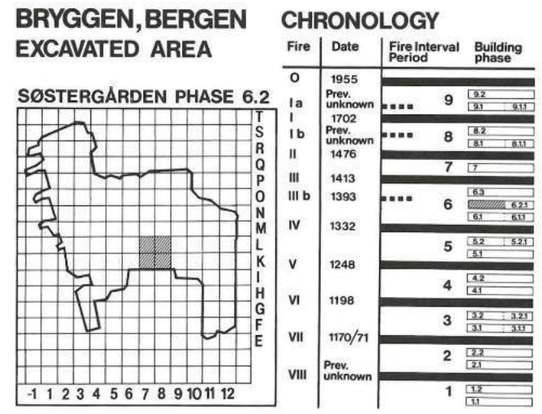
The timbers in courses 3–5 beneath Building 388 must have belonged essentially to Phase 6.2 and Building 389. This meant that the timbers below these must have formed the foundations of buildings in the preceding phase, Building 391 and the eastern part of Building 392 in Phase 6.1. In the eastern part of grid-square L7 this involved two or three courses of timbers (courses 7 and 8 beneath Building 388), while in the western part of L7 and in K7 there were seven, or possibly eight, courses of timbers beneath Building 390. In the middle of L7 there must therefore have been a boundary between two buildings running across the tenement, and two separate buildings can therefore be assigned to Phase 6.1, Buildings 391 and 392.

Building 391 (L7,VIII,IX) consisted of two, or possibly three, courses of foundation timbers, the lowest of which consisted exclusively of crossbeams from a ship. Eastern limit outside the excavated area; western limit at c 83.5y. Maximum recorded length 6.50m; assumed width 5–5.2m.

Building 392 (K7,XI,XII; L7,VIII,IX) consisted of seven, or possibly eight, courses of foundation timbers. Eastern limit at c 83.3y; western limit outside the excavated area in grid-square I7. Maximum recorded length c 11m; width c 5.1–5.3m.

The Old Church Road

In the area immediately adjacent to Søstergården, the surface of The Old Church Road was in a good state of preservation and almost intact in places. In the eastern part, in grid-square L7, were the remains of a road surface supported on joists whose westward projections were provided with a rebate to receive the surface of the road as it continued further west. From the situation in the northern half of the road, where there were two road surfaces corresponding to each of the two phases 6.1 and 6.2, it was tempting for some time to see a similar situation here, with two separate levels, 6.1.1 and 6.1.2, belonging to this phase. But as there was absolutely no evidence for a second layer in grid-square K7 and the western part of L7, the possibility cannot be ignored that this simply indicated a partial replacement of the road surface in the eastern part of L7, while the original surface continued in use to the west.



Summary, Period 6

The above account shows that as in Bugården and Engelgården there were three phases of development, Phases 6.1, 6.2 and 6.3, in Søstergården South between Fires IV and III, but in this tenement there was no intervening fire corresponding to Fire IIIb at the end of Phase 6.2. It should perhaps be pointed out that the surviving remains from this phase in Bugården were also on the whole unburnt, any traces of burning only being recorded in a small area towards the western end of the tenement in grid-squares G and H 11–12. With the same rate of redevelopment in Søstergården as in the adjacent tenements of Engelgården and Bugården, where evidence of Fire IIIb was found in all four rows, it is not unreasonable to assume that it was also Fire IIIb which was responsible for the third phase of development within Period 6 in Søstergården, either because the tenement had been directly affected by the fire or because its buildings had been pulled down in order to increase the fire-break effect of The Old Church Road.

In all three phases between Fires IV and III, the buildings in the North Row were independent structures, separated from the South Row by an eaves-drip gap 75–80cm wide.

In Phase 6.3, the latest of the three phases, probably two buildings were recorded in each row, although in the South Row there was no clear evidence for the dividing point between them. In the North Row the stone building, Building 386, was erected in this phase. A wooden-lined drain covered with boards and birch bark ran diagonally across the room beneath the level of the floor, of which no traces had survived. Building 388 in the eastern part of the North Row must have had two storeys, and the collapsed remains of a stone-built fireplace, which had been situated on the upper floor, were found.

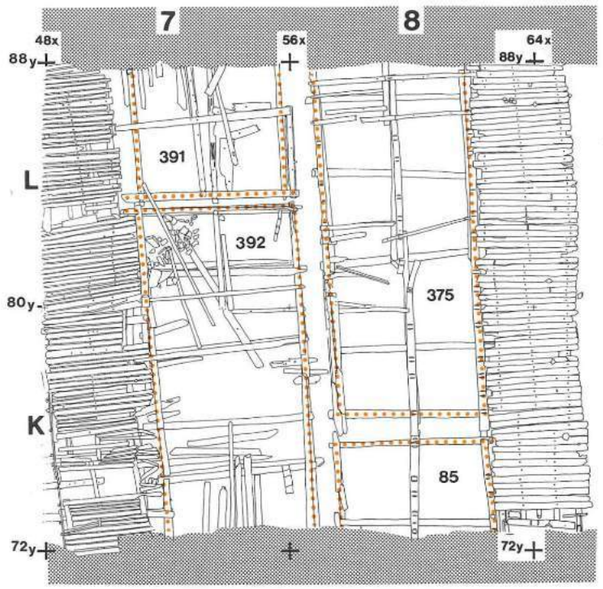
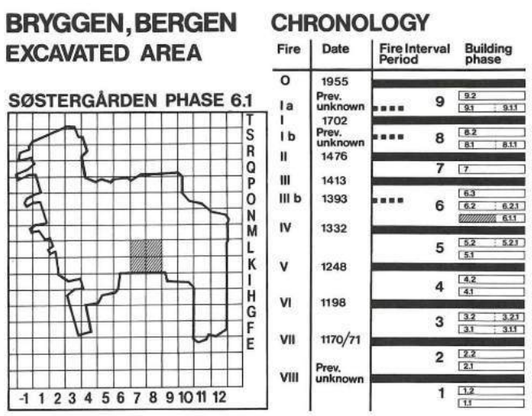


Fig. 68. Søstergården Phase 6.1.



The width of the buildings varied around the 5m mark in the South Row and between 5m and 5.3m in the North Row.

Of the tenement passage on the south side of the South Row there were a few scattered remains, while the adjacent parts of The Old Church Road to the north of the tenement were well preserved in places.

In Phase 6.2 the layout of the tenement was the same as in the following phase just described, except this time there was evidence for at least two buildings in the South Row. Again, there were the remains of two buildings in the North Row with an unusually well-preserved plank floor in the western one.

Both the tenement passage and the adjacent parts of The Old Church Road in this phase had well-preserved remains and were almost intact in places. The width of the passage was c 4m.

In Phase 6.1, the first phase in Period 6, two buildings were recorded in each row, the dividing point between them in the South Row being the same as in the following phase. The tenement passage on the south side was exceptionally well preserved and intact, as were the adjacent parts of The Old Church Road except for a disturbed area at the western end. The width of the passage was c 3.2m.

Period 5

Phase 5.2, burnt in Fire IV (1332) (fig 69)

South Row

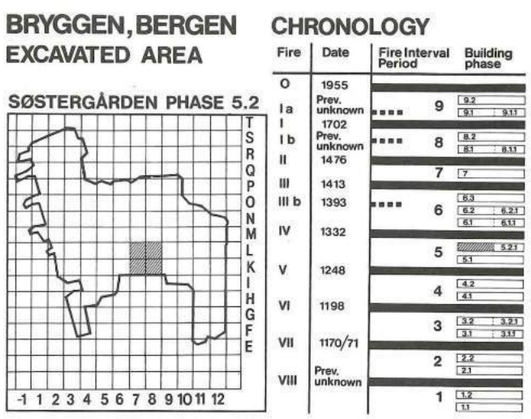
Between Fires IV and V there were two complete phases of redevelopment, Phases 5.1 and 5.2. At the eastern end of the site, however, the remains of two buildings were recorded, Buildings 89 and 90, which belonged to an intervening phase. They seem to have replaced Buildings 376 and 377 during Phase 5.1, but appear also to be contemporary with buildings in Phase 5.2. As there seems to be no reason for preferring to put them in one phase rather than the other, we have chosen to include them with Phase 5.1, as a sub-phase 5.1.1.

The detritus layer from Fire IV could be traced through grid-squares K8 and L8. It varied in thickness from 3–5cm at the eastern end to as much as 40cm at the western end, where it was separated from the overlying Fire III by c 60cm of deposits. Elsewhere, the intervening layers were c 80cm thick. In and immediately over the fire-layer, which was reddened by heat in some places, abundant remains of charred wood and small stones were recorded.

In this phase the layout of the South Row was different from that in the later levels, in that the buildings took up the whole width of the row and there was no passage along the south side. Communication along the tenement must therefore have been through the actual buildings. In grid-square L8 and the adjacent part of K8, only the foundations of a building on the southern side of the row were identified, Building 88. On the northern side the only structural remains consisted of fragments of a longitudinal sill-beam right against the eaves-drip of the North Row. On the basis of the situation in Sub-phase 5.1.1, as well as in the preceding Phase 5.1, this must have belonged to a side-annexe erected against the building to the south with no eaves-drip gap between them. In the main part of grid-square K8, however, there was a narrow passage running down the middle of the row, with the remains of a small building, Building 86, on the north side and a larger one, Building 87, on the south side. There was no indication that the remains of Building 88 to the east overlapped the two buildings to the west. It would also seem that there had been a lack of co-ordinated planning in this part of the tenement, as the north wall of Building 88 ran straight towards the central line of the passage between the buildings to the west. Perhaps there was no need for any co-ordination, as there appears to have been a cross-passage on the east side of Building 88, which seems to have contained a privy.

Building 88 (K8,XII; L8,XIII) consisted solely of burnt foundation timbers running longitudinally. Eastern limit at 86.50y; western limit at 78.60y. Width probably 4.8m, but the line of the north wall is uncertain, and the width may have been 3.6m.

Fig. 69. Søstergården Phase 5.2.



If the northern half of the row was built on in this phase, the building must have been either 3.6m or 4.5m wide. A separate building number has not been assigned to a structure here, even though it is highly likely that there was a side-annexe to Building 88. The alternative would be an unusually wide central passage which does not seem to fit in with the layout and dimensions of the row otherwise.

Building 87 (K8,XII) consisted of four courses of burnt foundation timbers. Eastern limit at 78.40y; western limit outside the excavations. Maximum recorded length 5.8m; width 3.7m.

Building 86 (K8,XII) consisted of five courses of foundation timbers. Eastern limit at 78y; western limit outside the excavations. Maximum recorded length 5.7m; width 3m.

Tenement passage

In Phase 5.2 there was a narrow passage in grid-square K8 running down the middle of the South Row between Buildings 86 and 87. To the east there was probably an internal passage inside the side-annexe, which in all probability was built directly on to the north side of Building 88. At the east end of this building there was, as already suggested, a cross-passage, possibly containing a privy.

North Row

Under the deposits of Fire III, there were three phases of development in the North Row, described above under Period 6. The deposits separating Fire III from the underlying Fire IV were generally 1.1–1.2m thick, while the layer of detritus from the lower fire was 10–15cm thick over the whole row. Apart from in the adjacent area of The Old Church Road there were discontinuous scattered remains of burnt buildings, and their separation into individual structures could only be deduced from a detailed analysis of the foundations. In the eastern part of grid-square L7 there were only the remains of a couple of charred floor joists, which were presumably not lying *in situ*. Even though it is most likely that there was a building here, it has not been given a separate number. In the western part of grid-square L7 and the adjacent part of K7 there was a large concentration of generally small, partly heat-cracked stones and the remains of a ground-wall, which has been designated Building 393. The spread of stones continued westwards for a couple of metres into the western part of grid-square K7, where it overlay the burnt remains of a building, Building 394. The original parts of this building consisted of a foundation substructure with four or five courses of timbers, designated Kar 110.

In Phase 5.2 the North Row was again quite separate from the South Row, but the eaves-drip gap between them was greatly reduced. This level comprised two buildings numbered 393 and 394 and the remains of a third one to the east.

Building 393 (K7,XIII,XIII.1; L7,X) consisted of a row of stones c 4.5m long clearly forming the southern ground-wall of the building, and a compact group of stones in the western part, which continued more or less without a break to another group of stones to the west (see Building 394 below). Assumed eastern boundary around 83.4y; western limit around 77.4–77.5y. Assumed length 6m; assumed width 5–5.2m.

Building 394 (K7,XIII,XIII.1) consisted of the fragments of square floor joists with the remains of longitudinal tongue-and-groove floorboards, all badly burnt. In the layer of detritus from the fire there was a concentration of stones, for the most part heat-shattered, which lay inside the north wall. They continued into Building 393 and are probably from a hearth, No.29, which is assumed to have been located in Building 394. The foundations to the building consisted of five courses of timbers. Eastern limit at 76.8y; western limit outside the excavated area. Maximum recorded length 3.8m; assumed width c 5m.

The Old Church Road

The adjacent parts of The Old Church Road consisted of a relatively well-preserved surface of adzed boards sup-

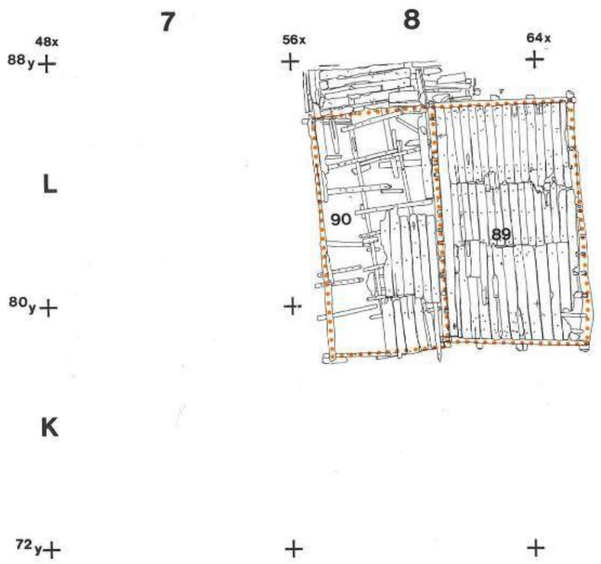
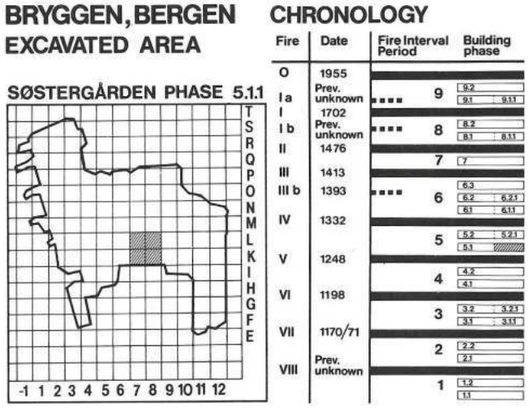


Fig. 70. Søstergården Sub-phase 5.1.1.



ported on joists. The boards were of uneven width and thickness, and most of them were burnt away on the south side. In the western part of grid-square K7, however, they were completely missing.

Sub-phase 5.1.1, between 5.1 and 5.2 (fig 70)

South Row

The badly burnt remains of Building 88 from Phase 5.2 lay immediately over the surviving remnants of a building, Building 89, which had been pulled down. These were in an unusually good state of preservation, and showed no traces of burning. On the north side were the remains of a side-annexe, Building 90, which was also unburnt. Both structures belong to Sub-phase 5.1.1. To the west they ran up to Buildings 378 and 379 from Phase 5.1, but they were also associated with Buildings 86 and 87 from Phase 5.2.

Building 89 (K8,XIII; L8,XIV) was a log-built structure and consisted of an almost intact longitudinally-laid floor which showed traces of repair, square floor joists laid transversely at close intervals, and massive sill-beams, as well as an underlying layer of foundation timbers. Eastern limit at 86.60y; western limit at 78.70y. Length 7.90m; width 4.70m.

Building 90 (K8,XIII; L8,XIV,XIV.1) appears to have been a side-annexe built up against Building 89. It was probably erected with the north wall of the latter building as its side wall and would have had a pentice roof. Fragments of longitudinal floorboards and slender, square joists had survived. It had the same length as the main building, but its width is less certain. All the beams which could definitely be interpreted as floorjoists *in situ* were roughly cut through at a distance of 2.4–2.5m from the main building, clearly at a later date. To the north of these, however, there were the remains of floorboards laid over short, separate joists which had been similarly cut through. These fragments of flooring must have belonged to a secondary period of use of the side-annexe, after it had been improved. The total width was c 4m at the east end and c 3.8m at the west end.

Phase 5.1, unburnt level over Fire V (fig 71)

South Row

Beneath the unburnt Building 89 and adjacent part of Building 90 lay the remains of yet another unburnt level belonging to the first building phase following Fire V. In the southern half of the row the foundations belonging to Building 89 lay directly over the foundation timbers of a similar building from the previous phase, Building 376. In the northern half, the foundations ran into a planked surface of transverse boards fixed to joists. This is interpreted as the remains of a side-building, Building 377, and not a passage, which might perhaps have been a more natural conclusion – see commentary below.

To the west of Buildings 376 and 377 the layout was less clear, but the criteria for its interpretation were the same as those on the east side. In continuation of the side-annexe Building 377, there was a planked surface c 3m wide with the boards laid lengthwise. To the south this ran into the foundation timbers of an obviously separate building. At their western end the boards were cut off on the slant and from comparable examples it is reasonable to assume that they were scarfed to a further section of flooring, which had continued westwards. In that case the planked surface must have belonged to a separate side- building, like that to the east. Along the north side the bottom planks of a sunken drain were recorded, which was clearly part of some localized system rather than a continuous drain in a passage. The interpretation is nevertheless a subjective one. On the basis of what has been said here, it is feasible to suggest that there was a main building on the south side, Building 378, and a relatively wide side-annexe on the north, Building 379.

Building 376 (K8,XIV; L8,XV) consisted only of foundation timbers. Eastern limit at 86.6–86.7y; western limit at 78.6y. Length c 8m; width 4.1m.

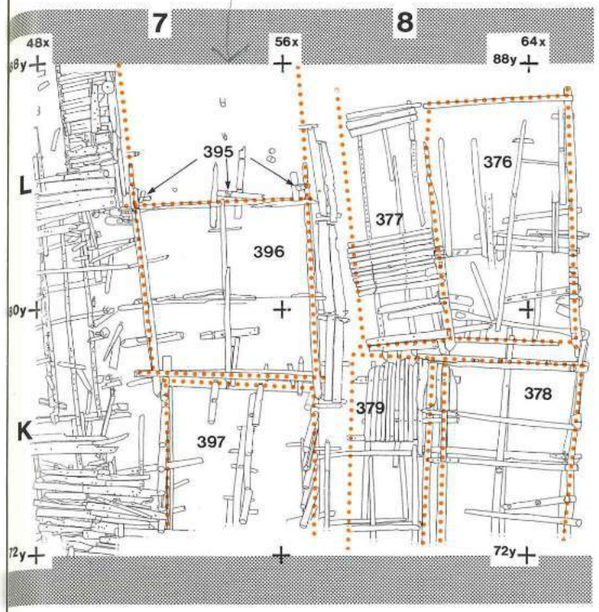


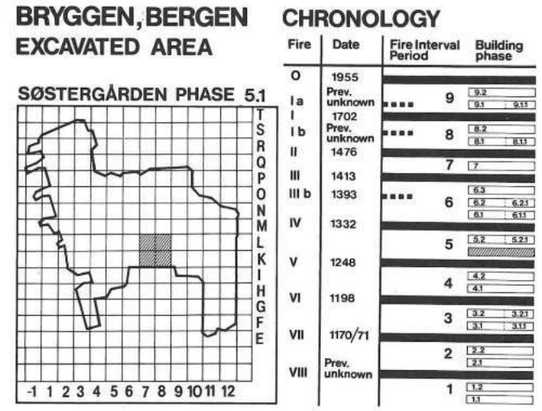
Fig. 71. Søstergården Phase 5.1.

Up against the north side of the building and with the same eastern and western limits there was a c 2.8m wide deck of transverse boards, which may have been part of a passage, but which is nevertheless interpreted as the floor of a narrow side-building. The main reason for this interpretation is its association with Building 376: the building pattern changed both further east and further west. Moreover, just to the north of the planked surface in the eaves-drip gap between the North and South Rows and some 35–40cm deeper, there were boards laid longitudinally in pairs which would appear to be the base of a drain. Evidence for this drain was found running through grid-square L8 and half of K8 to the west. If the planked surface which has been interpreted as the floor of a building had belonged to a passage, it would seem somewhat pointless to construct a separate drain outside it. With some reservation, the remains have been allocated a Building No.

Building 377 (K8,XIV; L8,XIV.1,XV) consisted of sections of transverse planking laid on relatively slender joists taken to be part of the floor of a side-annexe built up against Building 376. Same limits to the east and west as 376; width c 2,8m.

Building 378 (K8,XIV,XIV.3) consisted solely of the foundation timbers laid in four courses in the southern half of the Row. The connection with Building 379 on the north side is unclear. Eastern limit at 78.2y; western limit outside the excavated area. Maximum recorded length 5.8m; estimated width between 4.1m and 4.6m.

Building 379 (K8,XIV,XIV.1) consisted of parts of a relatively well-preserved planked surface c 3m wide, but originally at least 3.4m wide and from 3m to 3.4m in length. In addition there were three or four courses of foundation timbers. Eastern limit at 78.2y as Building 378. It probably continued into the unexcavated area to the west. Maximum recorded length c 5.8m, width c 3.4m.



One of the reasons for interpreting the remains in the northern part of the South Row in this way was the existence of the bottom boards of an associated drain, consisting of six boards up to 40cm wide laid in pairs one behind the other on short cross joists with no plug holes.

North Row

Apart from in the western part of grid-square K7, the traces from Fire IV had gone so deep that significant sections of the underlying level, Phase 5.1, were also burnt, and in places it was difficult to separate the two levels. The identification is based on details in the relationship between the foundation timbers and their respective passages. Within the original excavation area three buildings were identified in this phase, Buildings 395, 396 and 397. They were associated with a single foundation substructure. In the eaves-drip gap on the south side were the remains of a drain with planks forming the bottom.

Building 395 (L7,X,X.1,XI) consisted solely of the thin foundation posts of a light structure. Two of the posts under the west wall were standing on short transverse elements and a shaped piece of wood was probably a third one still lying *in situ*. There were four, or possibly six, more posts, all from the western part of the building. Eastern limit unidentified, probably outside the excavated area; western limit at 83.8–84y. Maximum recorded length c 6m; width c 5.6m.

Building 396 (K7,XIII,XIII.1; L7,X,X.1) consisted of five or six courses of foundation timbers, forming the substructure unit Kar 109. Upper sections burnt in Fire IV. Eastern limit at 83.4–83.6y; western limit at 77.6–77.8y. Length c 6m; width 5.6m.

Building 397 (K7,XV) consisted of the remains of 16 posts set into sleeper-beams in three rows and originally carrying sill-beams (see figs 71 and 72). In the eastern part some of the posts were burnt, but most of them had survived to the height of the seating for the sill-beams. Their length varied from 1.15 to 1.70m. The ground on which they had been placed had sloped markedly down to the west

already at the time of the construction of the building, no doubt accounting for the projections at the base of the posts, which were up to 50cm long. The building had been raised on a foundation of longitudinal timbers laid over transverse timbers following a considerable back-filling of the area. Eastern limit at 77.6–77.8y; western limit outside the excavations. Maximum recorded length c 5m; width c 5.1m.

The Old Church Road

In the adjacent area, the surface of The Old Church Road had survived in places throughout the L7 grid-square and the western part of K7. Where the surface was missing, the underlying joists were still intact. The surface in the western part of K7 sloped significantly down to the south towards the adjacent building and an attempt had been made to level it up by laying short boards right on top of the original ones. The surface was of varying nature, ranging from round logs to adzed boards of various dimensions. The perforations which had been made for transporting the original timber were still visible on many of the boards.

