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Building Assyrian society: the case of the Tell Sabi Abyad Dunnu
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Citation
Lanjouw, T. J. R. (2025, December 9). *Building Assyrian society: the case of the Tell Sabi Abyad Dunnu*. Retrieved from https://hdl.handle.net/1887/4285033

Version:	Publisher's Version
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IV. Archaeological deposits in the *Dunnu*

This chapter deals with the processes of physical transformation that lead to the *Dunnu's* excavated condition. The main aim is to understand better the relation between archaeological architecture and so called 'infill', e.g. the surrounding soil matrix. Architecture and infill are closely intertwined, as the mass and form of buildings influence patterns of deposition. It is assumed that these patterns can be used to better understand the physical properties of architecture itself such as building height and presence of roofs. In addition, much of these patterns of deposition are created by weathering processes as well as human activity such as construction, demolition and modification. As such, they can be used to understand better the processes of transformation the settlement underwent, and ultimately reveal something about the relation between people and the built environment.

IV.1 The formation of mud brick sites

IV.1.1 Material and deposition

Mud brick structures have their own characteristic formation processes that turn them into buried archaeological sites. These features derive from the main building material: mud brick, or more generally: loam. Its wide range of application, universal availability, fast degradation has resulted in the typical archaeological landscape of the Western Asia. It is one scattered with mounds of ruined architecture, the tells: villages and towns build and rebuild sometimes for periods over millennia. As such, these tells have been studied for understanding their formation processes. This information can in turn be applied to other sites with similar properties, such as the *Dunnu* of Tell Sabi Abyad. Tell formation deposits can be classified as follows (Miller Rosen, 1986, p. 9):

- A primary matrix consisting of decayed mud brick
- A secondary matrix consisting of:
    - Organo-cultural refuse: fine grained sediment with ash. Food remains and dung. In pits and midden areas.
    - Collapsed rubble: heterogeneous sediments derived from reworked brick, stone, fibres and sherds. This is the most prevalent secondary matrix.
    - Water laid deposit: laminated deposits with strong sorting of grain sizes

- Biogenic and geochemically altered sediments. In arid environments, carbonates develop at the surface, causing some cementation. Characteristic for post-abandonment phase.
- Eolian sediments, e.g. wind blow soil particles.
- Alluvial deposition. Relatively rare, considering the morphology and height of most sites.

A large part of our understanding of these archaeological sites comes from documenting and analysing the sequence and relative amounts in which these elements occur in the stratigraphy of a site, building or enclosed space. For instance, layers of eolian sediments interspersed with mud brick erosion deposits reveal a building that is open, and gradually decaying for an extended period of time.[24] Large amounts of unstratified mud brick rubble indicates sudden and fast collapse, while multiple distinguishable layers of mud brick rubble indicate multiple collapse events. Besides these obvious signs of decay following abandonment, a mud brick settlement is continuously in a state of decay. The rain, sun, and wind cause erosion and chemical weathering, resulting in a continuous formation process characterised by addition and removal of sediment (Torraca, Chiari and Gullini, 1972; McIntosh, 1974; Friesem, Karkanas, *et al.*, 2014). To this are added the cultural factors resulting from human activities of construction, levelling, digging, backfilling and demolition, and all economic and domestic activities that cause and move waste (Schiffer, 1983; Stein, 1987; Schiffer, 1996). Together, these result in the complex archaeological phenomenon that we call a 'tell' or settlement mound (Figure 14, Figure 15).

[24] A good case study of this type of formation is discussed in Friesem *et al* (2011).

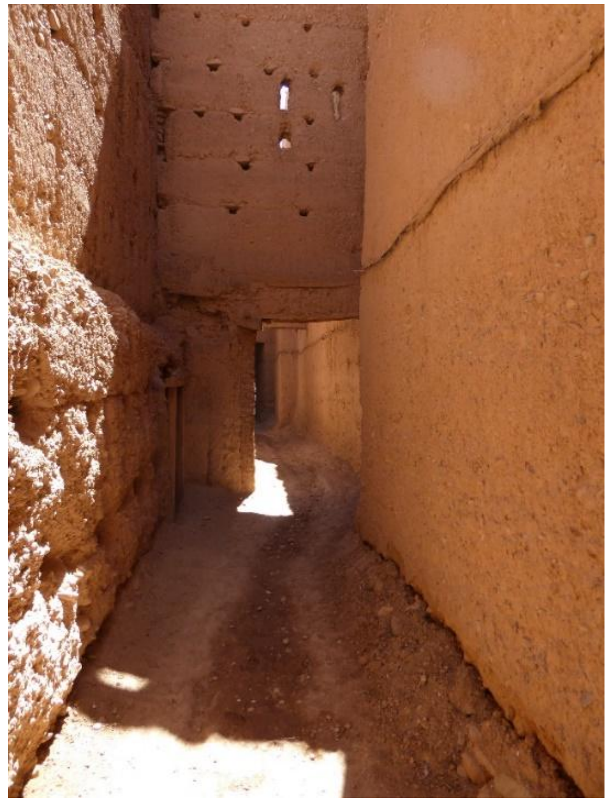

Figure 14 (previous page). Different types of mud brick site formation processes.

Left: Collapse, fortified town near Agdz, SE Morocco. Note that nearly all debris falls inside the building in this case, causing a stark difference in stratigraphy outside and inside.

Right: Water- and gravity-based erosion and sedimentation, same place as previous. Photo by author.

Below: Gradual decay and eolic infill, Gvulot, Israel. Eolic sediments form half of the contents of this experimentally excavated abandoned mud brick house (after Friesem et al. 2011).