Summary, Period 5

The period comprised two phases of development, 5.1 and 5.2, with evidence for an intervening phase 5.1.1 at the east end of the South Row. The two rows were built separately, but the eaves-drip gap between them was found to be considerably narrower than in Periods 6–8.

The layout of the South Row in this period was quite atypical: it was divided down the middle and the buildings ran up to the neighbouring tenement of Engelgården, extending over the area later occupied by the eaves-drip gap between the two tenements. In Phase 5.2 there were two small buildings to the west on either side of a narrow passage running down the centre of the row, while to the east there was a main building with a side-annexe built on to its north side. The narrow passage did not continue, so that either the line of communication was broken or it passed through the annexe. In Phase 5.1 the row was also divided down the middle, but in this phase both the western and the eastern building had a side annexe on the north side. The total width of the row was c 7.4m in the early phase and c 8.5m in the later phase.

The North Row had a normal layout with two, or possibly three, buildings in the later phase, the one to the

Fig. 72. Massive, well-preserved foundation posts, standing on sole-plates under Building 397 in Søstergården North, erected after 1332. Seen from the south-east.

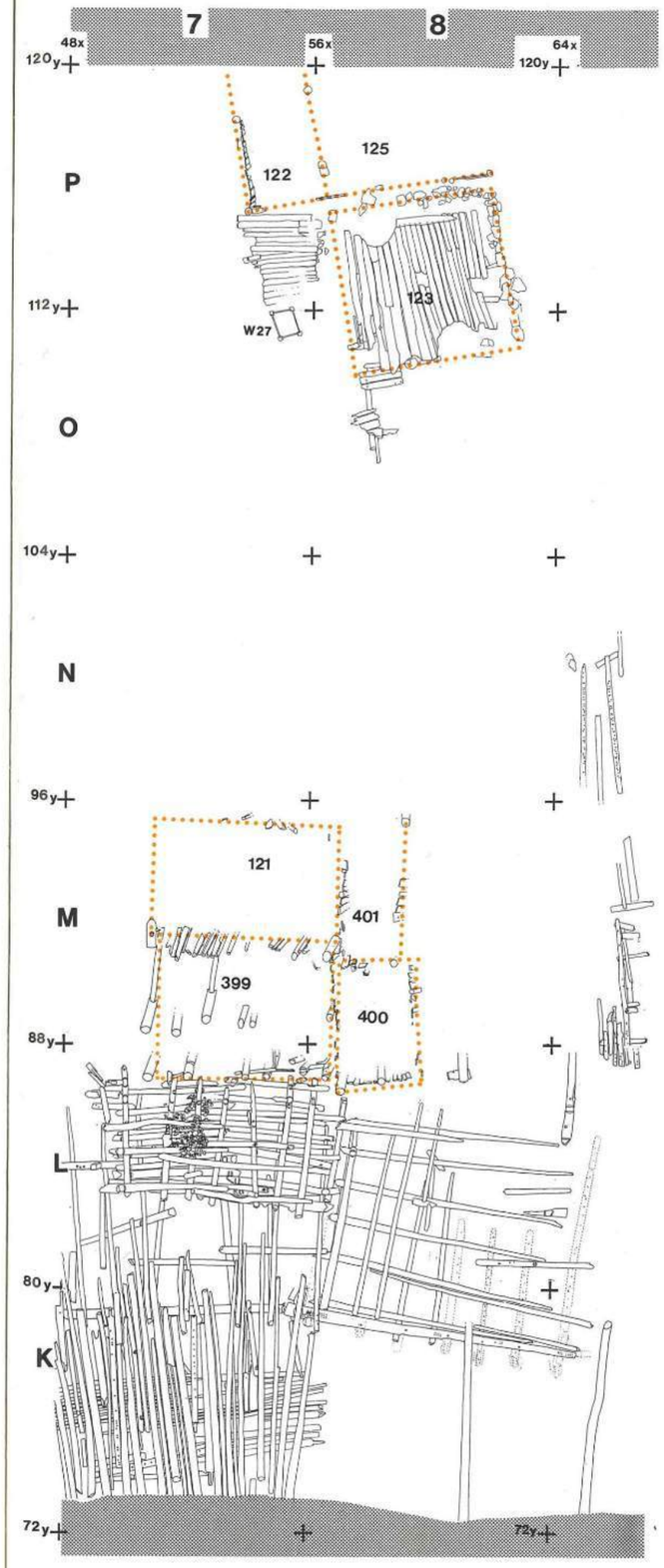


Fig. 73. Søstergården Period 4.

BRYGGEN, BERGEN
EXCAVATED AREA

SØSTERGÅRDEN PERIOD 4

CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
Ia	Prev. unknown	9	9.2, 9.1, 9.11
I	1702		
Ib	Prev. unknown	8	8.2, 8.1, 8.11
II	1476		
III	1413	7	7
III b	1393	6	6.3, 6.2, 6.21, 6.1, 6.11
IV	1332		
V	1248	5	5.2, 5.21, 5.1
VI	1198	4	
VII	1170/71	3	3.2, 3.21, 3.1, 3.11
VIII	Prev. unknown	2	2.2, 2.1
		1	1.2, 1.1

west containing the remains of a hearth. The width of the row in this phase varied from 5m to 5.2m. In Phase 5.1 the remains of three buildings were recorded. Building 397 to the west had been erected on 16 foundation posts in all, measuring up to 1.70m in height. These were all mortised into massive sleeper-beams with some of the tenons being up to 50cm long, presumably in order to prevent the building from slipping. It had been erected on considerable deposits of back-fill.

Both the North and the South Rows showed a marked break in their alignment towards the north-east, but especially the North Row, whose width increased from c 5.1m to the west to c 5.6m to the east. The total width of the tenement here was c 14.5m; to the west it was c 13.2m.

Between the two phases an intervening building level, Phase 5.1.1, was recorded at the east end of the South Row, consisting of a main structure, Building 89, with an almost intact floor of wide boards, and a side-annexe built on to the north side, whose floor had survived in places. To the east of these buildings there was the suggestion of a transverse passage, possibly with a privy at the south end. The width of the main building was 4.70m, and the side-annexe was c 3.8m at the west end and c 4m to the east.

The adjacent parts of The Old Church Road were disturbed and had been removed in places, but there were also some intact sections.

Both Phase 5.1 and the intervening phase were unburnt. Phase 5.2 had burnt in Fire IV, which terminated this period in 1332.

Period 4, burnt in Fire V (1248) (fig 73)

South Row

From this phase downwards the grid-squares M–P 7/8 jfr Summary, Period 4 p 115 are included in the description. The overlying deposits in the new part of the site were removed by machine down to this level and the excavation of the remaining layers had to be carried out as a rescue operation. The description will therefore continue to be based mainly on the original area of excavation.

Building 123 in grid-squares O8/P8 was cut through by two later wells, a sunken barrel forming Well 22 to the east and a similar barrel forming Well 21 to the west (fig 74). The latter was surrounded by a log-built well case, Well 38. All these must be later than Fire V (1248). Well 22 must

have burnt in Fire III (1413), but the date of the other well structure, Wells 21/38, cannot be determined as both parts were disturbed by the mechanical excavator. Generally speaking, the log-built shaft ought to be the latest, probably dating from the sixteenth or seventeenth centuries, but in this case the barrel lining must be the latest, as it had been inserted into the log-built well. These three well structures may represent a more than 200-year-long tradition for using this part of the tenement for a well, lasting until c 1700. They are not dealt with further here.

In the original part of the site, the deposits from Fire V were recorded at a depth of between 40cm and 60cm below Fire IV. The detritus from the fire was up to 12cm thick, reddened in places from the heat, and was recorded over the whole area from the eastern boundary to 81.00y in grid-square L8. In the extension it had been removed in N8 and O8, was sporadically present in M8 and was more or less continuous in P8. This discontinuity of the fire-layer is presumably a result of the machine having removed parts of the fire-layer as well as some of the remains of buildings at this level.

The surviving remains were limited to charred foundation timbers and scattered boards, and this description also applies to the main part of the site, where the only recognizable remains of buildings were from Buildings 123 and 125 in the rear parts of grid-squares O8 and P8, possibly Building 122 in P7, and the remains of two plank-wall structures, Buildings 400 and 401 in the western part of grid-square M8. In these last two structures the space between the floor and the ground was enclosed with vertical boards placed side by side. In Building 400 to the west there was a concentration of moss, just as in similar buildings of this type elsewhere. This may mean that it had been used as a latrine or as a storage place for moss.

The location of these buildings adjacent to the eaves-drip gap on the north side can also be taken as a strong indication that the South Row in this phase was again divided down the middle, even though there was no definite evidence of structures in the c 5m wide southern half of the row in this phase.

Further west only the foundation timbers had survived. In grid-square L8 they overlapped the equivalent burnt layer in the North Row, and on the basis of what was recorded at this level in the North Row, the layer must have continued beyond the limit of the excavated area at 72.00y.

The timbers in grid-square K8 were lying directly on the front of the structure which had burnt in Fire VI. After the fire, the area of the harbour nearest to the front must have been backfilled to the height of this structure and the foundations of the next phase, Period 4, must have been laid out over these deposits. A similar situation was found at the same level in the rows to the north.

Building 400 (L8,XV.3,XVI; M8,II,III) consisted of the foundation posts supporting the north, east and south walls and the vertical wall planks which enclosed the gap between the floor and the ground. East wall at 90.7y; west wall at c 87y. Length c 3.7m; width c 2.8m.

Building 401 (M8,II,IV) was of the same type as Building 400, and stood close in to its east wall. It consisted of the vertical wall planks from the south and north walls and the foundation posts from the north wall and the south-east corner. Eastern wall at 95.3y; western limit at c 90.8y. Length 4.5m; width c 1.9m.

Fig. 74. Well 21 in Søstergården South consisted of a barrel which had been sunk through the remains of Building 123, burnt in Fire V (1248).

Over most of the extension, the circumstances in the field and the opportunities for recording did not permit any reliable identification of what might belong to this level. In grid-square N8 and most of O8 there were no recognizable structural remains from this phase, but in P8 and the immediately adjacent parts of O8 the remains of one building had survived, Building 123, together with the broken fragments of what was assumed to be the western sill-beam of another, Building 125. To the north of Building 125 there were also the remains of a narrow building with an enclosed sub-floor area, Building 122, which may have been a side-annexe to an unrecorded building in the North Row.

Building 123 (O8,III; P8,IV) consisted of some intact sections of a longitudinal floor, probably laid detached from the walls. The boards were of various widths. It was penetrated by two later well shafts, Well 22 to the east and Well 21/38 to the west. Most of the ground-walls under the south and east walls had survived intact. Eastern limit at 115.6–115.8y; western limit at 110y. Length 5.6–5.8m; width uncertain, possibly c 6.5m. There had perhaps been an earth-filled box-bench running along the inside of the north, south and east walls. The entrance was probably on the west side *via* a narrow gangway of planks.

Building 125 (P8,IV) consisted of the surviving fragments of a beam set on edge and notched at the south end to accommodate an upright post in the building's south-west corner. This interpretation was made at the time of excavation, and there seems no reason to change it. There was no indication of the length of the building; its width could have been at least 5.6m.

Building 122 (P7,II) consisted of a continuous row of vertical planks from the north wall, together with the east and west corner posts and probably also two posts from the south wall. Eastern limit at 119.2y; western limit at 116.2y. Length 3m; width c 2.3m.

Tenement passage

In the levels dow to Period 4 there had been a clear gap between Engelgården and Søstergården which was not built on. Its form varied on account of the changing layout in Søstergården: in some periods it was laid out as an ordinary eaves-drip gap between the two tenements; at other times it was merely a narrow gulley between the passage along the south side of Søstergården and the adjacent row of buildings in Engelgården. In the subsequent extension of the site this boundary zone was practically filled in Period 4 with the fragmentary surface of a passage partly supported on posts, partly laid out over earlier foundation substructures. As the position of the north wall of Engelgården remained generally stable, this passage must have been laid out basically within the boundaries of Søstergården. Its width varied from c 1.7m at the rear of the site to c 2m nearer the front at 88.00y.

North Row

The chronological conclusions which could be drawn from grid-squares M7–P7 in the extension to the site are to a great extent subjective. The fire-layer from Fire V covered the eastern and central areas of grid-square L7 and c 3m of the adjacent area of M7. Elsewhere in the extension it was on the whole only identified in O7 and P7. In the original area it ran right up to the western edge of the site at 72.00y. The area in front of the earlier substructure, Kar 111, in the South Row (see fig 76) was backfilled and built over, extending the tenement westwards. A similar principle was followed in the North Row, but here it formed part of a more extensive development scheme involving The Old Church Road and the next row of buildings to the north, Gullskoen's Row No.2. For a detailed description, see the commentary on Rows 1 and 2 in Gullskoen (vol 3, part 2); only a recapitulation of the main features is given here.

Firstly, the two foundation units 115 and 116, which lay behind the large foundation substructure 114 from Phase 3.2, burnt in Fire VI, were built over by new foundation units, 72 and 73. This was necessary because the front section itself, Kar 114, only went back c 3.5m, whereas Kar 111 to the south went back c 7.5m. After this, the deck of the post-built quay from Phase 3.2 was removed and the area as far back as the front of 114 at 78–79y was backfilled to the height of the unit. On top of these deposits in the western part of grid-square K7 a row of logs was laid transversely, with a second row laid closely together lengthwise over them. This upper row of logs continued over Kar 114 at their rear (see figs 73, 75 and 76).

These two layers of logs, which consolidated and levelled up the area in Søstergården North and Rows 1 and 2 in Gullskoen, were associated in the latter tenement with the first phase of Period 4 (Phase 4.1). They were subsequently covered with a layer of deposits 20-30cm thick and built over in Phase 4.2 by a large substructure, Kar 119. On the basis of what happened in Gullskoen it is reasonable to assume that something similar took place in Søstergården North, but the substructure corresponding to 119 in Phase 4.2 was entirely removed, leaving only the remains from Phase 4.1. Its western extent is unknown, but the surviving remains of contemporary structures to the north and south would suggest that it terminated just west of the excavated area, along 71-72y with post-built quays along 67-68y.

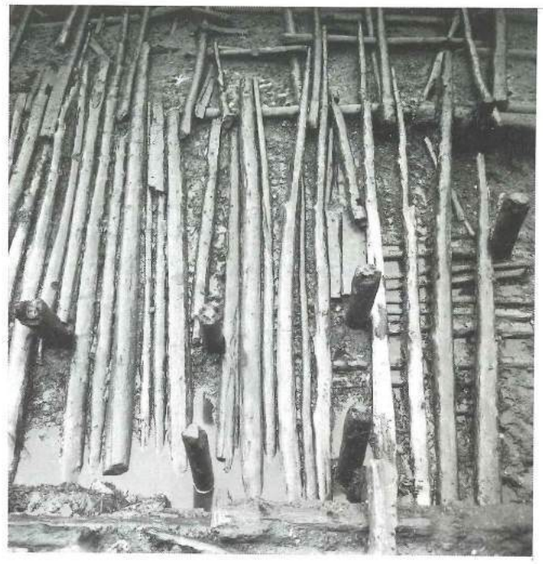


Fig. 75. Layer of logs laid close together to level up the ground in Søstergården North and the adjacent area of Gullskoen after Fire VI (1198). The cross logs in the background belong to the wharf of the preceding phase, burnt in Fire VI.

At the same time as the area was levelled up with the log layer, the opportunity was taken to correct a distortion in the orientation of Søstergården North, which appears to have been caused in Phase 3.2 by the alignment of the tenement on the south side (see figs 73 and 76).

Over most of the extension to the site, this level had been removed by machine, with the exception of a sequence of wells, 28/27/23. Over a barrel standing on natural (Well 28) a rectangular well case with horizontal boards slotted in corner posts was erected, Well 27, the top of which was burnt. This is thought to have happened in Fire V. A similar rectangular casing, Well 23, was erected over this, whose upper section had been destroyed by the machine and which cannot therefore be dated, apart from the fact that it must be later than Well 27. The barrel, Well 28, probably represents a separate well shaft, being earlier than Well 27. It possibly burnt in Fire VI. The internal dimensions of Well 23 were 70cm x 100cm, Well 27 measured 55cm x 80cm internally, and the diameter of Well 28 was c 70cm.

In addition to these wells there was a limited feature in grid-square M7, consisting of the remains of a building with an enclosed sub-floor area, Building 121. To the west, in the western part of M7 and the adjacent area of L7 there were some burnt posts, which from their context would seem to be part of the foundations of a building in

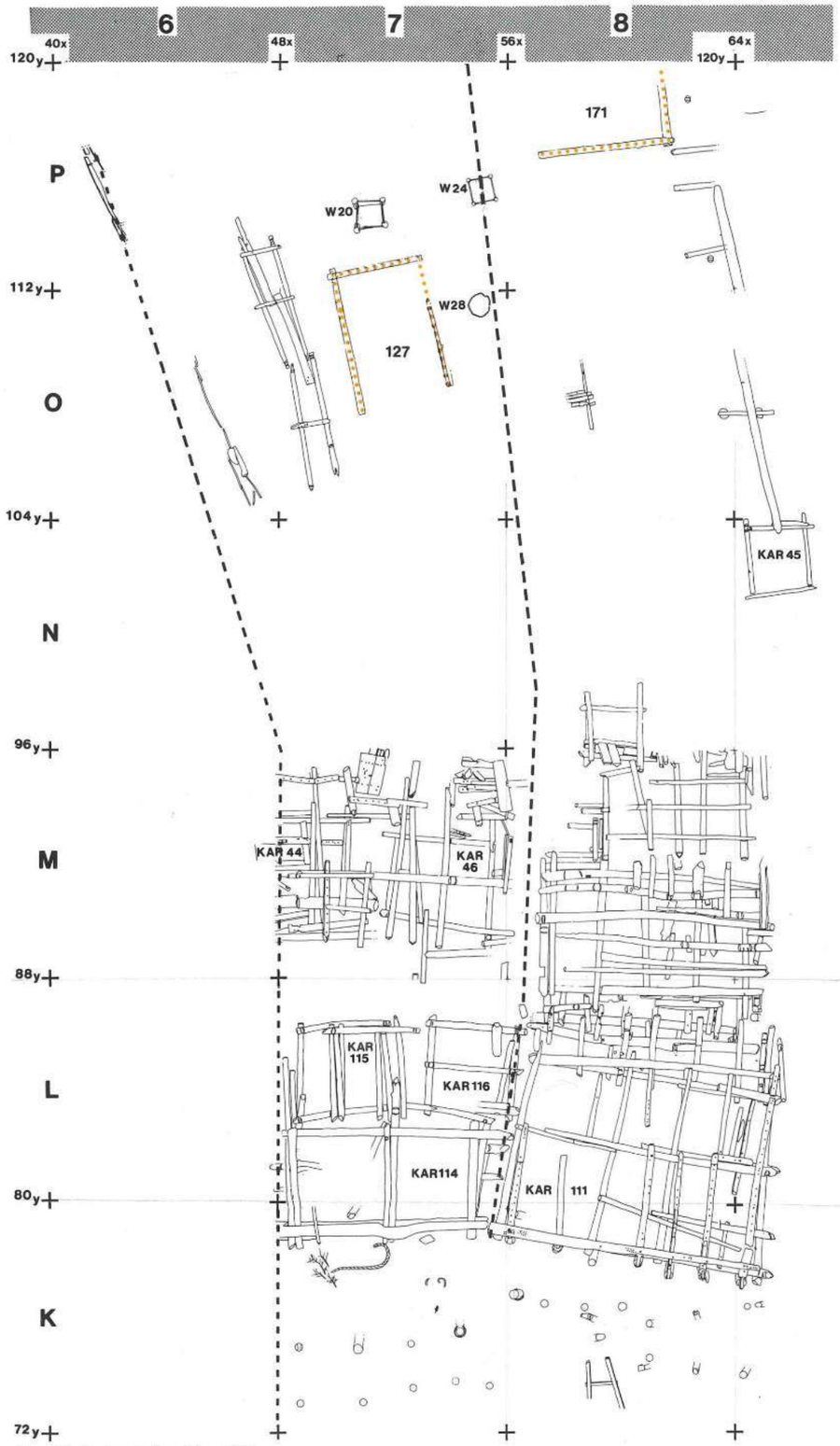


Fig. 76. Søstergården Phase 3.2.

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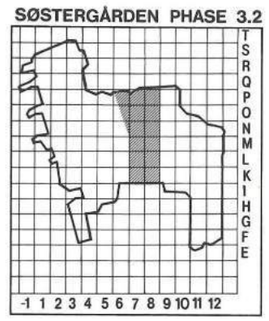

CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
I a	Prev. unknown	9	9.2; 9.1 9.11
I	1702		
I b	Prev. unknown	8	8.2; 8.1 8.11
II	1476		
III	1413	7	7
III b	1393	6	6.3; 6.2 6.21; 6.1 6.11
IV	1332	5	5.2 5.21; 5.1 5.11
V	1248	4	4.2; 4.1
VI	1198	3	3.21; 3.1 3.11
VII	1170/71	2	2.2; 2.1
VIII	Prev. unknown	1	1.2; 1.1

Period 4. It has been designated Building 399. Immediately to the west of this building a group of small stones was found lying among the burnt foundation timbers, but they did not appear to have any connection with a hearth. As mentioned previously, these foundation timbers overlapped the timbers of the contemporary foundations to the south.

Whether the small building with the sub-floor enclosure, Building 122, was a side-annexe to Building 125 in the South Row, or whether it was built up against a building in the North Row, of which no traces survived, has already been mentioned in connection with the description of the South Row (see p 112).

Building 121 (M7,II,III) consisted of the vertical planks of the west wall and fragments from the east wall, with a setting for the north-west corner post and probably one of the foundation posts from the south wall. Eastern limit at c 95.3y; western limit at c 91.6y. Length c 3.7m; width c 6m.

Fig. 77. Part of the waterfront in Søstergården burnt in Fire VI (1198), seen from the west.

Building 399 (L7,X,XI,XI.1,XII; M7,II–IV) consisted of ten or eleven foundation posts, six of which formed a row to the west. Those which had survived to the east formed a more random pattern. Western limit at c 87.5y; the easternmost posts were at 89.9y. The building may have extended as far as Building 121, at c 91–91.5y. Recorded length 2.40m, but it may have been up to 4m long. Recorded width 5.80m.

Summary, Period 4

From Period 4 downwards, grid-squares M–P 7/8 were included in the excavation area, but the deposits belonging to this period had been removed in some places during the mechanical excavation of the upper layers. There was evidence for only one phase of development with the remains of five buildings in the South Row and two in the North Row. The interpretation of some of the structural features is, however, open to question.

In this period the tenement seems to have been laid out with two adjacent rows of buildings and with a passage along the south side adjacent to Engelgården. There was possibly also an internal passage in the rear part of the tenement. The South Row appears to have been divided lengthwise, with the building in the southern half of the row as the major of the two (for example, Building 125, with Building 122 as its annexe). The situation was probably the same in the central and front parts of the South Row, where the two subsequent buildings with their sub-floor enclosures, Buildings 400 and 401, were the side-buildings to main buildings which had not survived. The moss filling of these side-buildings suggests that they may have been privies attached to the missing buildings.

The North Row contained the remains of two large buildings standing on posts, with the area between the floor and the ground being enclosed in each case. What happened further back in the row is not known: any surviving remains had presumably been removed by machine.

In the waterfront area only parts of the foundations had survived. The period began with the dumping of enormous quantities of refuse into the harbour until the sea-bed had been raised to the height of the earlier substructure. On these deposits a close network of timbers running in both directions was laid both in Søstergården North and in the adjacent rows of Gullskoen to the north. As indicated by the development in the latter tenement, this timber network formed the foundations in the first phase of Period 4, Phase 4.1.

The passage along the south side of Søstergården was indicated in a couple of places by longitudinal joists supported on posts with some fragments of boards still surviving in the central area and towards the front.

In this period it was not possible to determine either the width of the rows or the total width of the tenement.

The period terminated with Fire V.

Period 3

Phase 3.2, burnt in Fire VI (1198) (fig 76)

South Row

In the original part of the site, the remains from Period 4 were overlying continuous foundations which belonged

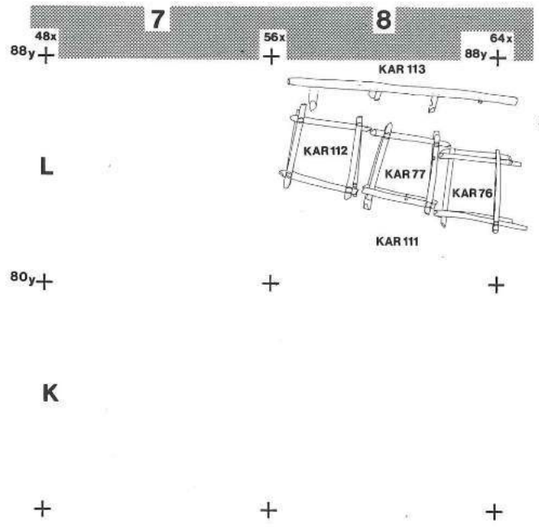

Fig. 78. Plan of foundation substructures 76, 77 and 112 in Søstergården South belonging to the first stage in the redevelopment after Phase 3.1. The foundation substructure Kar 111 at the seaward end formed the front of the wharf for a time during the early part of Phase 3.2.

Fig. 79. Close-up of the horizontal beam at the front of the Søstergården South wharf at the beginning of Phase 3.2. It was embedded with stones to provide a better grip for the feet when embarking or disembarking.

to Phase 3.2. The upper courses of the foundations included five of the originally seven beams which had carried the wooden deck of the wharf and in these were numerous remains of wooden plugs. These beams were fixed in the usual way to vertical posts at the front, so that they formed a solidly constructed wharf with its front at c 78–79y. This large foundation substructure (Kar 111) covered c 50 sq m and comprised sixteen courses of timbers at the front (see fig 77). The back ends of the uppermost nine courses rested on three small, almost square, foundation units, Nos 76, 77 and 112, c 2m x 2m, consisting of eight, three and seven courses of timbers respectively and measuring a good metre high (see fig 78). They were filled with earth. In front of these, deposits had been dumped to raise the sea-bed 60–70cm, and at this level the foundation unit 111 had been constructed, firstly as a separate unit but, as we have seen, ultimately united with those behind.

It is tempting to regard this foundation construction as a wharf, at least in the initial stage of Phase 3.2 – it was supplemented at a later stage with a separate wharf erected on posts in front. This theory would seem to be confirmed by the presence of a massive transverse beam fixed on top of the front edge, into whose upper surface two, and sometimes three, rows of small stones had been driven, clearly in order to provide a better grip for the feet when embarking and disembarking (see fig 79).

The beams carrying the deck were cut through 4–4.20m behind the front posts, and the plugholes indicated that this must have been the minimum width of the wharf as long as the structure served as the wharf itself. However, the southernmost of these beams, whose surviving length was c 7.5m, had plugholes at regular intervals for its entire length, possibly indicating that the wharf went back further than usual. The explanation for this may lie in the fact that the neighbouring row of Engelgården was c 4–5m shorter and if communication along the wharfs was to be maintained, it would have necessitated reserving a larger area at the front of Søstergården for the wharf (cf figs 76 and 91). It is, however, doubtful whether, or to what extent, such considerations would have been made between one tenement and the next. An alternative explanation, and perhaps the most likely one, could be that the front building in Søstergården stood at the ususal distance from the front of the wharf, but with a plank deck along the south side, perhaps as an extension to the passage between Søstergården and Engelgården, which would have given access to Engelgården's wharf.

The upper edge of the beams holding the planked surface was recorded as c 20cm below site datum, which would indicate that the wharf had subsided at least 70–80cm. As the depth of the foundations here was c 2.1m, this would indicate that the depth of water in front of the structure in this period would have been 1.50–1.60m at mean sea level.

After a while this situation must have been succeeded by a new wharf built on posts at c 73y with a ladder in front of it (see fig 76). This wharf was documented by thirteen posts altogether, which were arranged in two rows. In the course of time they fell between the structure of the earlier waterfront, Kar 111, and the layer of beams from Period 4 which sealed them. This corresponded to the local solution in both the North Row and the adjacent parts of Gullskoen. The length of the wharf from front to back was

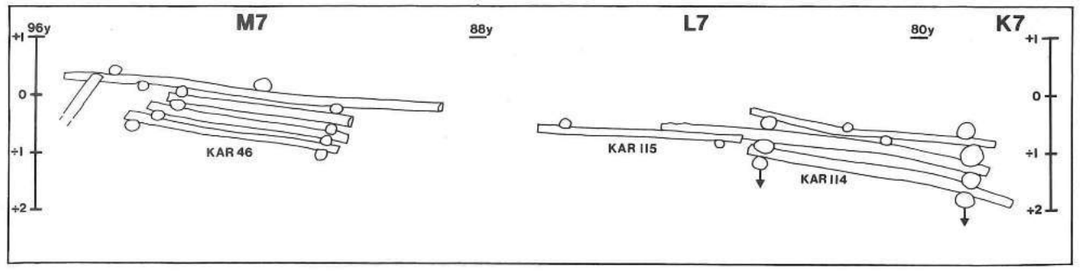

Fig. 81. Simplified long-section showing the main features in the development of the waterfront in Søstergården North in Phase 3.2, seen from the north. It was based at the rear on the substructure Kar 46 from Sub-phase 3.1.1, continued over Kar 115 in the centre, and terminated at the seaward end with Kar 114, which formed the substructure of the waterfront buildings. The substructures were bound together with several layers of timbers laid at right angles to each other.

c 5m, but the depth of water in front of the wharf is not known: it could have been around 2m.

The foundations of the wharf along 78y stretched with some overlapping of timbers over a distance of c 21m as far back as c 99y in grid-square N8. There were no identifiable traces of buildings here except for some scattered remains in O8 and P8 and three or four posts and vertical boards in the eastern part of L8, which may be from the western wall of a light structure, but this has not been assigned a Building No.

In grid-square P8 there were some intact sections of sill-beams from the west and south walls of a log building, Building 171, which continued to the east beyond the edge of the excavations.

In the central part of the row, the buildings followed the usual east-west orientation, but further back there was a change in direction towards the north-east, such as had been recorded in Periods 5 and 4, but this time more pronounced. It occurred around c 98–102y and may therefore reflect some original topographical feature, since in the preceding periods this was found to be the approximate point of the break in slope between the beach and the deeper waters of the harbour.

Within the front 7–8m (in the foundation substructure Kar 111) another change of direction was noted, this time towards the front part of the North Row. Several features indicated that this part of the South Row must have been erected before the corresponding section in the North Row and also partly at the expense of the latter (cf comments on the North Row, p 119, and summary, p 127).

Building 171 (P8,V) consisted only of parts of the sill-beams of the south and west walls. Its eastern limit lay outside the excavated area. No dimensions can be given.

The width of the foundation structure at the front was 9.8–10m, being reduced c 10m further back to c 8.3m.

Tenement passage

In Phase 3.2 in the eastern part of the site, there was a passage between Søstergården and Engelgården, which consisted of planks laid lengthwise over transverse joists. Towards the rear of the site these were laid directly on the contemporary ground surface, but in the middle they were laid on joists supported on posts. In gridsquare N9, the foundation substructure Kar 45 from Period 2 was re-used as a foundation for the passage surface. Although it was not clear, it is not unlikely that the western continuation of this passage continued over the southern section of the waterfront foundation substructure, Kar 111, and ran into the passage indicated there (cf p 116). The width of the tenement passage was c 1m.

North Row

In the original excavation area the layer from Fire VI covered a similar area as that from Fire V, as far as c 83y in the middle of grid-square L7, but the level was also indicated by burnt beams out to the front of the substructure, Kar 114, at 79y. It extended backwards for 4m into grid-square M7, but further east it had been removed.

The substructure Kar 114 ended on the same alignment as the front substructure in the South Row, Kar 111, which was interpreted as the actual wharf. A closer investigation has shown that the longitudinal beams of Kar 114 projected 60–65cm out from the front of the structure and this would seem to eliminate its use as a wharf. Moreover, there were ten or eleven posts in front of it, more or less arranged in two parallel rows across the North Row at a distance of 3–3.2m and 5–6m respectively from the front of Kar 114. On the basis of a contemporary post 10m to the north in grid-square K5 which still had the remains of a locking beam with plugholes attached to it, it is reasonable to interpret these posts in front of Søstergården North as the supports for a wharf structure in this period. Some of the posts had survived to a height of 3m and had transverse anchoring beams near the base, indicating that the level of the sea-bed lay at c 1.5m below site datum. The height of the foundation unit itself was 1.6–1.7m at least, giving a depth of water of 80–100cm. The front of the wharf in this phase probably lay at c 73.5–74y.

Since the remains of rope were found coiled round the foot of two of the rear posts, the construction of the wharf may have been spread over more than one phase.

The foremost sixteen or seventeen metres of the tenement foundations were quite different from everything further back. In grid-square M7 the earlier unburnt foundations of Kar 44 and Kar 46 in Phase 3.1 had been re-used and built on (see fig 81). They had first been extended backwards for c 1.3–1.5m with a layer of supporting beams laid lengthwise with their eastern ends resting on posts. After this the whole arrangement had been levelled up with 4–5 interlocking courses of beams and new foundations were then constructed in grid-square L7 like those

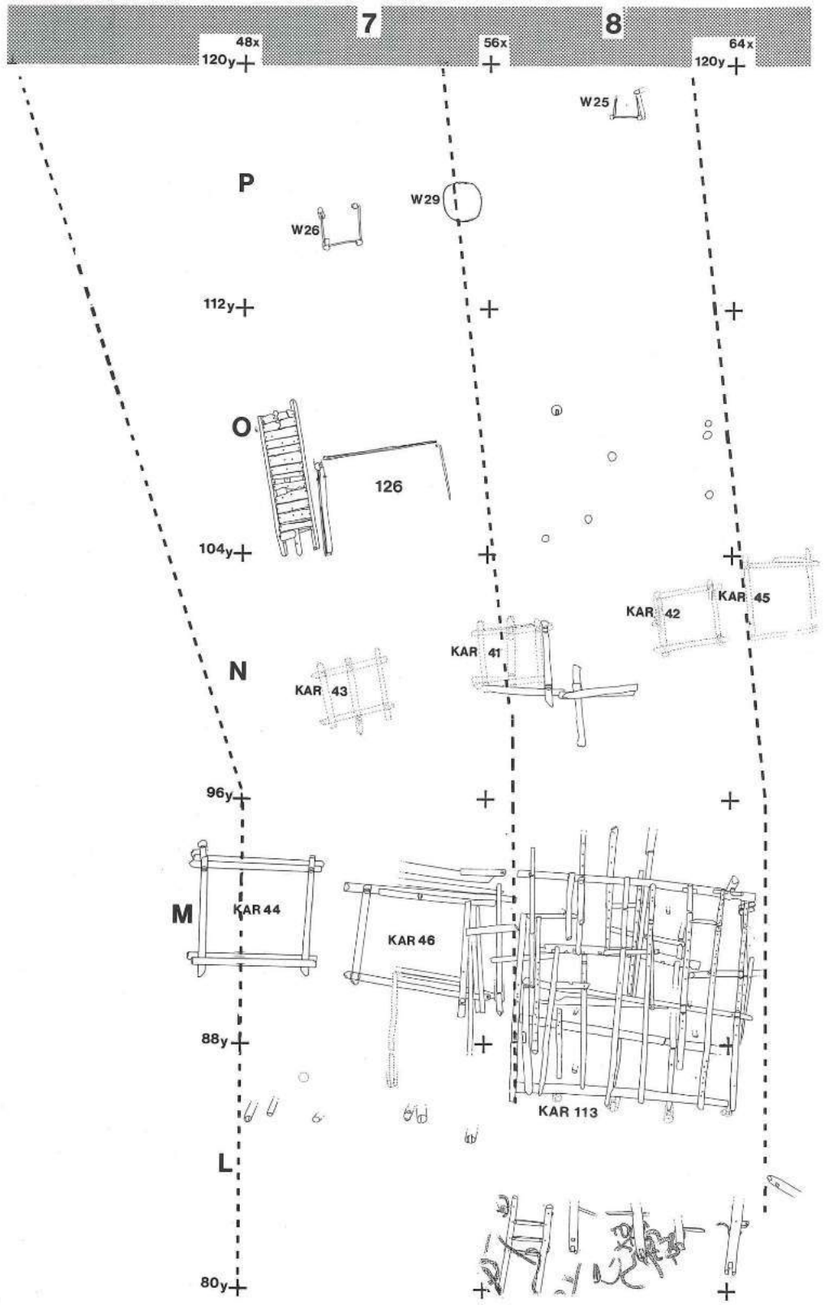

Fig. 80. Søstergården Phase 3.1.1 and 3.1. The Period 2 caissons 43, 41, 42 and 45 are indicated by dotted lines.

in the South Row. They consisted of a foundation substructure at the front, Kar 114, whose upper timbers were connected at the back to two small rectangular foundation units, 115 and 116 (see figs 76 and 81). Finally, the foundations in grid-squares L7 and M7 were joined together at the top. In Phase 3.2, this front section of the row had the traditional east–west orientation, at least as far as the major part of the structure was concerned and probably also the wharf itself. This is in contrast to the ESE/WNW orientation of the South Row at this time.

The foundations of the North Row wharf were combined structurally with the foundations beneath The Old Church Road and Gullskoen to the north: all the transverse beams in the wharf were extended either using fish-

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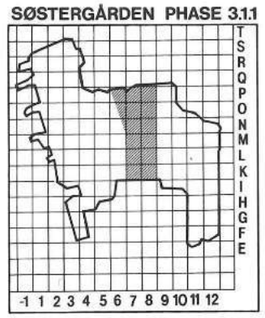
SØSTERGÅRDEN PHASE 3.1.1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
O	1955		
I a	Prev. unknown	9	9.2; 9.1; 9.1.1
I	1702		
I b	Prev. unknown	8	8.2; 8.1; 8.1.1
II	1476		
III	1413	7	7
III b	1393	6	6.3; 6.2; 6.2.1; 6.1; 6.1.1
IV	1332	5	5.2; 5.2.1; 5.1; 5.1.1
V	1248	4	4.2; 4.1
VI	1198	3	3.2; 3.2.1; 3.1
VII	1170/71	2	2.2; 2.1
VIII	Prev. unknown	1	1.2; 1.1

plates or by a good overlapping. From the North Row onwards, there was thus a great waterfront united structurally and stretching for 16.70m. There was no attempt to join this physically to the foundations of the South Row: quite the contrary, in fact, as the noticeably deviating alignment of the South Row wharf seems to have presented its neighbour on the north side with an uncomfortable *fait accompli* – over a distance of 7m the front section of the South Row swung c 1.5m towards the north (see fig 76). It is quite clear that the foundations of the South Row were laid before the corresponding work was begun in the North Row. In the next phase, Period 4, as we have already seen (p 114), this deviation was straightened out by laying the new foundations at the front of the North Row substantially over those of the South Row.

There were no remains of any actual buildings in the original area of the excavations, grid-squares K7 and L7.

In the later extension to the site, traces of Fire VI were limited to grid-square M7. No remains of buildings were recorded, but there were massive foundation timbers laid in several layers. The rearward limit was not identified.

In grid-square N7 there were some posts and post-holes which unfortunately could not be properly recorded and which may belong to Period 2 or perhaps to Phase 3.1.

In grid-square O7 and the adjacent part of P6 the side planks of a drain were recorded over a distance of c 14m. Its location and orientation with regard to the first row of buildings in Gullskoen would suggest that it occupied the gap between Søstergården North and the first row in Gullskoen.

About 2.5–3m to the south of this drain and with more or less the same orientation, there were the remains of a planked gangway 1–1.10m wide and also half the ground-frame of a building, Building 127. There were weak traces of burning associated with the building, but although the other remains were all unburnt, they were stratigraphically connected with Phase 3.2. These features were orientated ENE/WSW, and thus deviated from the usual alignment, but they followed the same tendency as the South Row, and it would therefore seem that there was a change in the alignment of the tenement in this area, somewhere around 98–102y, which happened to coincide almost exactly with the edge of the underwater shelf.

Although there appeared to be an undeveloped area 2.5–3m wide on the north side of the passage, there were indications that it was running between two buildings and that the remains of the building to the north had simply not survived. Compared with Phase 3.1 and especially with Period 2, it is nevertheless clear from the area which could be occupied by buildings, regardless of whether it was actually built on or not, that the row was divided lengthwise in the same way as we have described previously in connection with the higher levels, but that within the North Row the layout was in effect that of a double tenement (for further details, see Period 2, pp 124–25). Between Building 127 and the assumed northern boundary of the South Row there also seemed to be plenty of room. The tenement increased in width from an assumed c 16m at the western end to almost 20m in the rear part of the site and most of the extra space seems to have fallen to the North Row.

A group of wells at the rear of the row probably belonged to Phase 3.2. They were all either preceded by or were themselves predecessors of later wells and therefore represent a long tradition concerning the function of this part of the tenement. Well 28 was a sunken barrel construction which was succeeded by Wells 27 and 23 (see p 113). Well 24 was constructed with horizontal planks slotted into corner posts and it succeeded a large barrel-lined shaft, Well 29, from Phase 3.1. Well 20, which was constructed in the same way as Well 24, succeeded Well 26 from Phase 3.1, which had the same construction. The internal dimensions of Well 20 were c 98cm x 96cm and of Well 24 were c 76cm x 80cm.

Building 127 (P7,II; O7,II) consisted of the sill-beams on the east and north sides, and parts of the sill-beam on the south side. The building was of mixed construction. The sill-beam on the east side was notched at the north end for a log construction, but was slotted into a vertical corner post at the south end. The sill-beam on the south side, of which fragments had survived, was supported on a post in the middle. The east wall lay at an angle at 112.6–113.2y, and the north wall extended to 107.65y at its north end. Assumed length c 5m; width 3.30m.

Sub-phase 3.1.1 and Phase 3.1, unburnt levels below Fire VI (fig 80)

South Row

The earlier part of Period 3 consisted of several stages of development, especially in the South Row, but it was not possible to record the relationship between them. This account will therefore begin with a description of the respective elements as a basis for arriving at some mutual relationship.

The basic feature consisted of two small earth-filled foundation structures or caissons, Kar 47 and Kar 48, with 16 and 11 courses of timbering respectively (see fig 82). Each caisson formed a good solid structure with the help of four stakes driven into the ground on the outside. Edward Harris, who excavated them, noted that together they could have formed an independent wharf, basing his assumption on the fact that the state in which they were found represented a reduction from their original height. This may be correct, but I still find it hard to accept that they could have formed an independent waterfront. If they did, then it could only have functioned for a limited period of time, and even then, there must surely have been

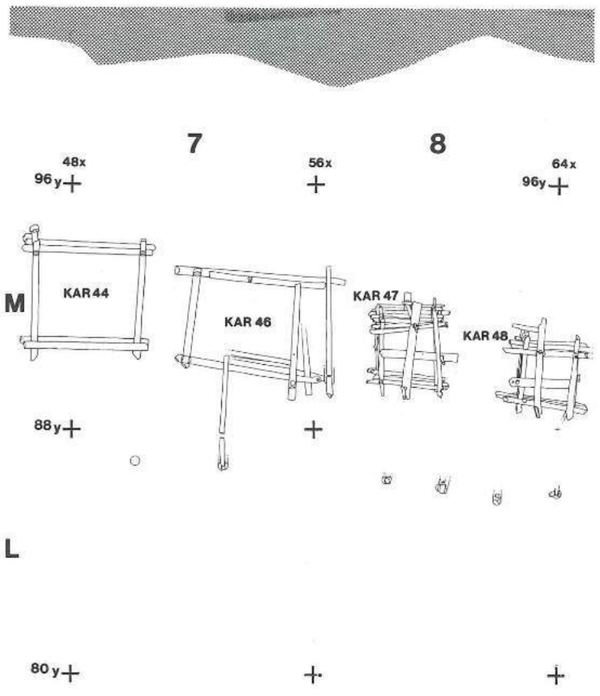
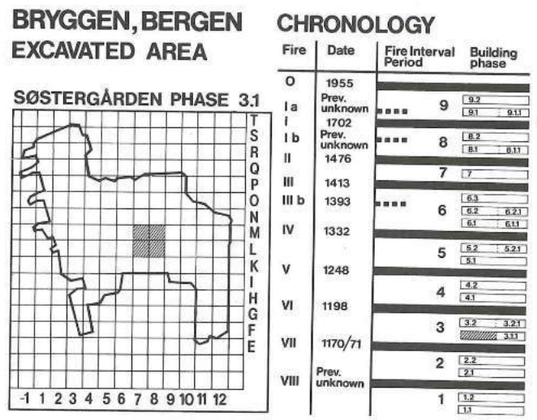


Fig. 82. Plan of the front substructures in Søstergården South with the posts of the quay in front. Phase 3.1, erected after 1170/71. The construction of the substructures Kar 47 and Kar 48 can suggest that they actually served as a wharf for a time.

a separate wharf on posts in front. However, no traces of any such construction were found during excavation. On closer analysis, however, the theory that they may have formed a component of an independent wharf does seem to be supported, since the front posts in actual fact could be identified (along 87y), albeit «disguised» as stabilizing vertical elements at the front of a foundation substructure from the next phase. This had been constructed so that its front abutted the posts supporting the earlier quay, and from then on they functioned as its stabilizing supports. After the wharf deck in front of the foundation units Kar 47 and Kar 48 had been removed, the units were reduced in height and then built over by a larger foundation substructure, Kar 113 (see fig 80). Four posts were recorded at the front of this, all with grooves at the top which must have held the horizontal locking beams which had carried the original planking from Phase 3.1. Fragments of two of them were by all accounts still *in situ*.

At the time of its excavation in 1972, the substructure Kar 113 and the posts in front of it were regarded as a single unit and interpreted as a wharf. This interpretation can no longer be upheld. There was, for example, no structural or physical connection between Kar 113 and the posts, and although the southernmost post was slanting towards 113, its base was situated beyond the south-west corner of the substructure. A natural explanation would be that the posts were earlier, and their closest associations would have been with the two foundation units, 47 and 48. These two elements should therefore be regarded as a



single unit (see fig 82). The wharf front, which has been placed in Phase 3.1, ran along c 87y.

The overlying substructure, Kar 113, must represent the next stage of development, with its own c 3.5m wide wharf in front of it, indicated by five upright posts along c 83y with a ladder associated with them (see figs 80 and 83). This stage has been placed in Phase 3.1.1.

Further back in the row, in grid-square O8, there were a number of post-holes, some of which may have belonged to Phase 3.1, some to Period 2. There was otherwise no evidence for any standing structures, with two possible exceptions – a well, No.25, built with horizontal planks slotted into corner uprights, and the limited rebuilding of an earlier substructure, Kar 41, in the north part of grid-square N8, which involved the addition of two courses of timbering. There were no traces of burning at this level.

Tenement passage

The passage adjacent to Engelgården may have been the same as that recorded in Phase 3.2.