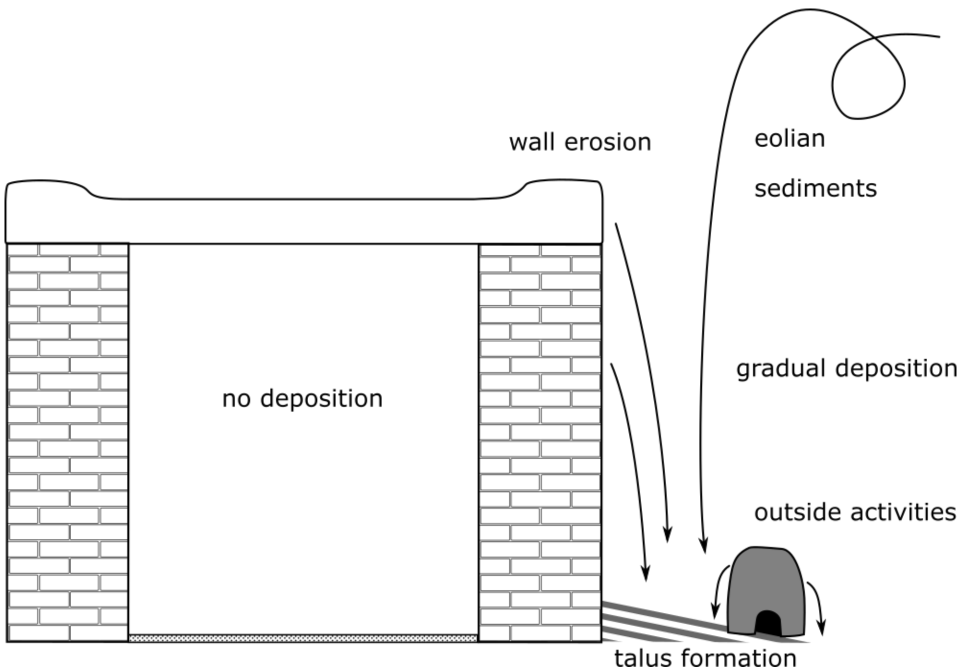

Figure 15. Common natural and cultural sediment deposition processes in loam-based settlements in arid environments.

Even if both addition and removal take place, the net result is generally positive. This fact is put to good use by archaeologists, as it enables them to peel an ancient settlement off from top to bottom, tracing its history back in time. This generally results in a simplified model of stratigraphy with different layers of levels stacked on top of each other, each representing a new phase in history. Although disastrous events such as war and earthquakes may flatten an entire settlement, followed by site wide rebuilding activity may create such blanket phases, for a large part this is not the case (Düring, 2012). For most of the existence of a settlement, it is a much more dynamic and asynchronous occasion.[25] Settlements respond to the natural

[25] The tendency to create blanket phases is critiqued by Düring (2012). And see Carver (2015) for a general critique of the flawed use of the concept of stratigraphy by archaeologists. Warburton (2003) for the view that in the archaeology of the Western Asia, stratigraphy is often not considered further than as a useful device to sequence occupation phases.

as well as to the cultural environment, and dynamically expand, contract and shift. More localised, individual buildings or houses reflect changing human demands, growth or decline of the family, or fluctuating economic welfare. In a very concrete way that means that one building may be in active use, while the one next to it is being demolished and rebuild (Figure 16). This is accompanied by the creation of rubble and levelling deposits and causes the house to 'go up a level', stratigraphically. To develop an understanding of these complex dynamics, which informs our reconstruction of settlement history, we first need to fully understand the depositional history of a site, in other words its formation processes.