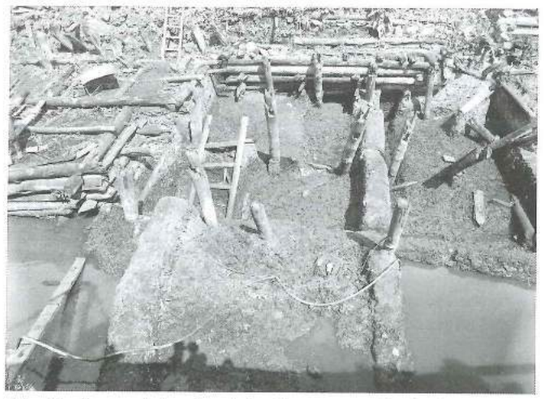


Fig. 83. Søstergården South looking east, with the front of the foundation substructure Kar 113 from Sub-phase 3.1.1 in the background and the posts of the associated quay in front of it, together with the remains of a ladder, which had originally leaned against the front of the quay in this phase. The three posts in the foreground belong to a later phase.

North Row

As in Phase 3.2 there were just random structural remains at the east end of the North Row, but sections of an internal passage had survived over a distance of c 5m. It formed the basis for the passage in the following Phase 3.2. On its south side lay the remains of the sill-beams from the north, east and south walls of a building standing on posts, Building 126 (see figs 80 and 84). This had probably been constructed with walls of horizontal planks slotted into the corner uprights. As there was an area 4.5–5m wide between the remains of the internal passage and Building 478 in the neighbouring tenement of Gullskoen, there would have been room for a row of buildings along the north side of the passage. The area narrowed to 3.5–4m towards the west, but widened to c 6m at the east end of the site.

The general layout indicated that the North Row had been divided lengthwise into two strips of similar width. In other words what we have been calling the North Row in the later periods was in this phase a regular double tenement in itself, and this situation was even clearer in the preceding Phase 2 (cf pp 124–25).

A number of free-standing posts towards the rear of the site could have belonged to this phase, and probably also a barrel-lined well shaft, Well 29, together with another well built with horizontal planks slotted into corner uprights, Well 26. The former was 1.20m in diameter internally; the latter was square with sides measuring c 1.2m. The foundation substructures from Phase 2 at the front of the row, Kar 41 and Kar 43, were apparently re-used in this phase.

Within the western part of the North Row the situation was completely different from that encountered in the South Row. In both rows the waterfront itself had been built in two stages, but while that in the South Row consisted of several sections – the basic substructures to the rear, Kar 47 and Kar 48, with their four wharf-bearing posts forming the first front, and Kar 113 with its post-built wharf forming the next wharf – the waterfront of the North Row consisted of two medium-sized substructures, Kar 44 and Kar 46, without any overlying construction and with the remains of two successive post-built wharfs in front. One of the posts from the earlier wharf had survived intact, together with the remains of the horizontal locking beam. The existence of a second post helped to confirm that there had been a waterfront along c 86.7–87y. The interpretation is further supported by a similar row of posts along 86–87y in grid-squares L6 and L5 to the north. The wharf in the North Row measured a good 3m from front to back. The later row of posts lay c 1.5m further west, but can hardly represent anything more than a minor adjustment to the waterfront during this phase (see fig 80).

Viewed in isolation, the main features of the two rows in Søstergården in this phase of Period 3 are clear enough, but in combination problems of a functional nature immediately become obvious. With the substructures 44 and 46 and their contemporary wharf front along c 87y, the tenement waterfront in Phase 3.1 ran more or less in a straight line, but with the erection of the wharf on posts ending around 83y in the South Row a new situation occurred. One would normally have expected the first building in the row to have extended to the front of the foundation substructure at c 87y, but this would have hindered communication along the wharfs. It must therefore be assumed that the front building in the South Row did not stand so far forward. Nevertheless, the expansion in this period

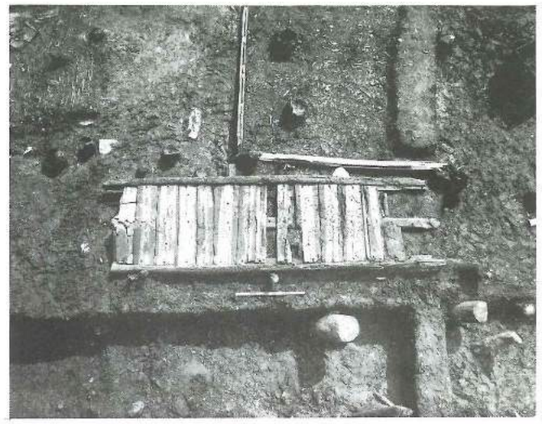


Fig. 84. The surviving remains of the tenement passage in Søstergården from Phase 3.1, together with the sill-beams of Building 126 supported on posts. Seen from the north.

could have brought about a need or a desire to adjust the line of the wharf in the North Row. This may be the stage of development which is described as Phase 3.1.1.

Building 126 (O7,II) consisted of the north-eastern corner post with the remains of the adjacent east wall and sill-beam and c 3m of the north wall, as well as almost 2m at the eastern end of the south wall. Eastern limit at 107–107.6y; western limit uncertain. Maximum recorded length 3m; width 4.20m.

Summary, Period 3

Two building phases were recorded in this short period, but the seaward expansion of the tenement took place in three stages, described as Phases 3.1, 3.1.1 and 3.2. The basic structures from Phase 3.1 were re-used in the following phase, 3.1.1.

Common to the two major phases was a noticeable change in the alignment of the rear part of the tenement: around 98–100y it turned towards the NNE. While the South Row seems to have had the same width throughout its length, the North Row showed a significant fan-shaped extension at the rear. Otherwise both phases are characterized by the existence of only a few fragmentary remains of structures, which can be stratigraphically associated with the wharfs.

In Phase 3.2 only one building was identified in each row. They were both of log construction and both stood at the rear of the site. Between the two buildings the remains of three wells were found. The existence of the remains of an internal passage running down the centre of the North Row with room on the north side for a row of buildings indicated that this half of the tenement was laid out as a typical double tenement at this point, a feature which was also found in the preceding phase.

The main tenement passage ran along the south side of the South Row.

The front of the northern half of the tenement consisted solely of foundation timbers laid at right angles to each other through numerous courses and extending for c 20m backwards. At this level the two rows in Søstergården were quite separate, but the foundations of the North Row

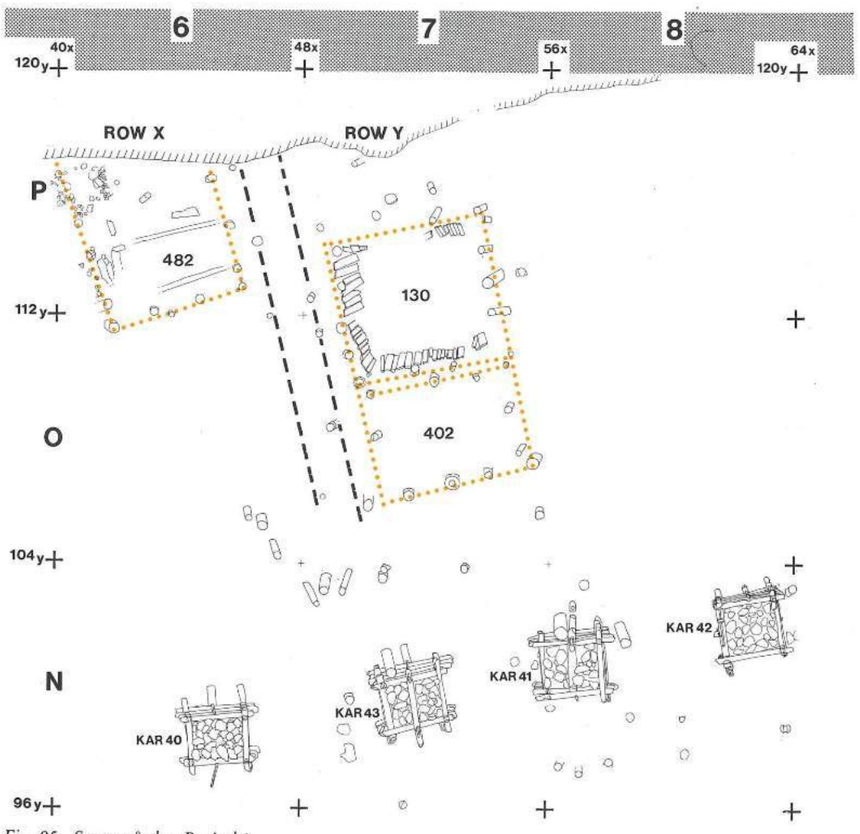


Fig. 85. Søstergården Period 2.

were integrated into a long continuous structure stretching northwards, which included The Old Church Road as well as the next two rows of Gullskoen. The foundation substructure for the South Row may have functioned as a wharf for a while before being extended with a new wharf standing on posts similar to the wharf of the North Row and measuring c 5m from front to back. The remains of a ladder indicated the seaward limit of the structure.

The waterfront is unusual in this phase in that the wharf of the South Row projected significantly further forward than that of Engelgården (see fig 91). This would clearly have caused problems in communication along the front of the tenements. There was nothing to hinder communication along the front of Bugården and Engelgården to the south, except for some slight differences in height, but to allow access to Søstergården, either the wharf of Søstergården South must have extended further back than usual over the main foundation substructure, or else the passage along the south side of the tenement must have been incorporated into the wharf. This is the more likely solution. Plug-holes for the planked deck could be traced 7.50m back over the main foundations. In the earlier phase, when the foundation substructure also functioned as a wharf, there may still have been problems of communication to the north.

In Phase 3.1 there were only the remains of a single building, Building 126, in addition to a few posts which were possibly structural, and three wells at the rear of the site. Building 126 stood in the southern half of the North Row with the remains of a passage running along its north side. This suggests that the tenement had the same layout as in the following phase 3.2 (see p 119 above and also Period 2 below).

In the middle of the site, four or five stone-filled caissons from an earlier phase seemed to have been re-used as part of the foundations for this phase.

The construction of the waterfront took place in two stages, but with a different result in the two rows. In the first stage, Phase 3.1, the front consisted of small foundation units of different shapes and sizes. The smallest in the South Row had the same form and dimensions as the earlier foundation units from Period 2. They were joined together at the top by timbers which were later removed and there was a c 3m wide wharf on posts in front. After a while, in Phase 3.1.1, a new foundation system, Kar 113, was laid over the top of the earlier units and a 3.5m wide wharf was erected on posts in front with a ladder at the seaward side. In the North Row a different construction was used. The extension of the South Row had probably caused problems in communication along the front and to solve this it was necessary also to extend the wharf of the North Row. This took the form of a limited addition of 1.5–2m to the front. Otherwise this phase was the same as Phase 3.1.

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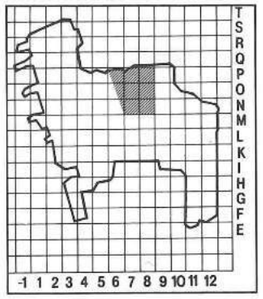
SØSTERGÅRDEN PERIOD 2



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
I a	Prev. unknown	9	9.2 / 9.1 : 9.11
I	1702		
I b	Prev. unknown	8	8.2 / 8.1 : 8.11
II	1476		
III	1413	7	7
III b	1393	6	6.3 / 6.2 : 6.21 / 6.1 : 6.11
IV	1332		
		5	5.2 : 5.21 / 5.1 : 5.11
V	1248		
		4	4.2 / 4.1
VI	1198		
		3	3.2 : 3.21 / 3.1 : 3.11
VII	1170/71		
		2	
VIII	Prev. unknown		
		1	1.2 / 1.1

Period 2, burnt in Fire VII (1170/71) (fig 85)

South Row

It was mentioned above that the foundation structure Kar 41 from an earlier phase had been extended and re-used in Phase 3.1. This foundation unit, or caisson, was from Period 2, and although it had the same form and was constructed in the same way as the earth-filled units 47 and 48 in Phase 3.1, it was smaller than these, stood further back, and was filled with stone. It stood at the bottom edge of the c 30m wide sandy beach and was one of a long row of similar structures which were uncovered during excavation, standing on the outer edge of the underwater shelf (see fig 86). At right angles to this row, especially in Gullskoen, more caissons ran at intervals in parallel rows back up the beach for some distance. These structures, together with the caisson Kar 45 in the adjacent tenement of Engelgården on the south side, represented in combination a significant expansion of the built-up area over the beach right out to the edge of the shelf, and this is characteristic for the whole site from this point northwards. It is reasonable to assume that these stone-filled caissons marked the seaward limit of the development in this period with wharfs supported on upright posts standing in front. The rows of caissons running up the beach would thus have marked the passages running between the tenements. This will become clearer when viewed in a wider perspective.

In grid-square N8 there were two of these caissons, Nos 41 and 42, measuring c 1.8 x 2m, standing 3.8–3.9m apart more or less on the sandy beach with the bottom course of timbers at -22cm. They were both over 1.50m high. In such a location they could not have formed part of the waterfront. On the other hand there were the remains of upright posts in front of them which can only make sense if they are interpreted as the front of a wharf. This wharf would have measured at least 2.50m from front to back. What the depth of water in front of it would have been is uncertain, but as the sea-bed dropped suddenly here, it would have given an acceptable draught regardless of how much the level had been built up with deposits. One can safely reckon with a depth of at least 1m.

The area behind the caissons contained both post-holes and a number of posts, and although the site documentation does not allow for any satisfactory interpretation, there is no reason to regard this area as undeveloped. It is thought that the phase burnt in Fire VII.

North Row

As in the South Row, the built-up area ended at the outer edge of the underwater shelf along 99–100y in the middle of grid-square N7 and was marked by a stone-filled caisson, Kar 43, and perhaps also by caisson 40. Caisson 43 stood a little above the middle point of average tides, which presupposes a wharf standing on upright posts in front of it, just like the rest of the caissons along the edge of the underwater shelf. In the area behind and also to some extent between them there were the remains of several posts, and from the circumstances several of these must have burnt in Fire VI. In grid-square O7, the posts formed a rectangular pattern, which must mark the outline of a building, Building 402, and just to the east there were several fragments of the ground-frame of a building with upright plank walls, Building 130 (see figs 85 and 87).

Building 402 (O7,IV) consisted of eight, or possibly eleven, posts which had supported the building. The eastern limit lay at an angle along 109.5–110.3y; the western limit lay at 106–107y. Length c 3.5m; width c 5m.

Building 130 (O7,II; P7,V) comprised most of the posts supporting the ground-frame of a building and the burnt remains of vertical plank walls below the floor level on the north, west and east sides. Eastern limit somewhat uncertain but probably at c 114.5–115.6y; western limit at 109.7–110.7y. Length c 5m; width c 5.2m.

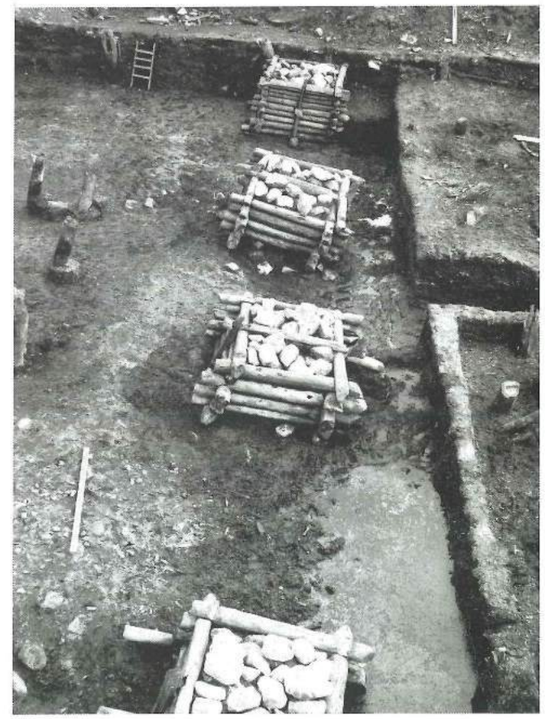


Fig. 86. Caissons 40, 43, 41 and 42 in the long row of foundation substructures belonging to Period 2 (up to 1170/71) located at the front of the beach on the edge of the underwater shelf. Seen from the north.

North of Buildings 402 and 130 a passage carried on upright posts could be traced over a distance of c 11m. There were three pairs of posts and three single ones. Between this passage and the first row of buildings in Gullskoen there were the remains of a building supported on posts, Building 482. Although the area between the passage and Gullskoen became narrower towards the front, there was room for further buildings, so that Building 482 could belong to a separate row of buildings, which we shall call Row X.

Row X in Søstergården North

Building 482 (O6,IX–XI; P6,X,XI,XVI) consisted of thirteen foundation posts in all, together with fragments of transverse floor joists, and scattered fragments of possible floorboards. Eastern limit at c 116.6y on the north side; western limit at c 111.5y. Length c 5.3m; width c 5.3m.

As suggested above, Building 482 could have been part of a row of buildings, designated Row X, forming one half of a regular double tenement, the other row being represented by Buildings 130 and 402 (see fig 85). Both from their location and from later tradition, however, the row to which these two buildings belonged ought really be described as Søstergården North, but for the sake of clarity it will be referred to here as Row Y. The layout documented here confirmed the hypothesis, which has already been put forward, that the row was divided longitudinally in Phase 3.1 and 3.2 (see pp 119 and 121), but in contrast to the other tenements where a longitudinal division was noted – Bugården, Engelgården and Søstergården South – in which there was always a wide main building and a narrow subsidiary structure or side-annexe, we have in this case all the features of a regular double tenement. The existence of this layout also strengthens the impression given in the later phases that Søstergården's North Row was in fact facing northwards, and it perhaps also helps to explain the isolated nature of Søstergården South.

In contrast to Row Y and the South Row, Row X narrowed considerably to the west, from a width of c 5.5m at the east end to c 3.7–3.8 at the west end. The total width of the whole tenement is estimated as approximately 17m at the waterside, and as much as 22m at the rear of the site. For the South Row alone, the comparable figures are c 7m and 7.5m, and for the two rows in the North Row taken together the figures are c 10m and 13.5m.

Throughout the whole of the period covered by the investigations, the southern limit of the tenement was fixed at c 63x at 120.00y, while the northern boundary, which in Period 2 lay at 39x at 120.00y, gradually took on a more east–west direction through a continual reduction in the width of the tenement at the rear. In the c 800 years between Period 2 and the present day, the adjustment at the eastern end of the site did not involve a greater movement of the northern boundary than c 4m. This reduction in width seems to have already begun in Phase 3.1 and continued in Phase 3.2. At the beginning of this period around 1180 or 1190, the position of the northern boundary at 120.00y was only 2–3m different from its position in 1955, while at 96.00y there was no divergence at all. This situation remained essentially unchanged.

Summary, Period 2

In Period 2 there were probably three rows of buildings occupying the site of the tenement, but no structural remains were recorded in the South Row. The North Row, which was in effect a double row in this period, extended a couple of metres further north than it did in the later periods. The remains of one building were recorded in Row X, the northerly of the two rows in the North Row, and two were recorded in the southerly row, Row Y. These had all been erected on foundation posts. In addition a number of posts and post-holes were found at this level which could not be related to any definite structures. Between the buildings recorded in Rows X and Y were the foundation posts from a gangway or passage, partly arranged in pairs. The built-up area in Period 2 had spread out across the beach area and its waterfront was marked by small, square, log-built caissons filled with stones, standing on the edge of the underwater shelf. Posts in front of these indicated the existence of separate wharfs, while the caissons themselves presumably formed the foundations beneath the front of the wharfside buildings.

The tendency towards different layouts, types of buildings and wharfs, which we recorded in the later periods, can now be seen to be based on earlier traditions. There were, however, few common features which were repeated from phase to phase: in one way or another each row manifested its own particular characteristics at each phase. What is perhaps most strongly evident is the isolated nature of the South Row and the orientation of the North Row, the latter at times being physically integrated with the structures to the north. With the North Row clearly defined as a double row in the earliest phases, it is reasonable to assume that the site occupied by Søstergården may originally have consisted of two separate tenements, the tenement to the north being a double row made up of Rows X and Y, and that to the south being a single row or tenement, and that they were all later combined into one tenement. On the other hand, the outer limits of Søstergården remained basically the same throughout the course of time, and any adjustments which took place were always associated solely with the northern boundary.

Fig. 87. In the foreground: Building 130 in Søstergården North, supported on posts, seen from the east. The gap under the floor was enclosed with upright planks placed edge to edge. Posts belonging to Building 402 can be seen to the west of this building. In the background, the contemporary waterfront is marked by the row of caissons along the bottom of the beach (from right to left: 40, 43, 41 and 42).

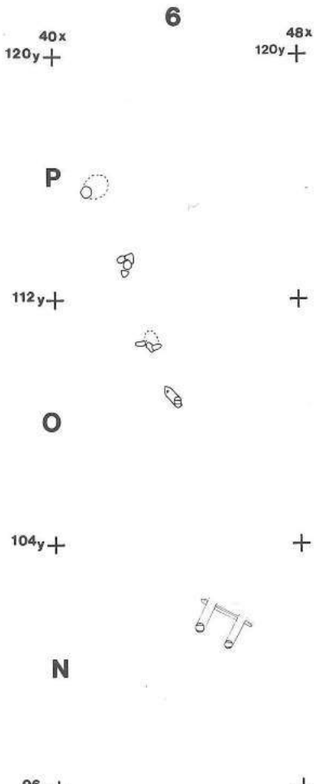


Fig. 88. Plan of the row of posts under Søstergården North, partly dug into the beach gravel, the first two connected at their base. The posts were probably part of a jetty belonging to Period 1, running out from the beach. Cf fig 89.

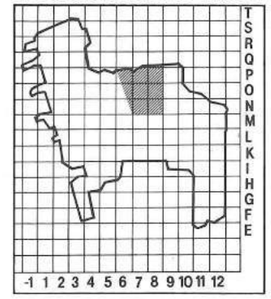
Period 1 (fig 88)

North Row

During the removal of the deposits by machine in 1971–72, five posts and a post-hole were recorded lying more or less along the northern boundary of Søstergården over a distance of c 15m. The two westernmost posts were only c 1 m apart and were joined just above their base by a horizontal timber running transversely through a relatively large hole in each. At the top they each had a rectangular cut for receiving a similar beam. They were roughly pointed at the bottom and had been driven down through the natural beach gravel. Similar pairs of posts were recorded in the medieval excavations at Borgund, near Ålesund, further north along the west coast of Norway (Herteig 1975, 28, fig 4), where they were interpreted as the supports for narrow jetties. They were solidly anchored to the bottom by heavy stones placed on the transverse timbers as in Søstergården.

BRYGGEN, BERGEN
EXCAVATED AREA

SØSTERGÅRDEN PERIOD 1



CHRONOLOGY

Fire	Date	Fire Interval Period	Building phase
0	1955		
Ia	Prev. unknown	9	9.2 / 9.1
I	1702		
Ib	Prev. unknown	8	8.2 / 8.1 8.11
II	1476	7	7
III	1413		
III b	1393	6	6.3 / 6.2 6.21 / 6.1 6.11
IV	1332	5	5.2 5.21 / 5.1 5.11
V	1248	4	4.2 / 4.1
VI	1198	3	3.2 3.21 / 3.1 3.11
VII	1170/71	2	2.2 / 2.1
VIII	Prev. unknown	1	

The next post c 8m further back was of the same type as the pair to the west, but unfortunately the details of the others could not be properly recorded. These three western posts clearly indicated a passage whose wooden pavement would have lain at between 90cm and 100cm above the level of the beach.

Similar circumstances in the Gullskoen area showed that in the first part of Phase 2.1, but not earlier, the whole of the beach area was built up right out to the edge of the underwater shelf. Stratigraphically it was not clear to what extent the posts along the northern boundary of Søstergården were contemporary with the situation in Gullskoen. Firstly, the remains of the passages from Gullskoen's Phase 2.1 were associated with stone-filled caissons on the beach. Secondly, associating the passage on posts in Søstergården with Phase 2.1 would mean that Building 482, which overlapped the passage and which was certainly an integral part of the total layout of Period 2, would have to belong to the later part of that period, in which case, the whole group of buildings in Rows X and Y and the passage between them would have to be assigned to Phase 2.2, and the earlier passage to Phase 2.1. However, this would be completely at variance with the assumed development of Gullskoen to the north, where eleven out of sixteen buildings which burnt in Fire VII also belonged to Phase 2.1. Moreover, the alignment of the passage disturbed the general layout of Søstergården in Period 2, as well as that of Gullskoen.

The situation described here seems therefore to point to an earlier dating of the passage on posts, in other words, to Period 1. As there is nothing to suggest that any of the caissons along the bottom edge of the beach are earlier than Period 2, it would seem more likely to regard this passage as a direct parallel to the jetties from the medieval trading settlement of Borgund, referred to above. Those were quite separate constructions with no buildings beside them, and this is how the Bryggen jetty should be regarded. It was the only example from Bryggen, dating perhaps to the first half of the twelfth century.

Summary, Period 1

Remains of posts and post-holes, which were recorded on the site of the North Row, predated the earliest evidence for any built-up development over the beach. These remains included one pair of posts and also others belonging to a raised gangway or jetty, showing that in the period

Fig. 89. Pair of foot-braced posts from a jetty at Borgundkaupangen in the district of Sunnmøre.

prior to the advance of buildings over the beach area there were jetties running out into the water. They are similar to those which were recorded in the medieval excavations at Borgund (Herteig 1975, figs 4, 5) and to comparable structures still found in districts such as Sunnmøre, which have retained their early cultural landscape (see fig 89).

Summary, Søstergården

Throughout its whole history, Søstergården occupied a rather special position among the tenements which have been excavated at Bryggen. Right up to the fire in 1702 it consisted of two separate rows without any physical connection between them. The southern row was generally orientated towards the south except in Period 5 when it had its own internal communication. The northern row was mostly orientated towards the north with at times its foundation substructure and wharf integrated with the structures on the north side. Running along the north side of the tenement was a public thoroughfare known as The Old Church Road, and apart from the very earliest period when Søstergården North was actually a double tenement with its own central passage, this thoroughfare functioned as a kind of tenement passage for the North Row.

In addition to the fact that building activities were carried on independently in the two rows, they could often show a different way of solving the same problem, such as in Phase 3.2 and Period 4 when the structures at the front of the two rows were apparently in conflict. With the exception of a slight widening at the very rear of the northernmost row in the twelfth century, the tenement stayed more or less within the boundaries which had been set at the beginning.

Period 1

There was no evidence for buildings in the beach zone in this period, but traces of a gangway or jetty on posts were found which apparently ran out to the edge of the underwater shelf, where ships could load and unload their cargo while afloat.

Period 2

The built-up area expanded in this period out across the beach, and its limit was marked by stone-filled foundation caissons (Nos 40, 43, 41 and 42) placed along the edge of the underwater shelf (see figs 85 and 90). In front of these the remains of post-built wharfs were recorded. The distance between the solid foundation units and the posts supporting the front of the wharfs was c 2.5m. The depth of water in front of the wharfs is uncertain.

Between the Building 130 standing on posts towards the rear of the site and the foundation units along the edge of the underwater shelf there was evidence for another building raised on posts, Building 402, which may belong to this period. In the northern half of the tenement there were traces of an internal passage and a further row of buildings, Row X, on the north side, represented by Building 482. In other words, the tenement of Søstergården in Period 2 consisted of at least three separate rows of buildings, the two to the north appearing to form a unit.

The front of the tenement was apparently represented by foundation units 40, 43, 41 and 42, which stood at regular intervals across the tenement, but in positions which were somewhat asymetric to the rows and passages. Caisson 42 probably came under the southern part of the South Row, caisson 41 approximately under the south wall of Row Y, the southern of the two rows in Søstergården North, and caisson 43 came partly under the north wall, partly under the passage along the north side. Caisson 40 in front of Row X would just have been in contact with the north wall of the row. This apparent discrepancy between the location of the foundation units and the overlying buildings presents no problem since it is quite evident that the foundation units would have been superimposed with transverse horizontal timbers linking them together. When the whole excavation area is taken into consideration, the homogeneous nature of these caissons becomes very evident, both as to their construction and to their location. One immediately gets the impression of a large combined layout probably preceding the development of the individual tenements. The relationship between the location of the caissons and the orientation of the rows was therefore of minor significance.

Period 3

Two phases of development were identified in this period, 3.1 and 3.2, but the actual waterfront was built out in three stages, 3.1, 3.1.1 and 3.2.

Phase 3.1

In the South Row, a number of foundation posts were associated with this phase, but no actual structures were identified (see fig 80). In the North Row, the remains of one building were excavated, Building 126, with a well-preserved stretch of passage 1.35m wide and 5m long running alongside it. As there was room for a further building on the north side, Søstergården North in this phase must have been divided longitudinally, in the manner of a regular double tenement.

The waterfront in the South Row consisted of two small foundation substructures, and there were two larger ones in the North Row, forming the foundations for the wharf-side buildings. In front of these foundation substructures traces of post-built wharfs were found (see fig 82).

Sub-phase 3.1.1

This structural phase affected only the waterfront. In the South Row the tenement was extended by the construction of a large foundation substructure, Kar 113, with a wharf measuring c 3.5m from front to back erected on posts in front of it. The front of the wharf ran from c 86.3y on the south side to c 87.2y on the north side, and therefore lay at a slight angle to the tenement. A ladder was found at the front of the wharf.

This extension of the waterfront was followed by a minor adjustment to the wharf in front of Søstergården North, barely measuring 1.5m. The depth of water in front of the southern wharf was c 1.5m.

Further back, there was some indication that the orientation from Period 2 was taken up, whereas the front part of the tenement, overlying the backfill and foundations in the deeper water, was orientated in a more east–west direction. These circumstances were probably conditioned by the original topography of the site.

Phase 3.2

In this phase the pattern of development towards the rear of the site showed even more clearly the alteration in the alignment noted in Phase 3.1. The point at which the alignment changed corresponded again to the edge of the underwater shelf around 98–100y. There were the remains of one building in each row, but Søstergården North again appears to have been divided like a regular double tenement with a passage down the middle. The South Row had its own passage along the south side.

At the front of the tenement, small earth-filled foundation structures, Kar 76, Kar 77 and Kar 112, were laid out in a row right across the tenement in front of the existing wharfs, and these were then joined together at the top by timbers laid in both directions (see figs 78 and 76). The actual details of the construction varied between the two rows.

In the South Row, the courses of timbers were built up into a large single foundation unit (Kar 111) and the beams in the top layer were locked to upright posts at the front. That this construction functioned as the wharf was shown by one feature in particular: just behind the front posts there was a massive transverse beam into which small stones c 1.5–2cm across had been embedded, presumably to provide a better grip for the feet when embarking or disembarking. The minimum width of the wharf from front to back was c 4.2m, it was c 2.1m high, and it is estimated that the depth of water in front would have been c 1.4m. After some time the waterfront was extended by the erection of a separate wharf on posts in front, c 5m wide from front to back and with a ladder in front. The depth of water is unknown.

In Søstergården North, the front structure, Kar 114, was joined to the foundation substructures behind it to form a large single structure, just like the substructure Kar 111 in the South Row, but it was also combined with the substructures under The Old Church Road and Gullskoen to the north. While the substructure 111 in the South Row functioned primarily as a wharf, it was clear from the construction of Kar 114 in the North Row that it must always have had a separate wharf structure in front, and traces of the upright posts from this wharf were recorded.

If the wharfside building in Søstergården North extended to the front edge of the substructure 114, as one would have expected, then there could not have been any communication between the wharfs of the two rows. It is not impossible that the wharfside building, contrary to usual practice, stopped short of the front edge of the underlying foundation unit, so that it would have been possible to get from one wharf to the next. Seen from our point of view, it would appear strange if the line of communication along the wharfs had not been maintained when the substructure Kar 114, the latest of the structures here, was being laid out. This may, of course, not have been an objective in itself, and one might also note the fact that the Søstergården waterfront in this phase consisted of two structurally separate units. A further argument against the need for communication between the two wharfs is the fact that the waterfront of Søstergården North was structurally integrated with the neighbouring waterfront to the north. The North Row was also orientated northwards by the fact that access to it was from the public thoroughfare along the north side, while the South Row had its own passage along the south side, adjacent to Engelgården.

A particular feature of Søstergården North was the problem which the neighbours to the south must have caused by encroaching on its waterfront area.

The front of the wharf in Søstergården North lay at 73.5–74y, it measured 5–6.m from front to back, and the depth of water in front would have been c 1.5m.

The phase was terminated by Fire VI.

Period 4

The alignment of the tenement was the same as before. The South Row was divided longitudinally with the main buildings on the south side (123, 125) and lean-to buildings or side-annexes on the north side (400, 401). There was a passage along the south side of the main building. In the North Row only two buildings in the western part of the site were recorded, Buildings 121 and 399.

After the wooden paved surface of the wharf laid in Phase 3.2 had been taken up, the area was extended by backfilling to the height of the existing wharfs, levelling up with layers of timbers laid closely together, and then laying out the foundations for Period 4 on top of this. The front of the wharfs now lay further west than the western limit of the excavations at 72y.

The period ended with Fire V.

Period 5

From Period 5 onwards, the history of Søstergården can

only be followed in the original area of the excavations, grid-squares K and L 7–8, but this nevertheless throws sufficient light on the development of the tenement. In Period 5, which is divided into two phases and one sub-phase, the layout of the tenement was particularly atypical.

Phase 5.1

The two rows were still physically separate. The North Row consisted of short wide buildings (395, 396 and 397), while the South Row was divided longitudinally with the main buildings to the south (376 and 378) and side-annexes (377 and 379) on their north side, possibly with a passage or some internal communication.

The phase was unburnt.

Sub-phase 5.1.1

This sub-phase consisted of two buildings in the South Row, a main building 89 and its side-annexe 90, replacing Buildings 376 and 377 from Phase 5.1.

This phase was also unburnt.

Phase 5.2

The tenement in this phase had more or less the same layout as in Phase 5.1, except in the western part of the South Row where there were two small buildings, 86 and 87, standing on either side of a short narrow passage running down the middle of the row. The South Row also contained Building 88, and Buildings 393 and 394 were recorded in the North Row.

Phase 5.2 was terminated by Fire IV.

Period 6

In Period 6, which is divided into three phases, the tenement consisted of two separate rows. The Old Church Road provided access to the buildings in the North Row, while the South Row had its own passage down the south side.

Phase 6.1

The remains of two buildings were recorded in each row, Buildings 375 and 85 in the South Row and Buildings 391 and 392 in the North Row. The tenement passage down the south side was c 3.2m wide, the width of the buildings in the South Row was c 5m, and that in the North Row from 5m to 5.25m.

The phase was unburnt.

Phase 6.2

There were the remains of two buildings in the South Row, Buildings 84 and 83, and two in the North, Buildings 389 and 390. Building 390 had a well-preserved wooden floor. The width of the tenement passage was c 4m, the buildings in the South Row were between 5m and 5.1m wide, and in the North Row between 5m and 5.3m.

There were no traces of fire terminating this phase.

Phase 6.3

The foundations of at least one building in the South Row were recorded, Building 82, and traces of the tenement passage. In the North Row there were the remains of two buildings, Building 388 to the east, with evidence for a fireplace on its upper floor, and Building 386 to the west. This was a well-built stone structure, forming an above-ground cellar, which continued in use with some alteration right up to Fire I.

Phase 6.3 terminated with Fire III.

Period 7

The layout recorded in Phase 6.1, with the two rows standing back to back separated only by an eaves-drip gap, continued throughout the rest of Period 6 and on into Period 7. In fact, it continued right up to the fire in 1955, the only change being the elimination of the eaves-drip gap in Period 9. As usual, the tenement passage served the buildings in the South Row and The Old Church Road provided access to the North Row.

In the South Row the remains of two buildings were recorded in Period 7, Buildings 80 and 81, with widths of between 5.2m and 5.3m, while the tenement passage on the south side was c 3m wide. In the eastern part of the North Row there were the poorly preserved traces of a building, Building 387, while to the west the stone building from Phase 6.3 was rehabilitated after the fire in 1413 and the entrance altered. A collection point for water was provided in the floor with a wooden-lined channel leading the overflow out to the main drain in The Old Church Road. The width of buildings in the North Row ranged from 5.5m to 5.8m.

Period 7 ended in Fire II.

Period 8

The layout was the same as in Periods 6 and 7. There were two phases of development in the South Row, but evidence for only one in the North Row.

Phase 8.1

The remains of one building were recorded in the South Row, Building 79, with a width of c 5.4m. It was unburnt.

Phase 8.2

In the main phase of Period 8, three buildings were identified in the South Row, Buildings 76, 77 and 78, and one in the western part of the North Row, Building 385. The surviving remains of the stone building 386 were reused to form the basis of Building 385, but there is some doubt as to whether the stone walls were still standing or whether they had been demolished to ground level and just formed the ground-walls for the new building. If the standing walls had been re-used, the building must have lost its protective stone vaulting, since the wooden floor was badly burnt in Fire I, which terminated Period 8. With some reservation, the hypothesis that the ruined walls were used as ground-wall has been chosen.

Period 9

There were two distinct phases in this period. Phase 9.1 was the first time the tenement's two rows were combined into one unit with a main row and a side-annexe. The side wall of the main row formed one wall of the annexe. This pattern was repeated in Phase 9.2. The tenement passage ran along the south side of the main row.

Phase 9.1

The ground-walls of three buildings were recorded in the main row, Buildings 73, 74 and 75, whose widths varied from 5.6m to c 6m, while in the side-annexe to the north there was evidence for two buildings, 383 and 384, with widths varying from c 5m to c 5.2m. Down the south side of the passage a drain was constructed with dry-stone walls, such as was usual in all the tenements after the 1702 fire.

Phase 9.2

The area covered by the excavations comprised three buildings in the main row, with widths varying from 5.8m to 6.9m, and two on the north side, measuring 5.3–5.9m wide. This was the situation which burnt in the fire in 1955. The wooden floors and the paving in the passage on the south side were generally well preserved. The width of the passage was 3.9–4m, and the stone-lined drain from Phase 9.1 was heightened.

This account of the development in Søstergården has revealed a series of deviations from the traditional layout of the tenements excavated at Bryggen:

1 The orientation of the tenement changed more or less at the point where the underlying beach dropped into the deeper water of the bay, and this feature can be traced back to Period 3, when the built-up area first expanded beyond the end of the beach zone. The front part of the tenement was aligned at right-angles to the shore, whereas the rear part retained its original orientation, lying at a slight angle to the shoreline.

2 In Periods 4 and 5 the South Row was divided longitudinally, and in Phase 2.2 and Periods 3 and 4 the North Row was also divided lengthwise.

3 Right from Period 2 the two rows were really separate entities, but from Period 3 onwards their development proceeded independently, using different basic constructions. The development of Søstergården North now coincided with that of the area to the north, with the foundations forming an integral whole, linking Søstergården North with The Old Church Road and with Gullskoen north of the road. This basic pattern was maintained right up to Period 8, ending with the fire in 1702. When the area was redeveloped after this fire, in Phase 9.1, the South and North Rows shared the ground-wall between them and a structural entity was established which lasted until the fire in 1955.

Søstergården was described in recent times as a single tenement with a side-annexe (on its north side), but on the basis of the development sketched briefly here, there are grounds for doubting whether this description is representative for the earlier phases. Throughout the whole of the Middle Ages, Søstergården consisted of two distinctly separate rows, unlike the other tenements which have been excavated. In the earlier medieval period, the northern half was to all intents and purposes a double tenement, and in the High Middle Ages it was physically integrated with the buildings to the north and served by The Old Church Road. The southern part of Søstergården, on the other hand, formed an isolated single tenement with its own passage along the south side.

In Period 4, not only did the basic constructions of the waterfront differ, but there were also problems of communication. The internal north-south lines of communication which were always present between Bugården and Engelgården had most likely not been established in this part of the site at this time, and probably did not become a reality until Phase 5.1 some time in the thirteenth century. Unfortunately, we have not been able to confirm this. Generally speaking, such a lack of communication would seem unthinkable if the two rows were under common ownership. From the structural remains which have survived there are grounds for regarding the two rows in Søstergården as two separate tenements in the medieval period, only one of which could have been Søstergården.

The width of the rows in Søstergården

Søstergården lay at the point where the east–west orientation of Bugården and Engelgården «collided» with the NNE–SSW orientation of Gullskoen. As a result Søstergården was a wedge-shaped site, wider at the east end (see figs 76 and 91). Moreover, the internal layout of this

Table 6. The widths of the two rows and of the whole tenement at 80y, 88y and 120y.

Period/ Phase	Measured at	North Row	South Row	Total width of tenement
9	88y 80y	6m 4.75m	6m 5.9m	16.6–17m 14.8–15.2m
8	88y 80y	c 5m	6m	16.6–17m 15.20–15.60m
7	88y 80y	5.5m	5.1m	14m 13m
6.3	88y	5.5m	5m	min 15m
6.2	88y	5.15m	5.05m	15.5m
6.1	88y	5.2m	5.3m	14.5m
5.2		5.2m	8.5m	14.5–15m
5.1		5.4m	c 8m	c 14.5–15m
4	120y 88y	5.9m	7.1m	c 21m c 17m
3.2	120y 80y	c 7–8m	?	c 20m 16–17m
3.1	120y	c 9.5m	?	prob as 3.2
2	120y 88y	c 10.5m		c 21m c 17m

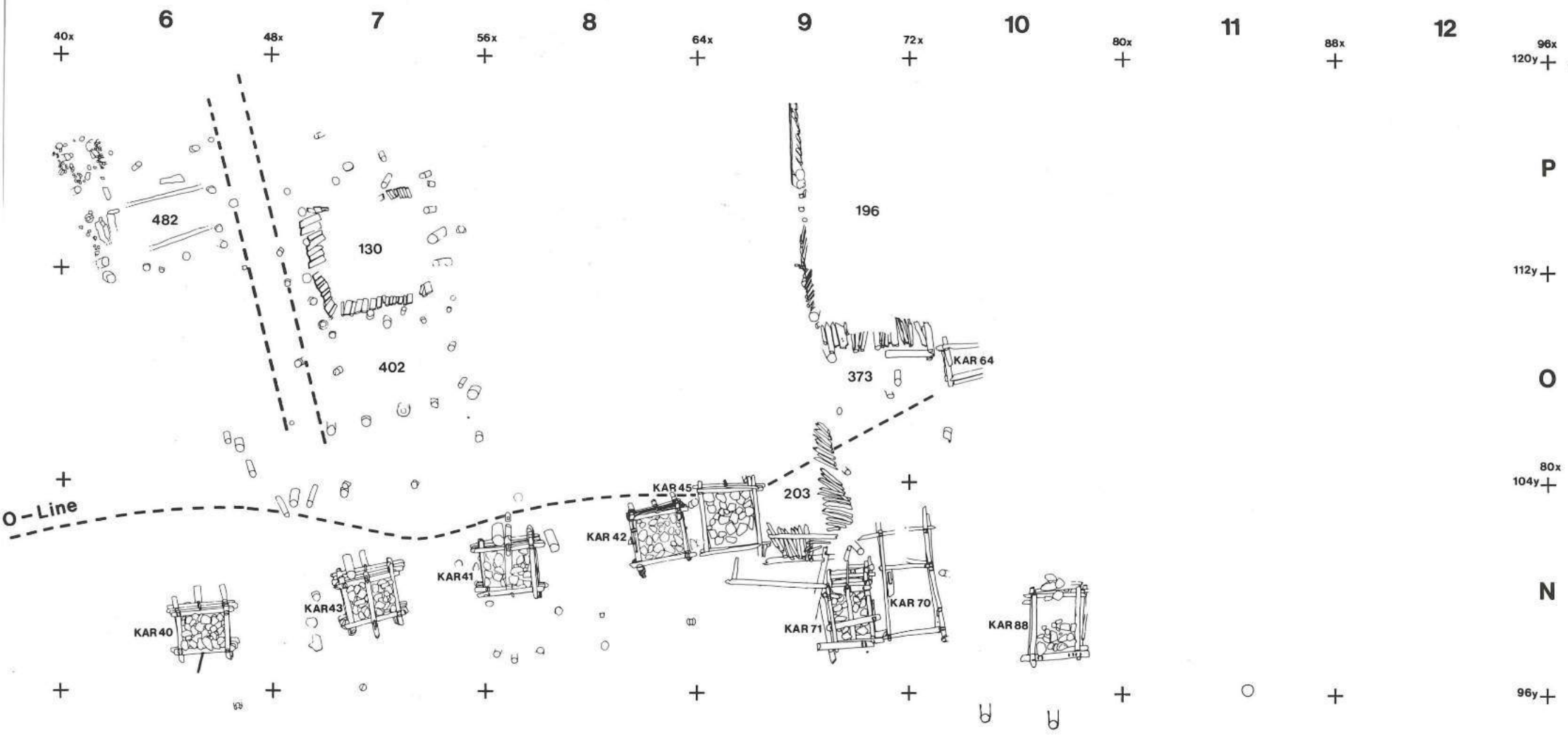


Fig. 90. General plan of Bugården, Engelgården and Søstergården, showing the main features in the waterfront in Period 2, terminating in 1170/71.

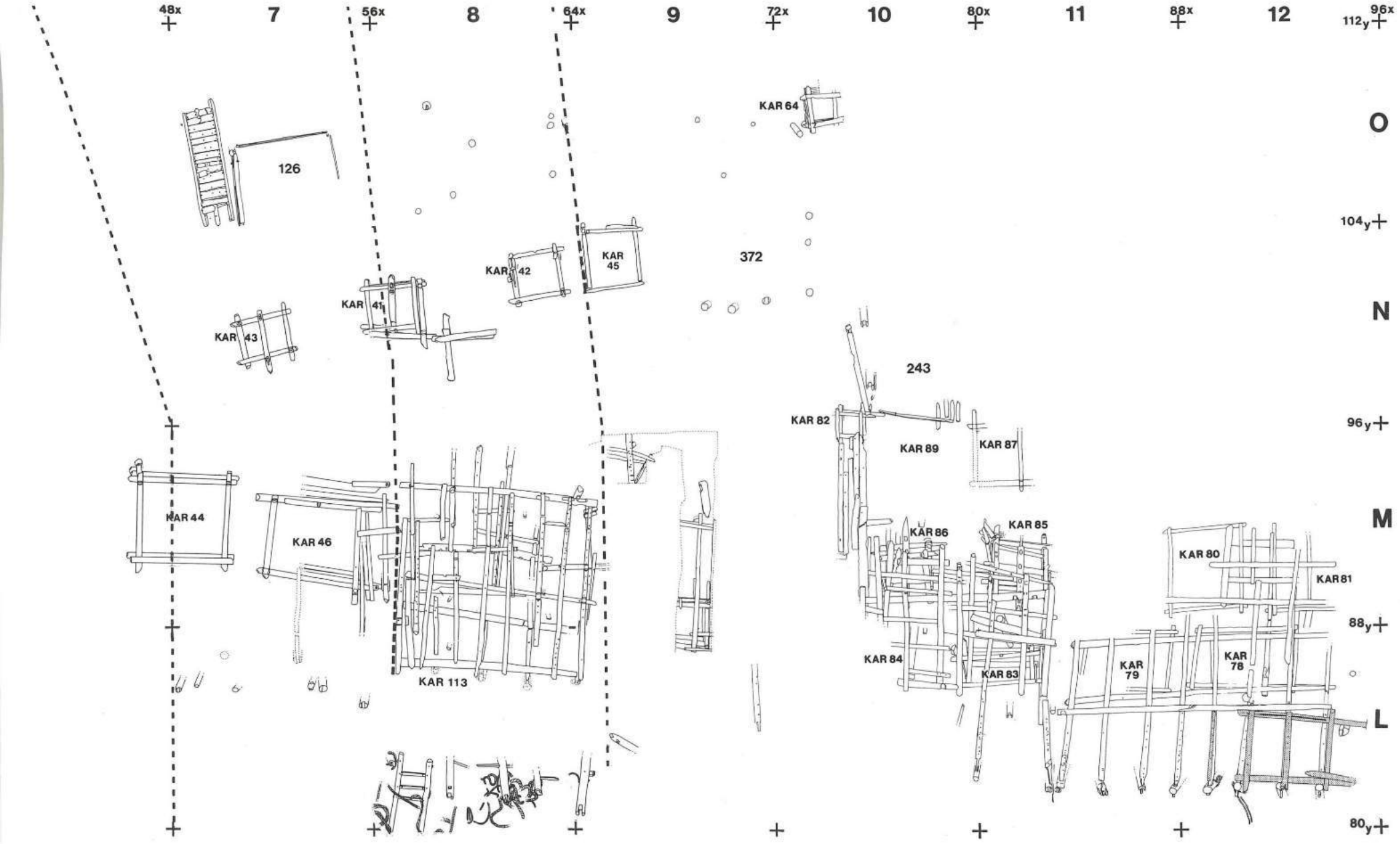


Fig. 91. General plan of Bugården, Engelgården and Søstergården, showing the waterfront in Phase 3.1.

tenement deviated from that of the other tenements. Not only were its two rows divided lengthwise in some phases, but the northern row in Periods 2 and 3 must really be regarded as a regular double tenement with a proper row of buildings on either side of a central passage. In Period 4, the northerly of these two rows was eliminated, and Søstergården assumed its later layout with two main rows. Yet at the same time the northern row remained physically integrated with the area further north. The southern row appears to have gone on living its own life, most of the time clearly orientated to the south, but occasionally with an internal passage, and always physically separated from the northern row.