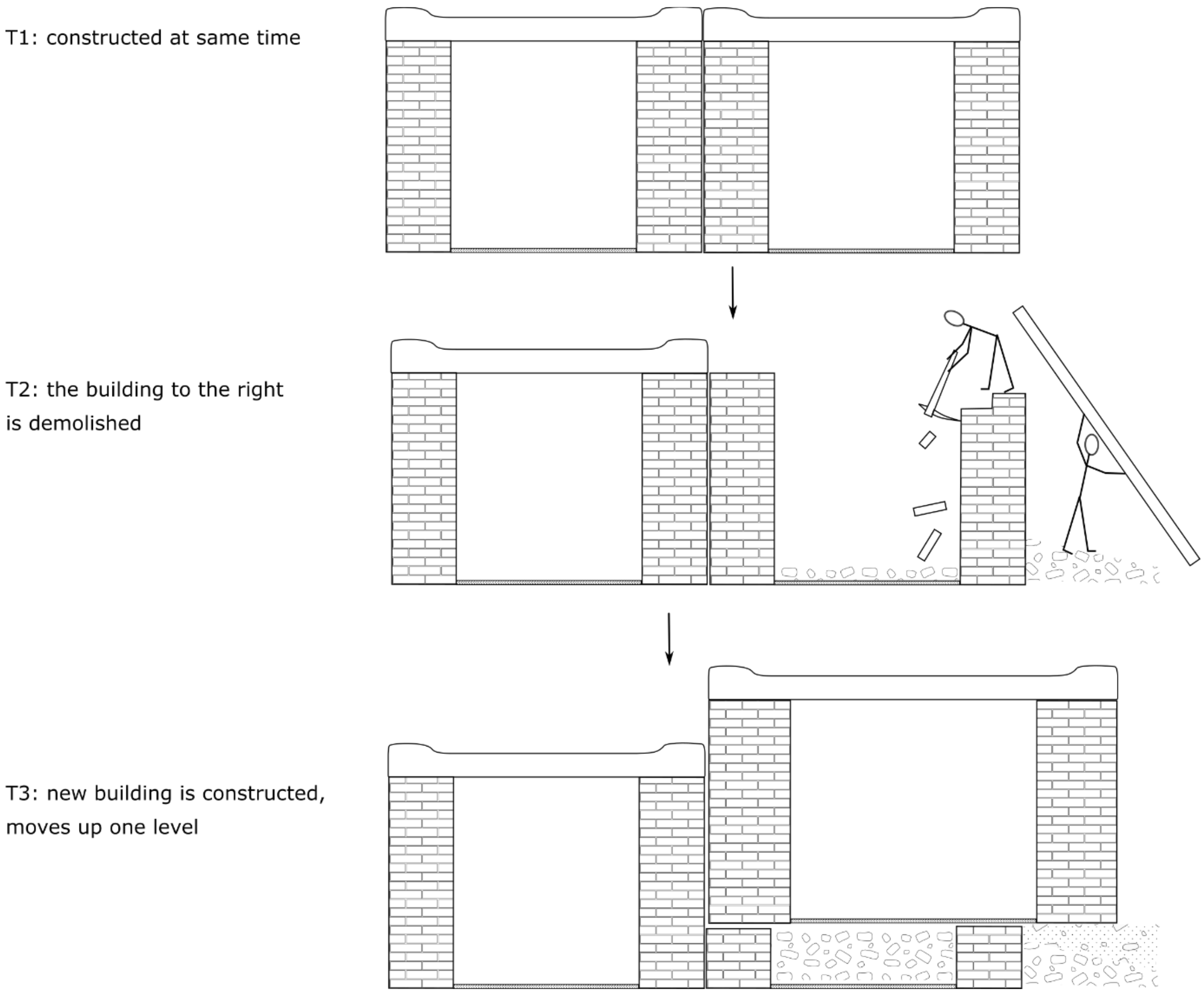

Figure 16. Model of how unparallel life cycles may result in different floor levels inhabited at the same time. If the left building is finally also demolished, a single archaeological 'level' is created, and a false impression of contemporaneity is given.

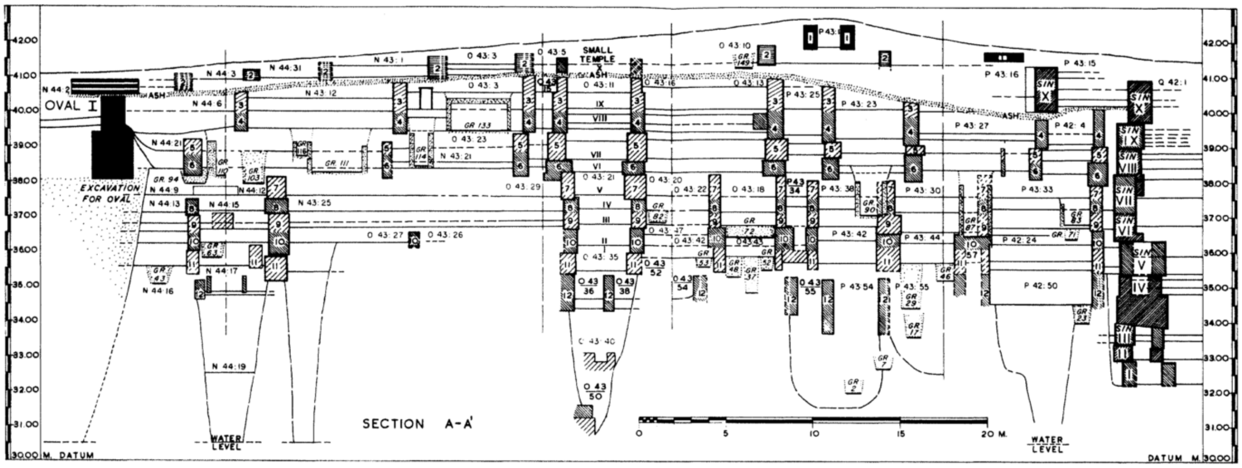

Figure 17. Construction and reconstruction cycle of mud brick houses in a section through the housing area in Khafajah, first half of 3rd millennium BC (after Delougaz, 1940, plate XII).

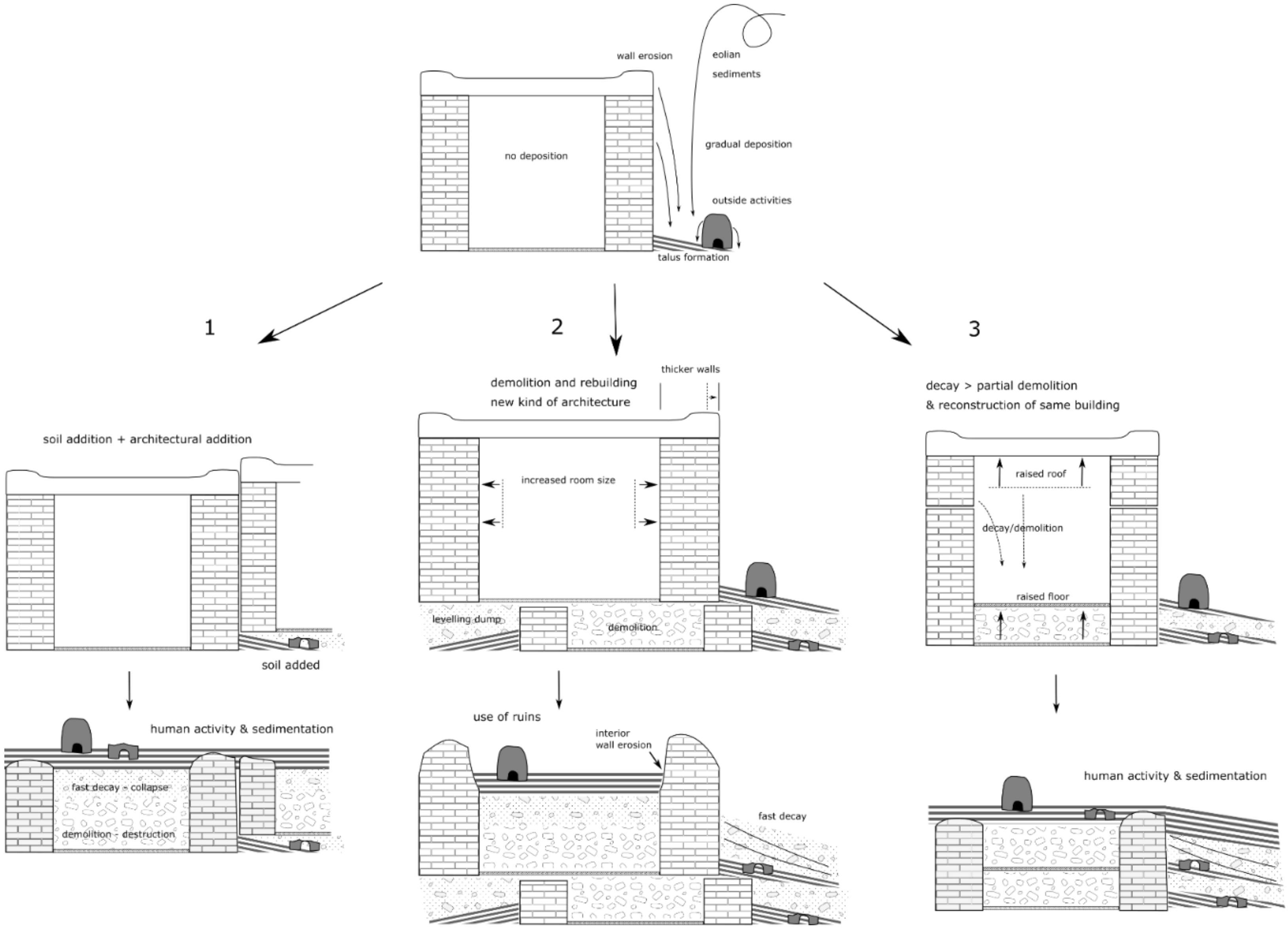

Figure 18. Site formation model developed in this chapter. It includes natural processes of erosion and sedimentation, and cultural factors including different types of architectural modification.

IV.1.2 Global settlement dynamics

The formation of stratigraphy is closely linked to cycles of construction, use and decay. On a higher level, this ties in with settlement dynamics related to social, economic and political processes. A number of ethnoarchaeological studies of village decline and growth link phases of decay to economic or demographic causes. Hall's study of the village of Asvan, in the upper Euphrates region, showed it had at least six distinct faces, and phases, over a period of less than a century (Hall, McBride and Riddell, 1973). Each time house construction or decay could be connected to the migration to and from the village, sometimes related to governmentally organised repopulation and building programs. In fact, it was noted that these phases were so entwined, that it would be hard, better said impossible, to reconstruct from archaeological remains alone. In the case of Horne's study of the Iranian plateau, phases of construction and decay responded to economic and demographic trends, which were in turn closely tied up with the financial means of land owners and the arid climate which did not easily sustain long term permanent settlement (Horne, 1993). These are just two examples of studies in the general region of this study, but such trends have been studied in many cultural and historical contexts, each with a particular mechanic or interplay of factors that may include political, economic, social/demographic, or ecological elements. These affect all settlements, and form the greater context of settlement change, and periods of construction, use and decay.

IV.1.3 The life cycle of a mud brick building

"*The lifetime of some of these buildings was unexpectedly long. Mud brick, so long as it is protected from above, is a durable material, and it has the advantage that it allows of easy repair - it is far simpler to patch a mud-brick wall than one of burnt brick or stone, and it is far simpler to make a new door in, or otherwise modify, a mud-brick than a burnt-brick or stone wall.*" (Woolley, Mallowan and Mitchell, 1976, p. 14). Mud brick sometimes suffers from the prejudice of being a weak building material, that cannot be used to construct lasting architecture. This is not true, but mud brick does require a certain expenditure of effort to sustain on the long term, which is an important part of its life cycle. On the other side, the malleability of the building material is often used to its full potential, making mud brick buildings and settlements a very dynamic phenomenon.

The life cycle of any building includes at least three phases: construction, use, and decay. During use we can identify two important 'sub phases': maintenance and modification. There are choices to be made in each of these steps, such as the quality of the loam and mud brick, the dimensions of the walls and building, the type of timber and roof construction. All such choices will affect in some way its capacity to sustain decay, demolition and destruction. Moreover, during its lifetime differences in maintenance regimes will for a large part be responsible for the length of life of a building. There are no general rules for lifespan, but in many societies a regular mud brick house survives one generation (Table 2).[26] This may be viewed as a cultural choice or a reflection of social structures, rather than the limits of the construction material. Descriptions of house construction in village contexts suggests that houses are simply left to decline when the inhabitants had died, and their off-spring had built their own house elsewhere (Friedl and Loeffler, 1994). In other cases social structures and economic cycles give the impetus for construction, decay and reinvestment (Horne, 1993). In contrast, in an ancient urban context, Woolley and Mallowan find that most houses they excavated in Old Babylonian Ur span the entire period from 2025 to 1763 BCE. This is not to say there was no thorough renovation at times, as thresholds of doors are observably replaced and elevated 2 or 3 times during these 260 years, but the layout and foundations of these buildings is essentially the same. A more recent example is Shibam, the mud brick "skyscraper" city in Yemen[27], whose oldest houses go back 200-300 years, but the city is older and many houses did undergo demolition and complete rebuilding at times (Damluji, 2007). So, a mud brick building can go through a multitude of cycles which constitute construction, use, modification, abandonment, and decay. In theory, the different ways in which these material and cultural aspects play out, will also cause differences in site-formation, and therefore in the final resulting stratigraphy (Figure 18). On many former excavations of West Asian sites, archaeological methodology and technique were generally not developed to a sufficient level to reliably distinguish all such processes, although at some sites like Çatalhöyük these are better attuned to recognizing and interpreting them (Matthews and Farid, 1996).[28]

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[26] As Kubba (1998, p. 45) remarks, there is no general consensus on this issue. All data is based on incidental reporting during archaeological and ethnographical studies, and never really subject to critical investigation.
[27] These houses are 25-30 meters high.
[28] There are however the occasional experimental studies of recently abandoned mud brick sites, such as those of Friesem *et al.* (Friesem *et al.*, 2011; Friesem, Karkanas, *et al.*, 2014; Friesem, Tsartsidou, *et al.*, 2014) or an example from Botswana (Baloi, 1995) and Ghana (McIntosh, 1974, 1977). But these are too isolated and limited in scope to change archaeological practice.