In spite of these deviations the tenement on the whole retained its original boundaries. As mentioned before, the boundary with Engelgården remained more or less fixed, and this was also generally the case with the dividing line between the two rows. However, the width of the buildings varied with the changing layout. Particularly in the central and rear parts of the site, the tenement in some periods deviated from the usual layout and building pattern. The dimensions of the tenement are therefore not reflected by the width of the individual buildings. Table 6 shows the widths of the two rows and the total width of the tenement on the basis of the measurements in the central or front part of the site, and at the eastern end.

The waterfronts in Bugården, Engelgården and Søstergården in the High Middle Ages

The local topography of the Bryggen area is characterized by a relatively narrow strip of littoral sediments on which human habitation has been possible between the foot of the mountain and the bay. In the early medieval period this strip of land merged into a beach zone 25–30m wide ending with a sudden drop into deeper water. The outermost 8–13m of the beach zone would normally have been affected by the tide. Apart from some local variations, the depth of water at the edge of the underwater shelf would not have been more than 40–50cm, and at mean low tide practically the whole beach would have been exposed (cf Herteig 1969, 98–99).

Up to the middle of the twelfth century ships and boats would have been drawn up onto the beach, and the beach zone would have been used for loading and unloading cargo. In the mid-twelfth century, however, the beach also began to be used for habitation. In due course, the settlement encroached to the edge of the underwater shelf with wharfs on posts extending for a further 2–3.5m out into the water (see fig 90). There is some possibility that there was a narrow jetty running out from the northernmost part of Søstergården already in the first half of the twelfth century (cf fig 88), but for the time being this should be regarded as an isolated example involving the loading and unloading of larger vessels while they remained afloat.

As the water generally was too shallow to allow larger vessels to get close in to the wharf-side buildings of Period 2, there must have been separate wharfs in front of all the tenements, and evidence for these was mostly found. It is not very likely that there was any communication between any of the wharfs at this early stage, although there was nothing which disproved the possibility.

Period 3 saw the beginning of a new era, in that the settlement began to extend further out over the deeper waters of the harbour. While the buildings and the passages between them had previously been erected on piles, a new technique for the foundations was now introduced involving horizontal logs forming square constructions filled with earth (figs 90 and 91). We have seen that in Period 3 all three tenements were extended in several stages and that both the horizontal log foundations of the waterfront and the wharfs on posts in front of them became integrated with the neighbouring structures. The only exception is Søstergården. In Period 4 there was a further significant expansion in all three tenements. Intercommunication between the wharfs cannot be documented in these two periods, but physically it would appear to have been a relatively simple matter.

After Period 4 it is only in Bugården that we have any details concerning the development at the front of the tenements, but the analysis of the structures in Engelgården South augmented with information from the long section on the Bugården side of the tenement provides some basis for accepting a corresponding pattern of expansion in Engelgården as was documented for Bugården. This would suggest that communication along the wharfs was possible.

In this account we have built on the results gained from systematic excavation in the period 1955–68 and from supplementary investigations up to 1979. When the area laid waste by the 1955 fire began to be redeveloped around 1980, the eastern part of the site was excavated mechanically down to solid rock. In the course of this work three distinct marine deposits were revealed underneath the level of the beach zone from c 1100 in the area of Søstergården North, and on analysis these were found to include redeposited material from human occupation. For practical reasons the results from that investigation are included in the second part of this volume to be published separately in the near future.

Fig. 92. General plan of Bugården, Engelgården and Søstergården, showing the waterfront in Phase 3.2, burnt in 1198.

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APPENDIX I

A MEDIEVAL TREE-RING CHRONOLOGY OF 433 YEARS, BASED ON PINE-LOG MATERIAL EXCAVATED AT BRYGGEN IN BERGEN

by Terje Thun & Ulf Hafsten

Abstract

Tree-ring measurements and dendrochronological processing of samples taken from nearly 1,600 logs from the archaeological excavations at Bryggen in Bergen produced 267 logs with a matching tree-ring pattern. These logs, which were all associated with stratigraphical layers earlier than AD 1332, form a floating chronology of 433 years' duration, running from the relative year 4884 to 5316 in an auxiliary time-scale introduced in order to embrace both the present chronology and the one presented in 1984 on the basis of 42 matching logs. According to the results obtained from absolute dating by means of radiocarbon measurements, the floating chronology refers to the interval AD 883–1315 or AD 882–1314.

Introduction

The archaeological excavations at Bryggen in Bergen, which were carried out over many years following the major fire in 1955, produced a very large number of wooden constructions. Samples for dendrochronological analysis were sawn from nearly 1,600 logs associated with these structures and an initial tree-ring investigation was carried out by Nils Brandt, Oslo, until 1975.

In 1980, when the tree-ring laboratory in Trondheim was established, the dendrochronological treatment of the Bryggen material was resumed. All the samples were now examined by means of computer programs developed at the laboratory in Trondheim, and in 1984 the first investigation dealing with the actual tree-ring dating of the Bryggen material was published, viz the presentation of a floating chronology of 304 years based on 42 matching logs (Thun 1984a).

After the series of tree-ring widths of all the sampled logs had been processed, the chronology could be extended to cover an interval of 433 years, on the basis of data from 267 matching logs which were all associated with occupation deposits earlier than the extensive fire in 1332. The report presented here explains how this chronology has been obtained.

Some remarks on the principle of dendrochronology

Dendrochronology is based on the assumption that trees growing simultaneously within a climatically homogeneous area develop a matching pattern of wide and narrow tree-rings, normally corresponding to the changes from year to year in the climatic growth conditions. A tree-ring dating is carried out by sliding the tree-ring curve for an object of unknown age along a reference tree-ring chronology of known calendar age until a matching tree-ring pattern is found. The event which is determined by this process is the exact year of felling, provided that the object under consideration has the outermost tree-ring intact. Assuming that the log from which the sample was taken had not been stored for any length of time after felling, nor had been re-used, for example after a fire, the age determination of the outermost tree-ring will indicate the year the log was first used.

An absolute dendrochronological dating of an object is only possible if a reference chronology with a known calendar age has been established for the climatic province concerned. Such reference chronologies are normally built up progressively, starting with living trees of great age. The extension of the chronology beyond the period covered by living trees may be achieved by using samples of dead trees of consecutively greater age which overlap in time. Such material may be taken from standing objects, such as houses, churches, castles, timber foundations, wharves, etc, or from objects unearthed during archaeological excavations. In order to avoid irregularities due to samples originating from trees with an anomalous tree-ring pattern caused by purely local conditions, one must make sure that such chronologies are based on a large number of samples, preferably as many as 8–10 from each object.

As demonstrated by this report, tree-ring studies may be useful even in areas where absolute reference chronologies have not yet been worked out, as they can establish an internal, relative time-scale for material of unknown age, in other words a floating chronology for the objects in question.

Some remarks on the application of dendrochronology at Bryggen

There are at least two major obstacles to the application of dendrochronology at Bryggen. One is that an absolute dating of the medieval material from Bryggen by means of a tree-ring analysis is not yet possible, as a reference chronology extending back to or beyond the time of the Bryggen material has not yet been worked out for that part of the country. The only absolute tree-ring chronology available from Western Norway is that worked out by Brandt (1975). It is based exclusively on living trees, and as it only extends approximately 400 years back in time, it is far too short to date absolutely the Bryggen chronology. It must be extended backwards by approximately 400 years before a sufficient overlap with Bryggen can be established.

More extensive absolute tree-ring chronologies are available from other parts of Norway, including Eidem's chronology from Flesberg in Numedal in the south-eastern part of the country (Eidem 1975), and the pine chronologies worked out for Trøndelag in central Norway by Eidem (1953) and Thun (1984b). However, Brandt's reference chronology does not match with any of these, probably due to the climatic influence of the interjacent mountain barriers, which divide the country into separate climatic provinces. If the medieval Bryggen chronology is to be dated by a tree-ring analysis, an extensive reference chronology must be developed for that part of the country.

Another major obstacle for applying dendrochronol-

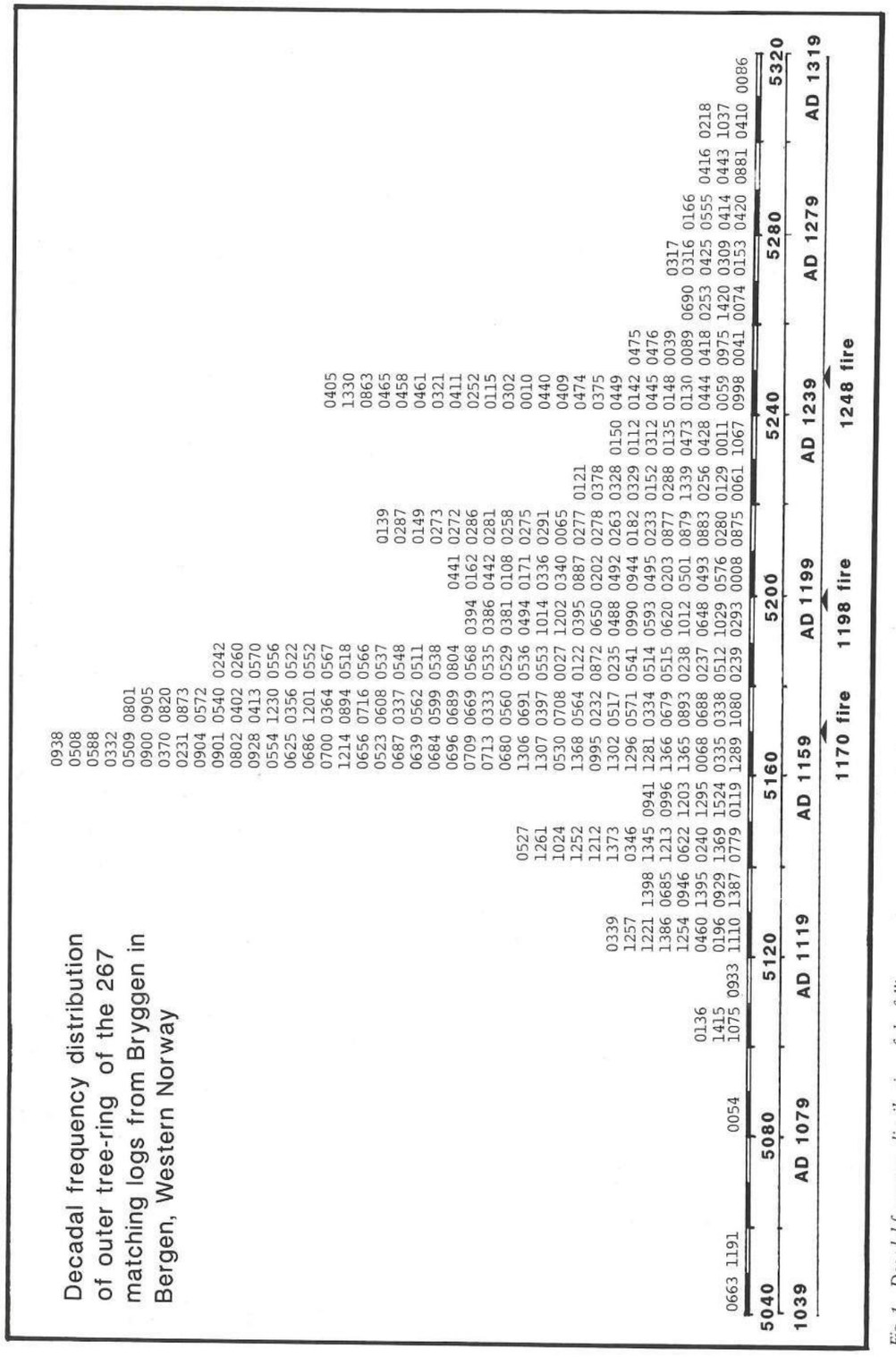

Fig. 1 Decadal frequency distribution of the felling year (outermost tree-ring) of all 267 matching logs from Bryggen. The figures refer to the log number. The samples are shown against an auxiliary time-scale, reflecting the relative dendro ages, and an absolute time-scale from AD 883 to 1315, based on radiocarbon dating (see Appendix II). The historically-recorded fires of 1170, 1198 and 1248 are also marked.

ogy to the Bryggen material is that we do not know for certain the geographical origin of all the timber used there. However, it is reasonable to presume that at least the greater part of it was transported to Bryggen, possibly by floating, from forested areas in the near vicinity. For instance, the island of Osterøy situated 10–12 km to the northeast has a tradition of supplying Bergen with building material after town fires. It was even said on Osterøy that a devastating fire in Bergen was 'a good fire', because it led to an increase in the demand of timber or even of prefabricated houses for the city.

In order to test the possibility of applying dendrochronology within this part of Norway, Brandt (1975) compared the tree-ring pattern of living pine trees within most of the county of Hordaland, from Hardanger in the south to the Lindås/Masfjord region in the north and to the Kvam/Voss region in the east. The fact that matching chronologies could be demonstrated within this wide area indicates that there should be no reservation in applying dendrochronology to the medieval material from Bryggen, since from what has just been said this probably came from a much more restricted area than that covered by Brandt's investigations.

The dendrochronological treatment of the Bryggen material

The samples from Bryggen which were collected for dendrochronological analysis were associated with specific fire layers and with specific constructions or contexts within the excavated area. The analysis, however, was carried out on the material as a whole, regardless of which constructions the samples came from, their location on the site or their stratigraphic context.

The following procedure was used for the dendrochronological treatment of the Bryggen material: the widths of the tree-rings were measured along two radii for each sample and, provided that they showed a corresponding pattern, the mean tree-ring widths for the two series were calculated. Similar mean series were worked out for all the samples which were sent to the laboratory, and these form the subject of the subsequent dendrochronological processing. This involved a mutual comparison of the mean series of all the measured samples, in order to detect positions at which the tree-ring patterns matched. The correlation between the different tree-ring series, or degree of matching, was examined by means of a computer program developed at the tree-ring laboratory in Trondheim. This involved the application of Student's T-test, as described by Baillie & Pilcher (1973), and checking by the degree of parallel variation *(Gleichläufigkeit)* discussed by Eckstein & Bauch (1969). The tree-ring series which were found to correlate were finally plotted and their matching was verified visually.

Since the number of matching logs in this case is much too great to enable the entire tree-ring series to be reproduced here, only a tabular representation of the final results has been given (table 1), showing the mean tree-ring width per year for the entire floating chronology, while the lists of matching logs and their relative and probable absolute ages are given in tables 2 and 3.

Discussion

The crossdating of the Bryggen material referred to above revealed 267 logs in all, which matched both mutually and with the preliminary tree-ring chronology published in 1984 (Thun 1984a). The results presented here mean that the 1984 chronology of 304 years' duration can be extended in both directions by a total of 129 years, giving a relative, or floating, chronology of 433 years altogether.

The chronology presented in 1984 was defined as running from the relative year 1 to the relative year 304. As the new chronology extends beyond both limits, to continue using the 1984 chronology would have resulted in a series of negative years at the beginning. To avoid this, both chronologies have been referred to a joint auxiliary timescale, where the relative year 1 in the 1984 chronology is set at the year 5001 in the auxiliary time-scale. The new floating chronology for Bryggen thus runs from relative year 4884 to 5316, with the more limited 1984 chronology running from 5001 to 5304. Table 1 shows the entire

Relative years	0	1	2	3	4	5	6	7	8	9
4884 – 4889					390	446	420	405	427	393
4890 – 4899	356	379	287	358	313	344	294	305	284	328
4900 – 4909	297	283	247	260	211	277	184	216	133	146
4910 – 4919	128	140	143	185	157	166	168	130	147	176
4920 – 4929	174	190	140	145	111	130	138	114	159	152
4930 – 4939	160	146	131	123	107	109	161	155	134	123
4940 – 4949	67	55	87	79	100	101	79	79	74	102
4950 – 4959	136	166	171	171	137	94	74	81	66	79
4960 – 4969	81	77	66	69	129	112	148	107	92	116
4970 – 4979	139	134	111	111	109	117	131	96	86	86
4980 – 4989	64	62	64	61	90	98	76	55	58	90
4990 – 4999	85	83	103	78	101	99	93	97	113	104
5000 – 5009	99	111	99	120	118	113	122	102	100	90
5010 – 5019	93	90	118	119	122	141	146	132	162	131
5020 – 5029	150	162	146	151	133	107	123	136	141	119
5030 – 5039	121	139	134	119	110	124	169	136	97	118
5040 – 5049	111	117	108	128	135	113	132	134	139	122
5050 – 5059	131	104	128	137	138	132	144	145	187	182
5060 – 5069	184	156	160	151	167	160	156	137	143	164
5070 – 5079	135	125	168	168	155	137	151	187	170	132
5080 – 5089	175	153	154	155	152	139	139	165	170	134
5090 – 5099	160	152	210	179	163	144	154	136	109	116
5100 – 5109	134	147	130	164	170	206	193	148	159	174
5110 – 5119	150	177	150	161	176	159	148	155	155	135
5120 – 5129	161	136	183	138	114	155	174	157	139	142
5130 – 5139	144	166	140	148	192	161	179	139	145	164
5140 – 5149	158	155	162	187	158	126	140	185	175	151
5150 – 5159	183	223	154	184	206	186	170	208	166	197
5160 – 5169	189	187	185	182	186	182	186	173	199	201
5170 – 5179	213	170	187	157	203	179	194	192	185	198
5180 – 5189	183	190	164	193	203	201	195	184	172	186
5190 – 5199	174	176	172	158	170	154	191	207	201	184
5200 – 5209	196	170	177	164	169	172	146	158	201	137
5210 – 5219	108	128	171	152	153	159	147	160	155	141
5220 – 5229	179	181	154	161	141	137	152	116	118	143
5230 – 5239	112	106	118	113	122	142	144	140	155	162
5240 – 5249	122	166	159	173	158	141	132	135	133	154
5250 – 5259	154	180	179	167	185	169	158	163	179	172
5260 – 5269	172	159	187	141	181	184	192	192	180	181
5270 – 5279	151	169	146	165	133	120	142	132	147	175
5280 – 5289	170	124	138	132	146	122	122	114	113	143
5290 – 5299	115	106	123	93	99	111	101	101	90	92
5300 – 5309	108	95	119	124	139	133	114	98	113	120
5310 – 5316	110	92	84	114	110	103	99			

Table 1 Mean annual tree-rings, given in 10^{-2}mm, for the floating chronology derived from 267 matching pine logs from the Bryggen excavations, covering the relative years 4884-5316.

relative chronology and fig 1 shows the decadal frequency distribution of the felling year (the outer tree-ring) of all the matching 267 logs.

One might wonder why only 267 logs out of a total of 1,600 processed samples were found to correlate dendrochronologically. This may be partly ascribed to irregularities in the tree-ring pattern, imposed on the trees by the differing growth conditions within the rugged coastal regions from which the trees may have come. It would probably have been easy to compensate for these irregularities if a more complete and systematic sampling had been carried out, particularly if the principle maintained above of securing an ample number of samples from each construction had been practised. However, in 1959–69, when the most intensive excavations at Bryggen took place, one did not have the dendrochronological capacity either to maintain the rate of sampling in the field or to treat all the wooden material which was exposed during this lengthy excavation.

As stated above, a proper dendrochronological treatment requires mutual comparison in all possible overlapping postions of all the individual tree-ring series involved. The execution of such an operation is in fact an enormous undertaking and it is only recently that computer programs dealing with calculations of this nature have been available at the Trondheim laboratory. It was apparently for this reason that the dendro sampling at Bryggen was confined mainly to those logs or constructions which were of greatest interest to archaeologists or historians.

Absolute dating

Since the reference chronology for Hordaland which was worked out by Brandt (1975) is of far too short a duration to date the floating Bryggen chronology presented here, an exact absolute dendrochronological dating cannot be established for the time being. Until such a reference chronology is available, other dating methods must be tried in order to provide a calendar dating of the relative Bryggen chronology.

As dealt with more extensively in the report by Gulliksen & Thun (Appendix II), a radiological precision dating was attempted by matching the radiocarbon ages obtained for the decadal samples from three selected logs against high precision calibration data. By also taking into account the relationship between the frequency distribution of felled logs (ie building activity) and the historically-recorded Bryggen fires, the authors found it reasonable to associate the relative year 5000 in the new auxiliary timescale with the calendar year of AD 999 or 998. This implies that the floating Bryggen chronology can be dated absolutely to the period AD 883–1315 or AD 882–1314.

On the building activity at Bryggen

Assuming that the dendro-dated selection of logs from Bryggen is a sufficiently random sample statistically, the decadal frequency distribution of the felling years (see fig 1) might reflect the extent of building activity at Bryggen.

The dendro-dated material includes three logs which were felled rather early compared with the majority of the matching logs (samples 0663, 1191 and 0054). These were felled in the relative years 5045, 5053 and 5081 respectively, corresponding to AD 1044 or 1043, AD 1052 or 1051, and AD 1080 or 1079. The allocation to these logs of such early dates corroborates, in fact, the stratigraphical analysis presented by Krzywinski & Kaland (1984) of a 'pre-urban coastal settlement' on the eastern bank of Vågen, in other words a settlement in the Bryggen area pre-dating the twelfth-century town.

As shown very clearly in fig 1, the majority of the dendro-dated material from Brygggen, however, does not appear until after the relative year 5100, ie after c AD 1100. After this date four different peaks may be seen, the first between 5120 and 5160, the second and most conspicuous one between 5160 and 5190, the third between 5190 and 5230, and the fourth between 5230 and 5260. These correspond approximately to the calendar years 1120–1160, 1160–1190, 1190–1230 and 1230–1260. Accepting that some of the logs may give a dendro-age that is too high, since some of the outer tree-rings may either have been removed during the trimming of the log before use or simply lost through the ravages of time, it will be noticed that the three later peaks correspond closely with the catastrophic fires at Bryggen recorded in 1170, 1198 and 1248.