Lifespan of loam buildings

Source	Place	Building technique	Reported lifespan
Oates (1977)		Mud brick	Well maintained: 40 years
Braidwood and Howe (1960, p. 40)	Iraqi Kurdistan	Puddled mud	“a casually built house”: 15 years
Watson (1979)	Western Iran	Puddled mud on limestone rubble foundations	50 years
McIntosh (1974)	Ghana, West Africa	Puddled mud 28 cm thick	Local enquiries: Covered wall, until repair: 6 to 7 years Exposed wall: 2 to 3 years House, before major repairs: 20 years House, well maintained: 70 years
Baloi (1995)	Botswana, southern Africa	Wattle-and-daub, puddled mud, and mud brick	Scholarly estimate: 20 years on average, 50 years maximum Oldest observed house: 46 years Local enquiries: 70 years
Aurenche *et al.* (1997)	Southern Turkey	Loam roof	Roof deck replaced (referring to the loam, unclear whether beams also need replacement): 10 years

Table 2. Reported lifespans of loam houses.

IV.1.4 Other cultural practices causing deposits

Besides construction, decay, maintenance and demolition, there are other aspects of material-cultural life that result in the formation of particular deposits, which can be informative about the microdynamics of life in a mud brick settlement. These are general activities related to economic, industrial or domestic life, waste production and discard and cleaning regime. These are not necessarily unique to mud brick settlements, but loam is involved in many of them. Like buildings, many other elements of use are also constructed of loam: benches, work surfaces, platforms, storage bins, ovens, kilns, troughs, silos, pens, etc. These all have limited – and varying – lifespans, and the intensity or frequency of use will contribute to their decay. Parts of them frequently survive, but mostly they have short use times and are replaced a number of times within the lifespan of a building, or a settlement. Their relationship with the formation of a stratigraphy is cyclical: construction material is taken from the tell and returns to the tell. If we are lucky, we find them in excavation nearly intact, but this then only represents the last generation of a series. The stacking of demolished bread ovens (*tannurs*, or any other ovens) below a single well-preserved one are a typical example of this.

Trash disposal is another contributor to archaeological deposits in general (Schiffer, 1996, pp. 58–72). Activities, such as cooking, tool making, bread baking etc. produce refuse. Settlements often have informally defined areas for trash dumping, or middens. Refuse disposal is often a staged process, in which the stages have been defined as primary and secondary. Thrash is often initially gathered near the place of the activity that it produced, and commonly moved out of the way at some later point (Schiffer, 1996, p. 59). All settlements produce a certain waste pattern in this way, and its direction and movement has been described as the "waste stream" of a settlement.

Related to trash disposal is cleaning. This is quite an ephemeral variable because it is hard to assess that which was removed, but it is nevertheless an important negative contributor the formation of deposits. In fact, as Schiffer (1996, p. 59) states, most societies are involved in periodical cleaning of certain areas of the settlement. The particular cleaning regime is determined by "rates of refuse generation, frequency of activity area use, and variety of activities performed" (Schiffer, 1996, p. 65). We may add that the perceived necessity to keep an area clean may also depend on the social status or function of spaces. Moreover, the cleaning regime may change over time, and rubbish and deposits left in the final stages of use may not be representative for the main phase of use.

IV.2 Building activities causing deposits

The initial construction of any kind of structure may be considered a type of deposit causing activity. A wall or a roof is therefore a deposit, just as natural sediments and refuse deposits are. Primary building activity and its effects in the form of various types of architectural structures are discussed separately (see section V.5). In this section any archaeologically detectable infill deposits are meant in the more traditional sense, caused by 'secondary' building activities such as maintenance and repair, demolition, and modifications.

IV.2.1 Maintenance and repair

Under maintenance and repair we can list activities such as resurfacing, reinforcing, and replacing. This is a understudied topic in archaeology and few good, detailed information is available about practices that goes beyond the anecdotal level. Maintenance and repair in mud brick architecture involves for a large part plastering or rendering walls, ideally every 1 to 3 years. Horne (1994, p. 194) reports that in Tauran, Iran, the exterior is resurfaced every three years. The interior is done once a year unless an expensive plaster is used, in which case plastering also takes place every three years. In Dia, Mali, rendering is a biennial activity (van der Linde, 2002, p. 55). In Aşvan, Turkey, interior floors, walls and ceilings are done on average once a month, while exterior walls are rendered yearly (Hall, McBride and Riddell, 1973, p. 259). Archaeological examples exist of cases of layers up to 10-15 cm in thickness, reflecting many such resurfacing phases

(Woolley, Mallowan and Mitchell, 1976; Miglus *et al.*, 2013). Renders may also have been completely or partly scraped off before applying a new layer. The loam of the roof deck possibly has a 10 year life-expectancy, but this is just reported by one study by Aurenche *et al.* (1997). Depending on how the old roof is removed, it is possible that parts of it end up on the floor and are levelled to form a new floor. The rendering and plastering, as well as renovating the roofs mean that new material is brought in, that will start to erode and contribute to the formation of new deposits.

Elements like door frames, doors, window frames and shutters will need occasional replacement, but this activity leaves few traces in the archaeological record. An interesting maintenance task related to doors is recorded in the Garšana building texts. ‘The pulling of doors’ (Heimpel, 2009, p. 175) is mentioned quite a few times, and at one time a scribe also lists the expenditure of ½ liter of tallow for lubricating ‘door bottoms’. We may therefore associate this task to the dislodging of doors, and cleaning out and lubricating the pivot holes or stones. Although pivot stones and lined pivot holes are often found, rarely they show phases and it will leave an insignificant and unobservable trace on the archaeological record. Theoretically phosphate analysis should be able to pick up the regular use of tallow.

Repair may also involve partial demolition. If a roof is in bad condition, the upper part of a building may be demolished, and built up again. If the new wall part is distinct due to change in material or structural characteristics, it is observable in the archaeological record. However, walls are generally not preserved to this height. If larger structural problems exist, more of the building may be demolished and rebuild on top of existing walls. Note that in wall construction, especially in larger projects, bricks made from different loam sources may be employed causing a similar observable effect. This could create a false impression of a renovation phase.

Instable walls can be reinforced by buttresses or abutments.[29] Most examples of such interventions found in the literature study come however from restoration projects, which are focussed on preserving something that has value as heritage object. Perhaps ancient practice often favoured demolition and rebuilding over stabilizing. Buttresses or abutments found in ancient construction are often part of the original design or employed when a building requires structural reinforcement in case of functional change. In which case it must be classified as a modification rather than a maintenance or repair activity.

[29] Buttress - an architectural structure built against or projecting from a wall which serves to support or reinforce the wall. It is often used in ancient structures as a means of providing support to act against the lateral forces arising out of the roof structures that lack adequate bracing. Abutment – here used in the meaning of a continuous buttress. Its function is to transfer loads from a superstructure to a foundation, or to transfer self-weight or lateral forces.

IV.2.2 Demolition

Unfortunately, demolition is rarely a topic discussed in detail in ethno-archaeological and architecture studies. Most information regarding demolition is from descriptions of archaeological contexts. Although archaeological deposits are often the effect of demolition or collapse events, they do not give information about behavioural and technical aspects involved in the formation of such deposits. A case that is well-described and analysed in detail in view of the sequence of deposits and the events they represent are the houses in Çatalhöyük (Matthews and Farid, 1996). It shows that intentional demolition and rebuilding was very common practice here, and followed a certain procedure. Similar practices will have existed elsewhere. Although the sociocultural context is not always the same, the basic material conditions are similar and the need for demolition and rebuilding is generally present.

Buildings or parts of buildings may be demolished and replaced completely. A bad state of maintenance, a desire to raise the ground level, or to replace a building with a new building of different type or dimensions, may all be motivations for demolition. As has been mentioned already, a house can keep the same dimensions and layout for centuries, but still not be exactly the same physical house. This cycle of construction, demolition and rebuilding is one of the most characteristic aspects of mud brick settlements (figure 16). Regardless historical period or cultural setting, the height of the walls of the previous generation that is left standing seems to be relatively constant at about 50 cm. It is possible that this reflects the acceptable amount of rise in ground level, while keeping the amount of effort to remove the rubble to a minimum. In terms of method, it is probable that walls are broken down from the top, but they may also have been pushed. Generally, the debris is deposited on the interior of the building. Some natural collapse may of course already have occurred if the building was in a bad state and abandoned for a while. But in the case of continuation of the same building plan, it seems likely that the same family that inhabited the house, who decided to renovate and thus demolish the upper part of the house. Some of the collapsed rubble may be removed, but with single floor buildings, it is likely that the volume of the walls is preserved largely inside the collapse. The case of Çatalhöyük shows a more elaborate sequence of fills, perhaps reflecting different practices (Matthews and Farid, 1996). Then the surface is levelled, and a new building is constructed on top using the old walls as outline and foundation if the building was demolished in the context of renovation. But if the reason for demolition was modification, the new building is not likely to have followed the older one's walls.

One ancient Assyrian source (SAA 15 113) explicitly mentions the demolition and rebuilding of a fortification wall of a fort probably similar in size to the *Dunnu* (the full text is given under VI.11.1). It specially targeted the 'southern and eastern directions' (i.e. southern and eastern fortification walls). The reason for demolishing these is not disclosed, nor does it tell how far the demolition went, but such an intervention has archaeological implications. If the wall was really demolished to the last brick, the traces of the renovation would not be observable anymore and an archaeologist would not know that this fortification had two construction phases. But if demolition was not complete, a few brick courses were left standing, on top of which the new wall is built. This might be recognizable as phase in the wall's construction. The completeness of demolition is an issue that is hard to assess, since we lack the empirical data about real practices. Although the archaeological record shows that it was extremely common to leave part of structures standing before a new one is constructed on top, this record is biased towards phenomena that survive.

IV.2.3 Modifications[30]

Loam is a flexible building material, and a building made may be modified or repaired more easily than a building made of baked brick or stone. A German researcher who studied traditional mud brick architecture in Turkey characterised it as 'd*as vegetatives Bauen*', or organic building (Peters, 1982, p. 226). And it has been observed a multiplicity of times in different cultural contexts. Hence, we can expect to see a lot of modifications during the lifetime of a building. We can classify the most common types of modification that may have archaeological consequences:

- Expanding vertically, e.g. adding a floor
- Expanding horizontally, e.g. adding a room or building to the exterior
- Partitioning/merging, e.g. breaking up a space in smaller units, or enlarging it by removing a wall
- Connecting/blocking, e.g. closing or opening a doorway or gate
- Demolition and replacing

Each of these building activities reflect particular choices related to the use and functioning of a building.

Expanding vertically means adding a floor, or multiple floors on top of an existing building, or on top of part of a building. Although the activity is not studied in detail in the ethnoarchaeological studies, it is clear that this may involve reinforcements on ground level in the form of abutments along existing walls. A good example is shown on Figure 19. In such a case, the construction phase would be visible archaeologically. However, the practice to construct the walls of a new house extra wide, with an eye on possible future vertical expansion is also recorded.