According to the site data for the dendro-samples passed on to the tree-ring laboratory, the matching samples came from various kinds of constructions, of which timber buildings, foundation substructures, and wharf constructions seem to be the most significant. Some samples are reported as having been taken from logs which had been used as the foundations for buildings or as back-fill in the foundation substructures and wharf constructions. This second category in particular may contain a considerable amount of re-used timber, which had escaped complete destruction in the preceding fire and which had consequently been felled at an earlier date than the bulk of material used for rebuilding after the fire. However, the authors do not have access to all the detailed site information to be able to go into this matter more deeply.

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Table 2 The 267 matching logs from Bryggen arranged according to the grid-squares in which they were found. Within each square, the logs are listed in inverse order of felling. The calendar ages of AD 883-1315 are based on the radiocarbon dating of the relative dendrochronology (see Appendix II).

Square reference	Log number	Relative dendro age	Calendar age AD
F 11	0166	5290	1289
	0074	5263	1262
	0130	5244	1243
	0171	5205	1204
	0068	5162	1161
F–G 11	0129	5223	1222
G 11	0086	5316	1315
	0153	5271	1270
	0253	5267	1266
	0089	5256	1255
	0252	5249	1248
	0142	5246	1245
	0135	5234	1233
	0152	5227	1226
	0288	5226	1225
	0256	5224	1223
	0139	5220	1219
	0287	5219	1218
	0286	»	»
	0281	»	»
	0275	»	»
	0291	»	»
	0278	5218	1217
	0263	5217	1216
	0182	»	»
	0280	5215	1214
	0136	5108	1107
G 12	0039	5257	1256
	0041	5251	1250
	0054	5081	1080
G–H 11	0148	5190	1189
H 11	0148	5245	1244
	0150	5239	1238
	0149	5219	1218
	0273	»	»
	0272	»	»
	0258	»	»
	0277	5218	1217
	0233	5217	1216
	0293	5194	1193
H 12	0059	5243	1242
	0061	5221	1220
	0065	5218	1217
I 4	0475	5260	1259
	0476	5259	1258
I 11	0162	5206	1206
	0242	5190	1189
	0235	5182	1181
	0238	»	»
	0237	»	»
	0239	5181	1180
	0240	5145	1144
	0196	5125	1124
I 12	0027	5185	1184
I–K 9	0312	5235	1234
I–K 12	0010	5249	1248
	0011	5233	1232
	0008	5201	1200
K 2	1345	5145	1144
K 3	1339	5225	1224
K 4	0418	5256	1255
	0474	5248	1247
	0990	5196	1195
	1289	5161	1160
K 4–5	0576	5201	1200
K 5	0416	5298	1297
	0414	5284	1283
	0690	5269	1268
	0440	5249	1248
	0441	5209	1208
	0650	5197	1196
	0593	5196	1195
	0620	»	»
	0648	»	»
	0804	5188	1187
	0801	5180	1179
	0820	5179	1178
	0572	5178	1177
	0802	5169	1168
	1296	5165	1164
	1295	5154	1153
K 6	0555	5288	1287
	0492	5202	1201
	0495	5201	1200
	0501	»	»
	0493	»	»
	0494	5200	1199
	0570	5189	1188
	0556	»	»
	0552	»	»
	0567	»	»
	0566	»	»
	0537	»	»
	0548	»	»
	0538	»	»
	0568	5188	1187
	0535	»	»
	0529	»	»
	0536	5186	1185
	0553	5185	1184
	0541	5182	1181
	0540	5178	1177
	0562	5173	1172
	0560	»	»
	0564	5172	1171
	0679	5171	1170
	0904	5170	1169
	0554	5169	1168
	0686	»	»

Table 2 (continued)

Square reference	Log number	Relative dendro age	Calendar age AD
	0687	5168	1167
	0530	5166	1165
K 7	0443	5298	1297
	0458	5249	1248
	0449	5248	1247
	0445	5246	1245
	0444	5244	1243
	0488	5197	1196
	0522	5189	1188
	0518	»	»
	0511	»	»
	0514	5182	1181
	0515	»	»
	0512	5181	1180
	0691	5173	1172
	0517	5171	1170
	0508	5170	1169
	0509	»	»
	0523	5168	1167
	0527	5150	1149
	0460	5125	1124
K 8	0375	5248	1247
	0394	5200	1199
	0386	»	»
	0381	»	»
	0395	5199	1198
	0402	5178	1177
	0716	5174	1173
	0779	5142	1141
K 9	0316	5276	1275
	0321	5249	1248
K 10	0329	5227	1226
	0336	5204	1203
	0340	»	»
	0364	5174	1173
K 11	0218	5308	1307
	0115	5249	1248
	0112	5236	1235
	0108	5206	1205
	0203	5201	1200
	0337	5174	1173
	0232	5172	1171
	0338	5171	1170
	0231	5170	1169
	0339	5130	1129
K 11–12	0333	5173	1172
L 3	1202	5199	1198
	1230	5177	1176
	1201	5175	1174
	1214	5168	1167
	1398	5139	1138
	1395	5136	1135
L 4	1368	5166	1165
	1281	5165	1164
	1366	5164	1163
	1365	5163	1162
	0996	5159	1158
	1369	5144	1143
L 5	0428	5234	1233
	0689	5173	1172
	0669	»	»
	0680	5166	1165
	1306	»	»
	1307	»	»
	1302	»	»
	0685	5139	1138
L 6	0410	5304	1303
	0405	5250	1249
	0411	5249	1248
	0409	5248	1247
	0473	5234	1233
	0413	5178	1177
	0571	5171	1170
	0688	»	»
	0588	5170	1169
	0900	»	»
	0901	»	»
	0928	5169	1168
	0625	»	»
	0656	5168	1167
	0639	»	»
	0684	»	»
	0622	5145	1144
	0929	5135	1134
	0663	5045	1044
L 7	0420	5283	1282
	0425	5276	1275
	0465	5249	1248
	0461	»	»
	0442	5207	1206
	0599	5173	1172
	0938	5170	1169
L 8	0378	5230	1229
	0608	5174	1173
	0397	5172	1171
	0708	»	»
	0700	5168	1167
	0696	5167	1166
	0709	5166	1165
	0713	»	»
L 9	0317	5278	1277
	0346	5145	1144
	0309	5272	1271
	0328	5228	1227
	0302	5249	1248
L 10	0370	5170	1169
L 11	0202	5202	1201
	0334	5171	1170
	0335	5161	1160
	0119	5151	1150
L 12	0121	5230	1229
	0122	5184	1183
	0332	5170	1169

Table 2 (continued)

Square reference	Log number	Relative dendro age	Calendar age AD
M 2	1212	5146	1145
	1213	5145	1144
	1221	5130	1129
	1254	»	»
	1191	5053	1052
M 3	1014	5200	1199
	1261	5147	1146
	1024	»	»
	1252	»	»
	1373	5145	1144
	1387	5131	1130
	1386	5130	1129
	1415	5107	1106
M 4	0975	5252	1251
	0998	5241	1240
	0995	5166	1165
M 5	0881	5296	1295
	0863	5250	1249
	0877	5216	1215
	0883	5215	1214
	0875	»	»
	0887	5203	1202
	0894	5174	1173
	0893	5171	1170
M 6	0879	5216	1215
	0873	5179	1178
	0941	5160	1159
M 8	1524	5152	1151
N 2	1203	5157	1156
	1330	5250	1249
	1257	5130	1129
N 4	1029	5196	1195
N 5	0905	5179	1178
O 2	1080	5171	1170
O 3	1037	5304	1303
	1110	5123	1122
O 4	1067	5231	1230
	1012	5196	1195
	1075	5104	1103
O 5	0944	5201	1200
	0946	5138	1137
	0933	5117	1116
P 1	1420	5263	1262
P 2	0872	5183	1182

Table 3 The 267 matching pine logs from the Bryggen excavations arranged chronologically, starting with the most recent. The relative dendro ages refer to an auxiliary time scale, whereas the calendar ages refer to the radiocarbon dating (see Appendix II).

Log number	Square reference	Relative dendro age	Calendar age AD
86	G 11	5316	1315
218	H 12	5308	1307
1037	O 3	5304	1303
410	L 3	5304	1303
416	K 5	5298	1297
443	K 7	5298	1297
881	M 5	5296	1295
166	F 11	5290	1289
555	K 6	5288	1287
414	K 5	5284	1283
420	L 7	5283	1282
317	L 9	5278	1277
316	K 9	5276	1275
425	L 7	5276	1275
309	L 9	5272	1271
153	G 11	5271	1270
690	K 5	5269	1268
253	G 11	5267	1266
1420	P 1	5263	1262
74	F 11	5263	1262
475	I 4	5260	1259
476	I 4	5259	1258
39	G 12	5257	1256
89	G 11	5256	1255
418	K 4	5256	1255
975	M 4	5252	1251
41	G 12	5250	1249
405	L 6	5250	1249
1330	N 2	5250	1249
863	M 5	5250	1249
465	L 7	5249	1248
458	K 7	5249	1248
461	L 7	5249	1248
321	K 9	5249	1248
411	L 6	5249	1248
252	G 11	5249	1248
115	K 11	5249	1248
302	L 9	5249	1248
10	K–K 12	5249	1248
440	K 5	5249	1248
409	L 6	5248	1247
474	K 4	5248	1247
375	K 8	5248	1247
449	K 7	5248	1247
142	G 11	5246	1245
445	K 7	5246	1245
148	H 11	5245	1244
130	F 11	5244	1243
444	K 7	5244	1243
59	H 12	5243	1242
998	M 4	5241	1240

Table 3 (continued)

Log number	Square reference	Relative dendro age	Calendar age
150	H 11	5239	1238
112	K 11	5236	1235
312	I–K 9	5235	1234
135	G 11	5234	1233
473	L 6	5234	1233
428	L 5	5234	1233
11	I–K 12	5233	1232
1067	O 4	5231	1230
121	L 12	5230	1229
378	L 8	5230	1229
328	L 9	5228	1227
329	K 10	5227	1226
152	G 11	5227	1226
288	G 11	5226	1225
1339	K 3	5225	1224
256	G 11	5224	1223
129	F 11	5223	1222
61	H 12	5221	1220
139	G 11	5220	1219
287	G 11	5219	1218
149	H 11	5219	1218
273	H 11	5219	1218
272	H 11	5219	1218
286	G 11	5219	1218
281	G 11	5219	1218
258	H 11	5219	1218
275	G 11	5219	1218
291	G 11	5219	1218
65	H 12	5218	1217
277	H 11	5218	1217
278	G 11	5218	1217
263	G 11	5217	1216
182	G 11	5217	1216
233	H 11	5217	1216
877	M 5	5216	1215
879	M 6	5216	1215
883	M 5	5215	1214
280	G 11	5215	1214
875	M 5	5215	1214
441	K 5	5209	1208
162	I 11	5207	1206
442	L 7	5207	1206
108	K 11	5206	1205
171	F 11	5205	1204
336	FK 10	5204	1203
340	K 10	5204	1203
887	M 5	5203	1202
202	L 11	5202	1201
492	K 6	5202	1201
944	O 5	5201	1200
495	K 6	5201	1200
203	K 11	5201	1200
501	K 6	5201	1200
493	K 6	5201	1200
576	K 4–5	5201	1200
8	I–K 12	5201	1200
394	K 8	5200	1199
386	K 8	5200	1199
381	K 8	5200	1199
494	K 6	5200	1199
1014	M 3	5200	1199
1202	L 3	5199	1198
395	K 8	5199	1198
650	K 5	5197	1196
488	K 7	5197	1196
990	K 4	5196	1195
593	K 5	5196	1195
620	K 5	5196	1195
1012	O 4	5196	1195
648	K 5	5196	1195
1029	N 4	5196	1195
293	H 11	5194	1193
242	I 11	5190	1189
260	G–H 11	5190	1189
570	K 6	5189	1188
556	K 6	5189	1188
522	K 7	5189	1188
552	K 6	5189	1188
567	K 6	5189	1188
518	K 7	5189	1188
566	K 6	5189	1188
537	K 6	5189	1188
548	K 6	5189	1188
511	K 7	5189	1188
538	K 6	5189	1188
804	K 5	5188	1187
568	K 6	5188	1187
535	K 6	5188	1187
529	K 6	5188	1187
536	K 6	5186	1185
553	K 6	5185	1184
27	I 12	5185	1184
122	L 12	5184	1183
872	P 5	5183	1182
235	I 11	5182	1181
541	K 6	5182	1181
514	K 7	5182	1181
515	K 7	5182	1181
238	I 11	5182	1181
237	I 11	5182	1181
512	K 7	5181	1180
239	I 11	5181	1180
801	K 5	5180	1179
905	N 5	5179	1178
820	K 5	5179	1178
873	M 6	5179	1178
572	K 5	5178	1177
540	K 6	5178	1177
402	K 8	5178	1177
413	L 6	5178	1177
1230	L 3	5177	1176
356	K–L 9	5175	1174
1201	L 3	5175	1174
364	K 10	5174	1173
894	M 5	5174	1173
716	K 8	5174	1173
608	L 8	5174	1173
337	K 11	5174	1173
562	K 6	5173	1172
599	L 7	5173	1172
689	L 5	5173	1172
669	L 5	5173	1172

Table 3 (continued)

Log number	Square reference	Relative dendro age	Calendar age
333	K 11–12	5173	1172
560	K 6	5173	1172
691	K 7	5173	1172
397	L 8	5172	1171
708	L 8	5172	1171
564	K 6	5172	1171
232	K 11	5172	1171
517	K 7	5171	1170
571	L 6	5171	1170
334	L 11	5171	1170
679	K 6	5171	1170
893	M 5	5171	1170
688	L 6	5171	1170
338	K 11?	5171	1170
1080	O 2	5171	1170
938	L 7	5170	1169
508	K 7	5170	1169
588	L 6	5170	1169
332	L 12	5170	1169
509	K 7	5170	1169
900	L 6	5170	1169
370	L 10	5170	1169
231	K 11	5170	1169
904	K 6	5170	1169
901	L 6	5170	1169
802	K 5	5169	1168
928	L 6	5169	1168
554	K 6	5169	1168
625	L 6	5169	1168
686	K 6	5169	1168
700	L 8	5168	1167
1214	L 3	5168	1167
656	L 6	5168	1167
523	K 7	5168	1167
687	K 6	5168	1167
639	L 6	5168	1167
684	L 6	5168	1167
696	L 8	5167	1166
709	L 8	5166	1165
713	L 8	5166	1165
680	L 5	5166	1165
1306	L 5	5166	1165
1307	L 5	5166	1165
530	K 6	5166	1165
1368	L 4	5166	1165
995	M 4	5166	1165
1302	L 5	5166	1165
1296	K 5	5165	1164
1281	L 4	5165	1164
1366	L 4	5164	1163
1365	L 4	5163	1162
68	F 11	5162	1161
335	L 11	5161	1160
1289	K 4	5161	1160
941	M 6	5160	1159
996	L 4	5159	1158
1203	N 2	5157	1156
1295	K 5	5154	1153
1524	M 8	5151	1150
119	L 11	5151	1150
527	K 7	5150	1149
1261	M 3	5147	1146
1024	M 3	5147	1146
1252	M 3	5147	1146
1212	M 2	5146	1145
1373	M 3	5145	1144
346	L 9	5145	1144
1345	K 2	5145	1144
1213	M 2	5145	1144
622	L 6	5145	1144
240	I 11	5145	1144
1369	L 4	5144	1143
779	K 8	5142	1141
1398	L 3	5139	1138
685	L 5	5139	1138
946	O 5	5138	1137
1395	L 3	5136	1135
929	L 6	5135	1134
1387	M 3	5131	1130
339	K 11	5130	1129
1257	N 2	5130	1129
1221	M 2	5130	1129
1386	M 3	5130	1129
1254	M 2	5130	1129
460	K 7	5125	1124
196	I 11	5125	1124
1110	O 3	5123	1122
933	O 5	5117	1116
136	G 11?	5108	1107
1415	M 3	5107	1106
1075	O 4	5104	1103
54	G 12	5081	1080
1191	M 2	5053	1052
663	L 6	5045	1044

APPENDIX II

DATING OF A FLOATING TREE-RING CHRONOLOGY FROM BRYGGEN IN BERGEN

by Steinar Gulliksen & Terje Thun

Abstract

A floating tree-ring chronology spanning 433 years based on logs from the excavation at Bryggen in Bergen, Norway, has been dated by radiocarbon matching against high precision calibration data. A chronological base has thus been established, allowing correlation between building activity, indicated by high occurrences of simultaneous felling years for logs, and the historical record of devastating fires in AD 1170, 1198 and 1248.

On the basis of the combined evidence, tree-ring no. 5000 in the floating chronology has been dated to AD 999. As a consequence, the beginning of a rapid development in the area can be dated to c AD 1100. This is in excellent agreement with the archaeological evidence.

Extensive re-use of building material is revealed by the stratigraphic positions of the dated logs.

Introduction

As described by Thun and Hafsten in Appendix I, a floating dendrochronology extending 433 years has been established by the correlation of a tree-ring series from 267 individual logs from the remains of constructions uncovered during the excavations at Bryggen. In the absence of dendrochronological data linking the Bryggen chronology to the present, it was decided to explore the possibilities offered by radiocarbon dating.

Regular radiocarbon dates are normally measured to a precision of ±50–60 years and converted to historical dates by applying calibration curves. Considerable efforts have been invested in very high precision measurements on tree-ring samples of known age to produce reliable calibration curves. These reflect both short and long term variations in the atmospheric radiocarbon content. Due to the short-term fluctuations, the calibration curves expose quite erratic patterns (fig 1), which severely complicate the calibration of radiocarbon dates.

Routine dating of single samples from the floating chronology could not therefore be expected to pinpoint the chronology with more than a modest accuracy, and certainly not with a precision allowing archaeologists to take full advantage of the dendrochronological framework.

However, the characteristic patterns in many intervals of the calibration curves allow a floating dendrochrono-

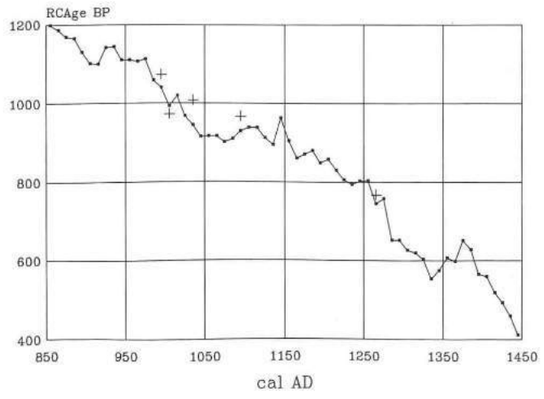

Fig. 1. High precision calibration curve based on decadal samples (Stuiver 1982)

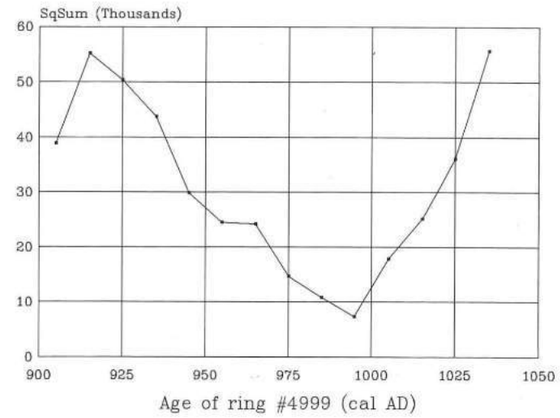

Fig. 2. Sum of the squares of deviations between Bryggen dates and the calibration curve; age assumptions for dendro-ring 4999 lie in the range cal AD 905–1035.

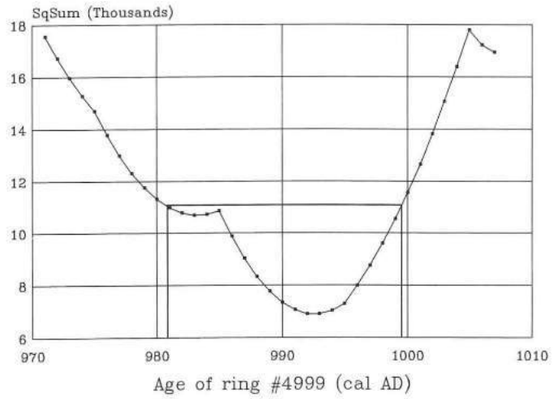

Fig. 3. Sum of the squares of deviations between Bryggen dates and the calibration curve; age assumptions for dendro-ring 4999 lie in the range cal AD 971–1007. Matches in the boxed area are valid at 1 σ level.

logy to be dated precisely by matching its radiocarbon pattern with that of the calibration curve (Ferguson et al 1966; Suess & Strahm 1970; Clark & Morgan 1983; Pearson 1986). Matching the irregularities in the curves is not dissimilar to finding matching shapes among the pieces of a jigsaw puzzle, while a closer analogy for archaeologists is the joining of potsherds by matching their irregular edges.

Preliminary measurements indicated that the Bryggen chronology should most likely be placed in the interval between the ninth and fourteenth centuries. The corresponding decadal calibration curve of Stuiver (1982) is shown in fig 1.

Radiocarbon matching

The most attractive periods for matching purposes are those with a steadily increasing atmospheric radiocarbon content. These give 'long' radiocarbon years and good resolution – contrary to periods when decreasing atmospheric content causes all the material formed during the period to have the same radiocarbon signature. On the basis of the preliminary dates, we therefore selected samples from the Bryggen chronology which we hoped had grown in the periods of cal AD 970–1050 and cal AD 1250–1290, two periods which show a very distinct increase in atmospheric radiocarbon.

At an early stage it became clear that the very attractive wiggle in the fourteenth century was unfortunately outside our reach. Our basic principle of only dating material from dendrochronologically high quality logs, ie those with a long ring series and high correlation factors, made sampling from the outer ends of the chronology complicated.

Due to possible radial transport of later material into the heartwood, a process well known to exist in pine, all samples were cellulose extracted from c 20g decadal wood. Measured in a gas proportional counter for 7-10000 min with intermittent monitoring of standards (Oxalic c 15000 min), standard deviations of c 30 years were obtained.

The measurements in table 1 define the radiocarbon

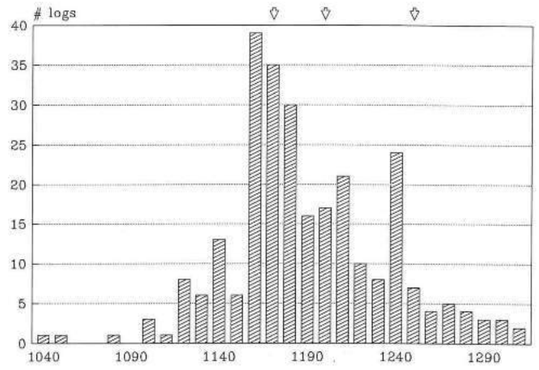

Fig. 4. The decadal frequency distribution of the age of the outermost ring of logs; dates based on radiocarbon matching. The three arrows mark the historical dates of known extensive fires.

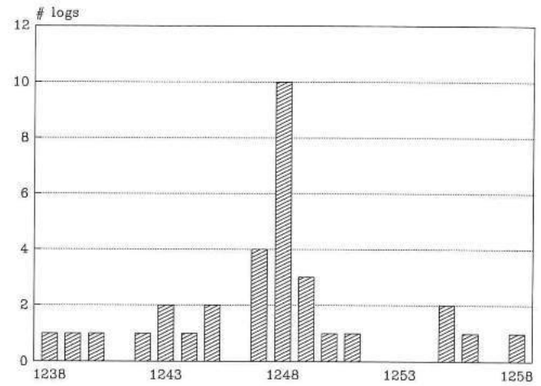

Fig. 6. The frequency distribution of the age of the outermost ring of logs shifted five years to correlate with the known fire in 1248.