[30] This is a general introduction of modification types and practices. Under section V.6, the evidence for modification and repair in the *Dunnu* is discussed.

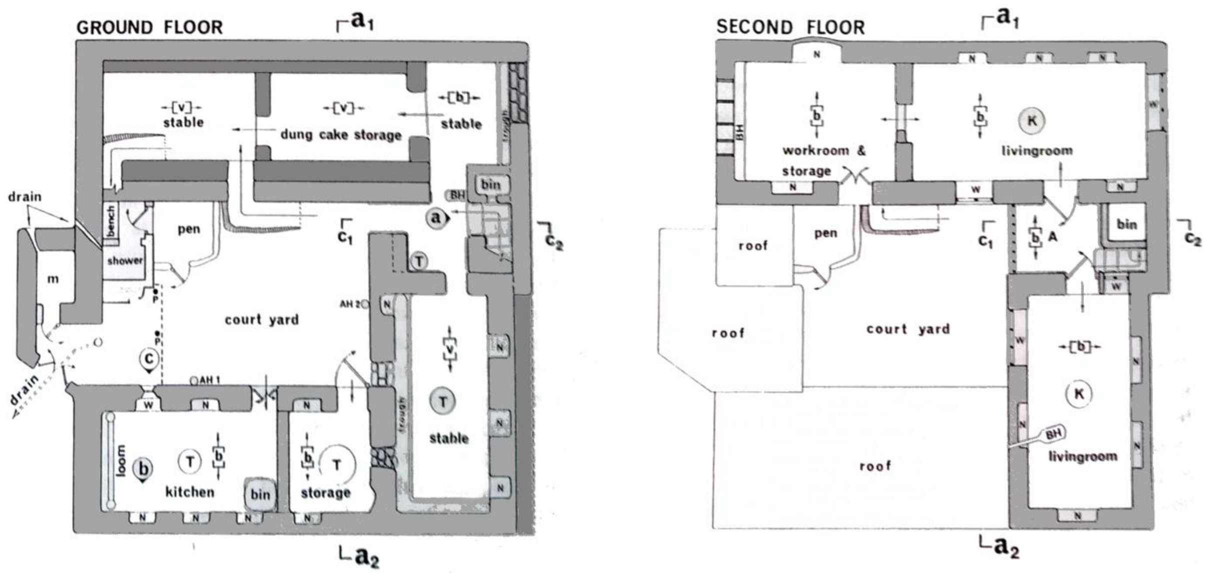


Figure 19. House in Shahabad, Iran. Modifications were made to this house to support a second floor, which it did not originally have. In light grey the original walls, and in dark grey the reinforcements (after Kramer, 1979, p. 148).

Horizontal expansion occurs when new rooms or additional buildings are constructed as an expansion to an existing building. It may be distinguishable from the original construction by various architectural characteristics such as brick colour, wall width, or bonding type. If two walls are abutted rather than bonded, we generally assume one is later than the other. It is however possible that part of the old wall may be demolished and bricked up again and bonded with the new expansion. It is not known how widespread this practice is in ancient mud brick construction. But in such cases differences in brick or mortar colour can be indicative, but these are not always present. The best indicator, in the absence of others, is stratigraphic position. Due to climatic conditions, and the physical nature of mud brick settlements, sediments will always collect in outside areas. These include all types of sedimentation discussed in the beginning of this chapter, and the cultural processes discussed later. Walls or buildings constructed on top of these can be quite safely dated to a later phase of the architecture under study. However, there may be circumstances in which the outside area next to a building does not show this accumulation. In the case of streets or sloped area, it may erode as fast as sediments accumulate. Areas might also be kept very clean. Or an area might be levelled before construction, to ensure the ground surface of the new building is on a level with the ground surface of the old building. But this last practice might not be that widespread, considering the general tendency to simply construct on top of the available surface, and the natural rise observed in most ancient mud brick settlements.

Partitioning and merging are two sides of the same coin, involving either the construction or removal of interior walls to change the size or configuration of spaces. These are often of lighter construction than the load bearing exterior walls, and can be made of mud brick but also using cobbing[31] or a type of wattle-and-daub over a reed or palm leave frame. This naturally influences wall preservation, and they are only rarely recovered.[32] In terms of ordering the events, these can be among the hardest to put in a sequence, as a stratigraphic difference between the original construction and partition wall is not always apparent. There is no sedimentation or gradual layer development taking place on the interior. Only if a partition wall is part of a larger renovation project after a collapse or partial demolition phase resulting in a mud brick rubble deposit on the floor, there is a good indication for temporal difference. Discontinuous plaster or render layers can be another indication for order of construction, and should ideally be studied very closely in order to determine order of construction. Merging spaces is an activity that has less chance of survival because it involves the removal of walls. Only with heavier constructions and large-scale renovations that cause rubble deposits, the bottom part of older partition walls may survive. In all other cases, it will be very hard to recognize a removed wall.

Creating or blocking doorways, gates or windows is a relatively minor event in terms of effort and cost, but can have big consequences on how a building or settlement functions spatially. Blocking generally involves constructing a mud brick wall inside the gap. It is usually recognizable as such, but not always apparent what its temporal relation with the main structure is. Some blockings are completely concealed from view by covering it with the same render as on the adjoining walls, while others have more the character of a quick and rough intervention. This could relate to the visibility of the blocking or status of the space the wall belongs to. Cutting a gap through a wall to create a doorway is not always that easy to recognize, since in archaeological context, bricks are usually very eroded at the jambs and corners of walls. It may be recognizable if the level on which the hole is made, is above the ground level of the wall. However, sometimes an integrated brick threshold of one or two course is part of the original construction. Otherwise, the same 'rules' as with other modifications apply related to our ability to recognize temporal differentiation.