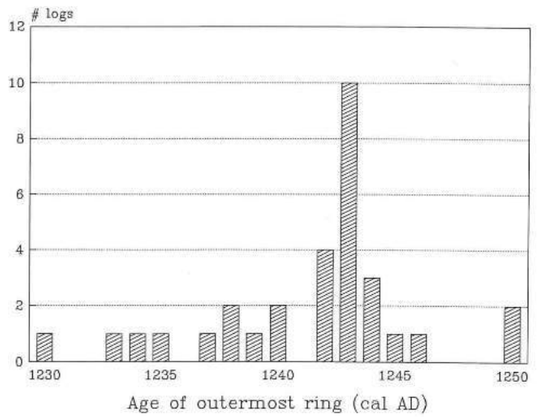

Fig. 5. The frequency distribution of the age of the outermost ring of logs around cal AD 1240; dates based on radiocarbon matching.

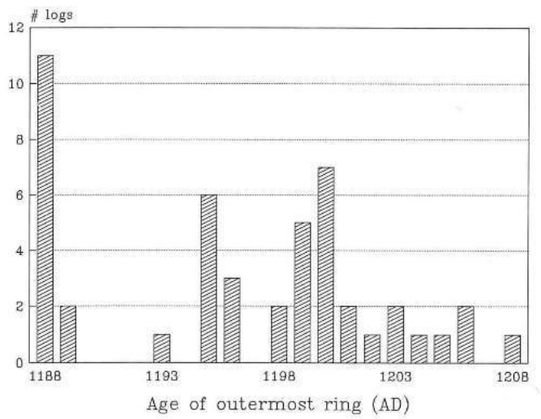

Fig. 7. The frequency distribution of the age of the outermost ring of logs between cal AD 1188 and 1208. An extensive fire is recorded in 1198.

LOG NO.	CHR RING NO.	LAB REF	RCAGE(BP)	$\delta^{13}C$ (PDB)
685	4994–5003	T-7247	1072±29	–23.6
685	5004–5013	T-7246	972±31	–24.5
685	5034–5043	T-6731	1007±28	–22.4
639	5094–5103	T-6732	967±27	–23.7
316	5264–5273	T-7245	768±30	–21.8

Table 1 Radiocarbon dates on cellulose samples from the Bryggen floating dendrochronology, spanning from tree-ring 4883 to 5316.

pattern of the floating chronology. A diagram giving the radiocarbon age as a function of the ring number could be fitted visually by overlaying the calibration curve and shifting the position of the floating chronology along the cal AD axis. However, the best fit is found most effectively by using a computer to look for divergencies between the Bryggen data set and the calibration curve. In practice this is done by successively assuming different chronological fixed points for the floating chronology, causing its position to progress through the relevant part of the calibration curve in steps of ten years. The sum of the squares of the differences between our five dates and the corresponding radiocarbon ages given by the calibration curve acts as a measure of divergence and is calculated for each step:

$$\mathrm{SqSum} = \sum_{1}^{5} (\mathrm{RCAge}_{\mathrm{floating}} - \mathrm{RCAge}_{\mathrm{cal.curve}})^2$$

The best match is then obtained when the floating chronology is at a position which gives the minimum result for the sum of the squares. This method is given in detail in Pearson (1986). According to fig 2 this should place our ring no. 4999 at approximately cal AD 995.

There is no reason to believe, however, that our rings 4994–5003 should coincide ring for ring with those of the calibration curve between cal AD 990 and cal AD 999. A more precise determination of the match could probably be obtained by establishing an approximate 10-year running mean calibration curve by assigning interpolated values to intermediate years. Matching is then performed with steps of 1 year, giving the results shown in fig 3.

When ring 4999 is positioned at cal AD 993, the sum of the squares has a minimum of 6900. This corresponds to a combined standard deviation for each measurement of 37 years, which agrees well with the standard deviations of c 30 years and c 20 years for our measurements and those of the calibration curve (combining to 36 years).

It has been shown by Pearson (1986) that confidence limits for the matches can be found by applying the chi-squared test under the assumption that standard deviations for samples and calibration curve measurements are equal. Although this is a very rough approximation in our case, we feel that the adoption of Pearson's approach will give a meaningful estimate for our confidence limits. The results indicate that matches yielding sums of squares between 5900 and 11100 are valid with 68% probability. As shown in fig 3 this implies that the Bryggen chronology is dated by radiocarbon matching as follows:

$$\text{Dendroring no. } 5000 = \text{cal AD } 994 \pm \frac{7}{12}$$

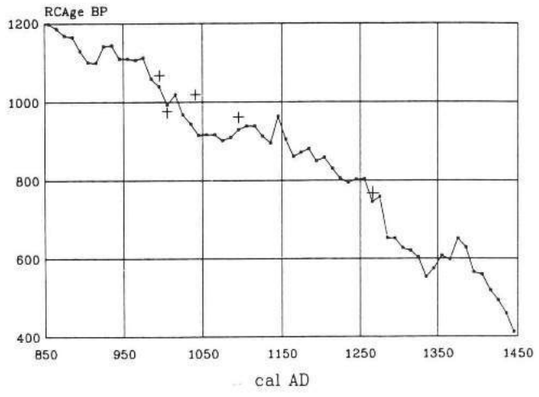

Fig. 9. The radiocarbon dates of the dendrochronological material from Bryggen compared with the calibration curve. The cal AD position of the samples is based on fire date correlation.

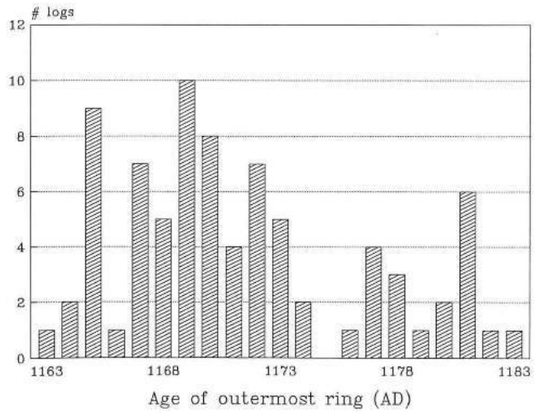

Fig. 8. The frequency distribution of the age of the outermost ring of logs between cal AD 1163 and 1183. An extensive fire is recorded in 1170/71.

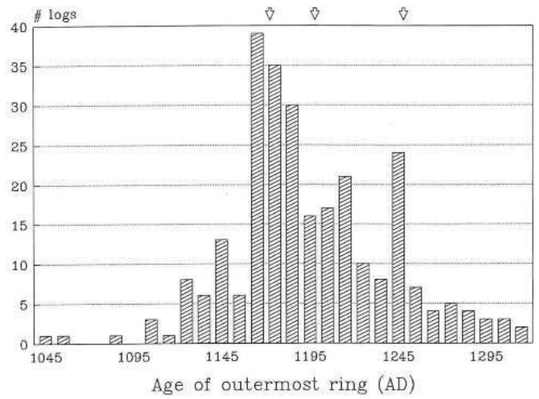

Fig. 10. The decadal frequency distribution of the age of the outermost ring of logs, based on fire-date correlation. The three arrows mark the historical dates of known extensive fires.

Correlation with fire dates

During the early part of this investigation we felt that some other information of value should be available in the ample dendrochronological material. The stratigraphic position of logs rendered a rather confusing picture, giving no clear answers.

It is quite obvious that the extensive fires in the Bryggen area, and especially those claimed by historical sources to have had a devastating impact, would have been succeeded by phases of high building activity. If all the timber ever used in the Bryggen constructions could be dendrochronologically dated, it should be possible to recognize such phases as high occurrences of logs with a simultaneous felling year. We cannot be sure, however, that our dendrochronologically dated selection of logs is sufficiently random, enabling these signals to rise above the noise possibly generated by preferential sampling of material during excavation. Another problem is that any loss of the outermost rings of the dated logs would cause attenuation and broadening of such signals.

The rather exact dating by radiocarbon matching provides a platform for testing the existence of signals indicating building activity against the historical dates of any fires extensive enough to trigger off such activities. The decadal frequency distribution of the age of the outer ring of the logs (fig 4) indicates that the dates of known catastrophic fires in the years 1170, 1198 and 1248 (marked by arrows) are in rather good agreement – but possibly slightly late.

A closer look at the very sharp signal around cal AD 1240 (fig 5) reveals that a shift of five years in the date of the floating chronology would give perfect synchronization between the historical date of the fire in 1248 and a high building activity.

The very low number of logs with an outermost ring dated within the five-year period preceding the 1248 fire strongly indicates that the loss of outermost rings is negligible for the timber felled as a response to the devastating fire in 1248.

If the five-year shift is accepted, the distribution of the outermost ring around the fire dates in 1170 and 1198 is also in good agreement (figs 7 and 8). Some logs, however, seem to have lost a few outer rings, placing their apparent felling year just before the date of the fire.

After evaluating all the evidence presented, we find that the Bryggen chronology can be dated as follows:

Dendro-ring 5000 = AD 999 ± 1

The corresponding position of our radiocarbon dates on the calibration curve is shown in fig 9.

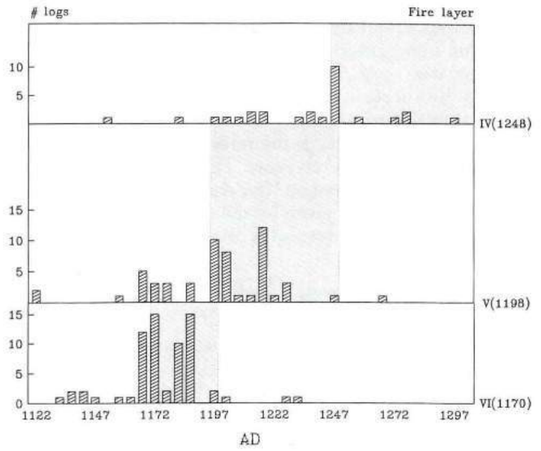

Fig. 12. The frequency distribution of the age of the outermost ring of logs plotted at 5-year intervals and according to their stratigraphical context, after shifting the fire chronology back one fire. Logs in the shaded areas show consistency between their felling year and the fire chronology.

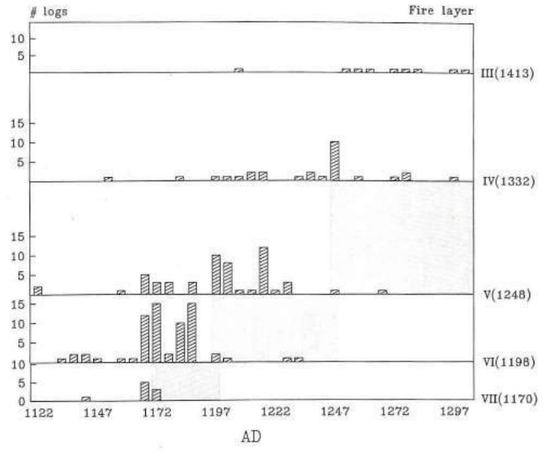

Fig. 11. The frequency distribution of the age of the outermost ring of logs plotted at 5-year intervals and according to their stratigraphical context. Logs in the shaded areas show consistency between their felling year and the fire chronology.

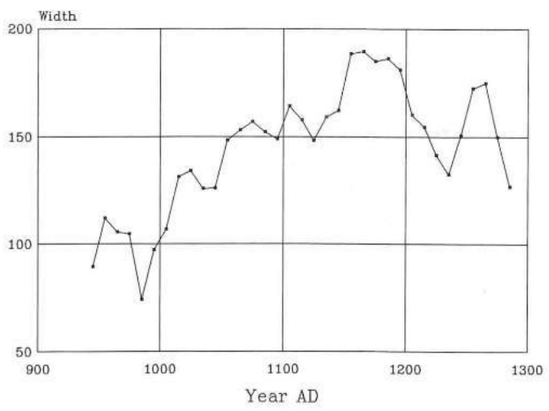

Fig. 13. Decadal mean ring width of the Bryggen chronology.

Discussion

The initial area of Bergen to be developed after the foundation of the city in c AD 1070 is thought to lie within or fairly close to the site of the excavations (Herteig 1969). Consequently, we should expect to find some logs from the earliest phases of the town's development among our dendrochronological samples.

Although the total number of logs with a pre-1170 felling year (ie the age of the outermost ring) is relatively small, our fig 10 should be interpreted as giving an indication of a rapidly increasing building activity from c 1100 onwards. This is in remarkable agreement with the statement in the Orkney saga that by 1127 Bergen had already developed into a centre for both domestic and foreign trade, and it coincides with an assumed vigorous expansion during the prosperous and peaceful reign of King Eystein (1103–23). Danish crusaders visiting in 1191 referred to Bergen as the most important town in Norway due to its position as a commercial centre with immense power (Herteig 1969).

The oldest two logs in the collection of samples have been carefully examined. Their dendrochronological dating is beyond suspicion and one of them definitely has no loss of outer rings. The other, with an adequate amount of sapwood present and bearing surface marks identical to those produced by debarking, has most likely lost very few rings, if any at all. Consequently, these two samples must be from the earliest phase of the town's development.

The stratigraphical details for 60% of the dated logs are indicated in the excavation reports. In fig 11 the distribution of felling years in 5 year intervals is plotted according to the position of the logs in the fire layer stratigraphy. The association between fire dates and layers is that generally accepted by archaeologists.

The latest rings of our floating chronology are dated to c 1315. Some 30% of the logs in fig 11 are from occupation deposits later than the fire layer of 1332, indicating that the re-use of building timber must have been extensive.

It is quite conspicuous that almost all the logs were found above fire layers, which are dated considerably later according to the accepted fire chronology than the logs' felling year. This would only be possible if nearly all the logs were re-used at least once, while for many logs multiple re-use is indicated. We find such an explanation very difficult to accept, and the evaluation of other possible causes has not resulted in the revelation of a probable one. Although it might be in conflict with the archaeological evidence, we find it necessary to point out that good agreement can be obtained by shifting the fire chronology back one step, ie by equating each fire layer with the fire date preceding the one usually assumed. By doing so, we find that the number of apparently re-used logs in the occupation deposits laid within the time span of the Bryggen dendrochronology is a more realistic 30–50% (fig 12).

As an example we have tabulated all logs with felling years dated within the first decade after the fires in AD 1170, 1198 and 1248 (Table 2). For each log we have given the number of the fire layer above and below the interval (period) where the log was found according to excavation reports. The table also indicates whether the date for the log correlates with this interval as it is dated by the fire layer chronology, both the established and the one obtained by shifting back one fire. A deviation given as R1 means that its date corresponds to the preceding fire layer interval, and consequently it must have been reused over one period. R2 means re-use over two periods. A negative number indicates that the log was found in an earlier interval than the date allows. This can be explained either by penetration during construction, inaccurate stratigraphic information or false dendrochronological dating for that log.

We strongly recommend that a revision of the fire chronology must be considered.

Variation of ring widths in a tree in agreement with environmental stress is a fundamental premise for dendrochronological dating. The stress factor with heaviest impact is, of course, the climate, which also affects human cultural development. The mean ring widths of the Bryggen chronology, given in fig 13, clearly demonstrate a dramatic recovery of climate in the early decades of the eleventh century.

Very favourable conditions were prevailing after c 1050 and throughout the twelfth century, coinciding with the well-known medieval warm period. Quite obviously, those responsible for the rapid expansion of Bergen in this period were relieved of the struggle against unfavourable climatic conditions. Preliminary data from a contemporaneous semi-floating chronology from the Trondheim area confirm the climatic information.

That the medieval warm period had a global impact is well documented (Lamb 1982). Ring-width trends observed in oak chronologies from different parts of Germany show narrow rings in the tenth century with a minimum in the 990s, and 35% and 80% wider rings respectively in 1052 and 1160 (op cit). Even the ring-width patterns of Bristlecone pine trees in California provide clear evidence of a remarkable improvement in the climate from the tenth to the eleventh century.

Acknowledgments

The continued support from the Norwegian Research Council for Science and the Humantities (NAVF) is acknowledged.

Postscript

A new attempt to date absolutely the tree-ring chronology from Bryggen was made by comparing it with the recently established tree-ring chronology back to AD 829 from the south-eastern part of Norway. To our surprise it was possible to match the two chronologies, and the dating of the Bryggen chronology to the period AD 882–1314, as described in this paper, was verified down to the very year. The reliability of the south-eastern chronology has been confirmed by comparison with Thomas Bartholin's tree-ring chronologies from southern Sweden.

Table 2. Correlation between the date for logs and the date obtained from their stratigraphical position between fire layers. Deviations are given both with respect to the established fire layer chronology and the one arrived at by shifting it back one step. Included are logs (with available stratigraphical information) that are felled in the first decade after the fires in AD 1170, 1198 and 1248.

Logs dated to AD 1180–1190				Logs dated to AD 1198–1208				Logs dated to AD 1248–1258			
Log no.	Between fire no.	Dev establ	Dev shifted	Log no.	Between fire no.	Dev establ	Dev shifted	Log no.	Between fire no.	Dev establ	Dev shifted
338	V/VI	R1	0	395	IV/V	R1	0	10	IV/V	0	–1
688	V/VI	R1	0	1014	IV/V	R1	0	302	II/III	R2	R1
893	V/VI	R1	0	494	IV/V	R1	0	115	III/IV	R1	0
679	V/VI	R1	0	381	IV/V	R1	0	252	IV/V	0	–1
334	V/VI	R1	0	386	IV/V	R1	0	411	III/IV	R1	0
571	V/VI	R1	0	394	IV/V	R1	0	321	III/IV	R1	0
232	IV/V	R1	0	8	IV/V	R1	0	461	III/IV	R1	0
564	V/VI	R1	0	576	IV/V	R1	0	458	III/IV	R1	0
708	VI/VII	0	–1	493	IV/V	R1	0	465	III/IV	R1	0
397	V/VI	R1	0	501	IV/V	R1	0	863	II/III	R2	R1
691	V/VI	R1	0	203	IV/V	R1	0	405	Ib/II	R3	R2
560	V/VI	R1	0	495	IV/V	R1	0	41	III/IV	R1	0
333	V/VI	R1	0	944	V/VI	0	–1	418	II/III	R2	R1
669	V/VI	R1	0	492	IV/V	R1	0	89	III/IV	R1	0
599	V/VI	R1	0	202	IV/V	R1	0	39	III/IV	R1	0
562	V/VI	R1	0	887	III/IV	R2	R1				
337	V/VI	R1	0	340	V/VI	0	–1				
608	V/VI	R1	0	108	III/IV	R2	R1				
716	VI/VII	0	–1	442	II/III	R3	R2				
894	V/VI	R1	0	162	IV/V	R1	0				
364	V/VI	R1	0								
356	V/VI	R2	R1								
540	V/VI	0	–1								
820	IV/V	R2	R1								
905	IV/V	R3	R2								
801	IV/V	R1	0								

0 : Date of log correlates with stratigraphical position
R1 : Log is re-used from preceding fire layer interval
R2,R3 : Log is re-used over two (three) intervals
–1 : Log found in earlier interval than allowed by date

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Plan 1

Long-section through Bagindon South, looking south, showing the various phases of development with the location and extent of the different buildings.

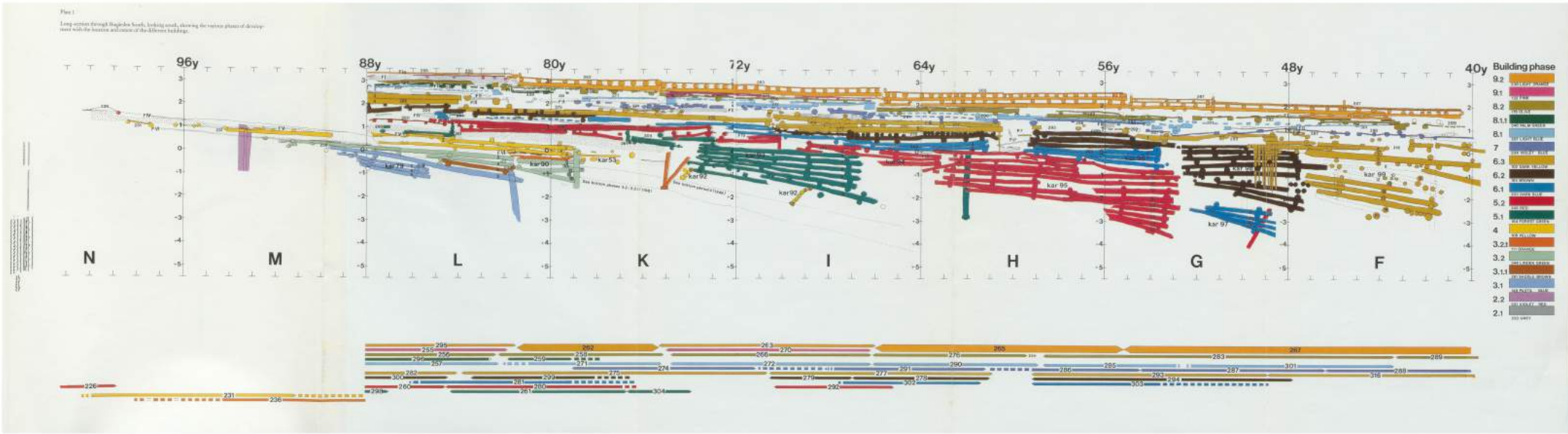
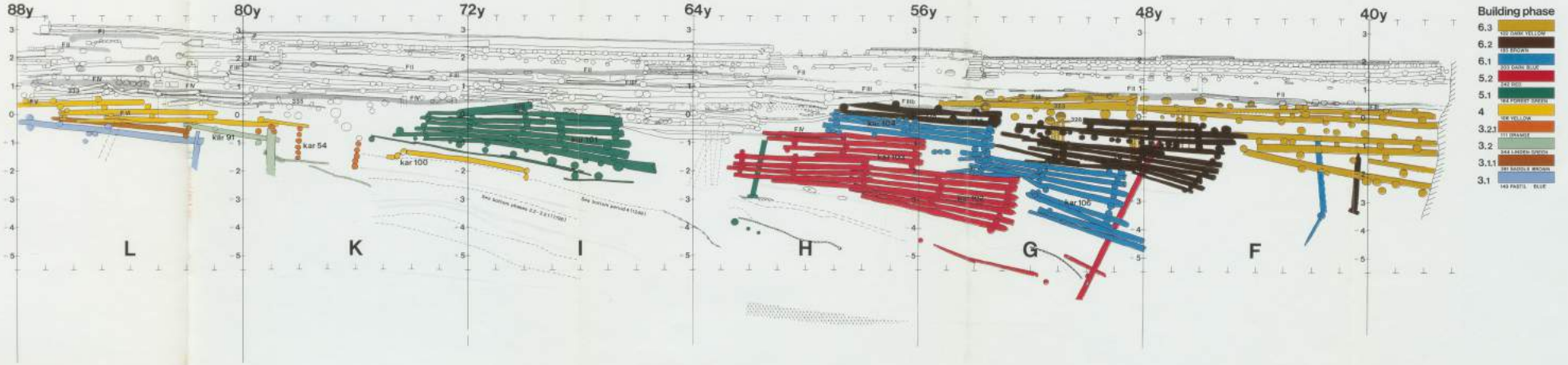


Plate 2

Long-section through Begärden North, looking south, demonstrating the development and seaward limit of the various waterfronts in Periods 3, 4, 5 and 6.



THE BRYGGEN PAPERS is a series of publications giving a scholarly presentation of the archaeological finds from the excavations at Bryggen – The German Wharf – in Bergen, which took place between 1955 and 1968.

Bryggen was the economic centre of the old Norwegian capital. Later – in Hanseatic times – Bergen became one of the largest and most important seaports and commercial centres in Northern Europe. The excavations at Bryggen have revealed extensive material which provides valuable information about the development of the city as well as European cultural history in general.

In the present volume Asbjørn Herteig traces the topographical and chronological development of Bryggen, presenting a richly illustrated documentation from 500 buildings and 12–15 different layers from the southern part of the area which was laid waste in the 1955 fire. The finds from the northern area will be analysed in Part 2.

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