The last type of modification is demolition and replacement. Demolition has been discussed already above. Replacement may involve either rebuilding the same structures on top of the walls of the previous structures. This is generally the case when a building is in a bad condition and requires renovation, while its main type and function probably remains the same. Alternatively, demolition may be followed by a

[31] A common earth construction technique involving balls of loam stacked on top of each other and beaten together.
[32] A rare example has been documented in Nuzi (Starr, 1939, Plate 24B).

completely different type of structure. Such cases would indicate that the motivation for demolition is a functional change, or an up- or downscaling of already present functions of a building.

IV.2.4 Roof beam recycling

Important for the archaeological understanding of mud brick buildings, is that due to the scarcity of this commodity, poles and beams were often reused. Numerous ethnographic observations testify to the salvaging of timber from abandoned houses (Hall, McBride and Riddell, 1973; Kramer, 1979; Friedl and Loeffler, 1994). Coincidentally illustrative is one of Tell Sabi Abyad's cuneiform tablets in which special mention is made of the beams when a farmer has to move places. In tablet 97-17 permission is requested for cattle farmer Sarniqu to take with him his belongings including the beams of his house (Wiggermann, 2000). Taking out beams causes some immediate collapse, and the rapid onset of accelerated decay (Figure 20). There is a large chance that some of this remains visible in the archaeological record. Even if the building is re-used, not all debris is necessarily cleaned up.

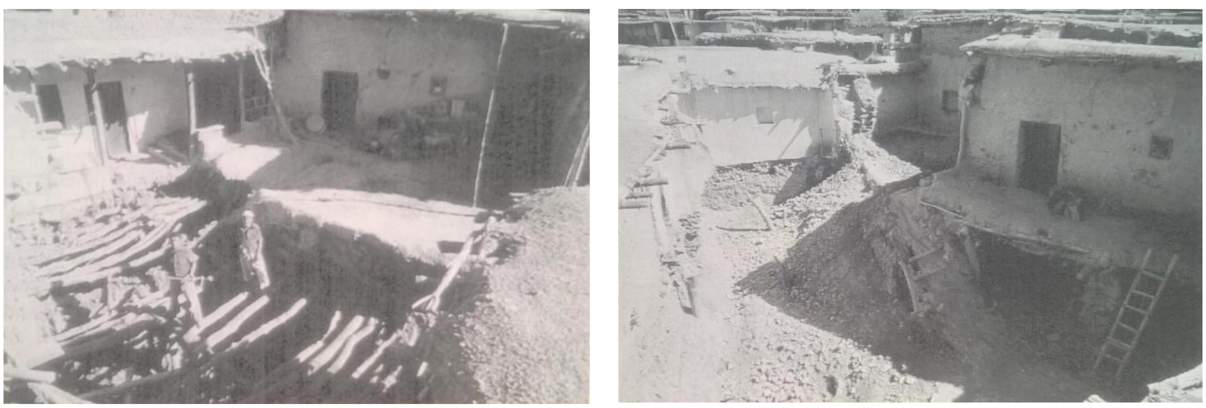


Figure 20. Demolition of a village house in the early 1980s, west Iran. Left: salvaging of roof beams. Right: the same house three years later. Much rubble is lying on the ground, but its distribution is very uneven. The house on the right is still inhabited (After Friedl & Loeffler 1994, figs.6 & 8).

IV.3 Deposit formation and architecture of the *Dunnu*

Now we will direct our attention to the analysis of the archaeological data from the *Dunnu* of Tell Sabi Abyad. As discussed in the introduction, the chronology of the *Dunnu* has been described in terms of a sequence of stratigraphic levels: level 7 to level 1. In this scheme, level 7 represents the oldest pre-Assyrian phase, level 6 and 5 the main Assyrian *Dunnu* phases, level 4 and 3 the contracted *Dunnu* phase and levels 2 and 1 are very shallow and unclear, but may be respectively Hellenistic and Byzantine. These levels are in principle an aggregation of architecture and strata in a single chrono-stratigraphic phase. Besides the implications of using the term 'level', there are also practical issues in the assignation of architecture and strata to certain levels (see VI.3.1). Moreover, from the following discussion it will become clear that neatly separable levels are not only a theoretical but also an actual impossibility in the *Dunnu.* It is however possible to discern four archaeological levels on a lower resolution by drawing boundaries between larger scale changes in mechanism of deposition (see column 'main phase' in Table 1). In this way, the levels are combined as larger stratigraphic units that can be better empirically validated.

IV.3.1 Deposit mapping and classification

Based on the excavation data – e.g. section drawings, field notes and deposit descriptions – the deposits found in the *Dunnu* have been classified according to the various mechanisms as discussed previously in this chapter. In summary, eolian, hydraulic and gravity-based sedimentation are among the natural processes, while human activity such as construction, backfilling, refuse disposal are the cultural contributors to layer deposition. The definition of deposit used here is the common one found in geoarchaeological work, and is derived from geology, where it is called a 'bed', or a "single sedimentation unit formed under essentially constant physical conditions with constant delivery of the same material during deposition" (Stein, 1987, p. 339). Also deposits caused by human activity, such as the construction of a wall or floor, can be considered a single deposit under this definition.

In order to assess the nature of the mechanisms of deposition, attention was paid to layer morphology (irregular or regular surface), layer thickness, layer distribution (even or uneven distribution throughout space), layer consistency (hard, medium hard, soft), layer texture (fine or course), layer colour. Prime indicators for deposition mechanisms are the thickness and content of the layer. The listed properties were chosen as these were normally recorded by the archaeologists either as textual description in notes, or on section drawings. This assessment is summarised in generalised diagrams called deposit sequence graphs such as Figure 21, which are designed to make it easier to visually compare the relative thickness, character and the order in which different deposits occur throughout the spaces of the *Dunnu*.

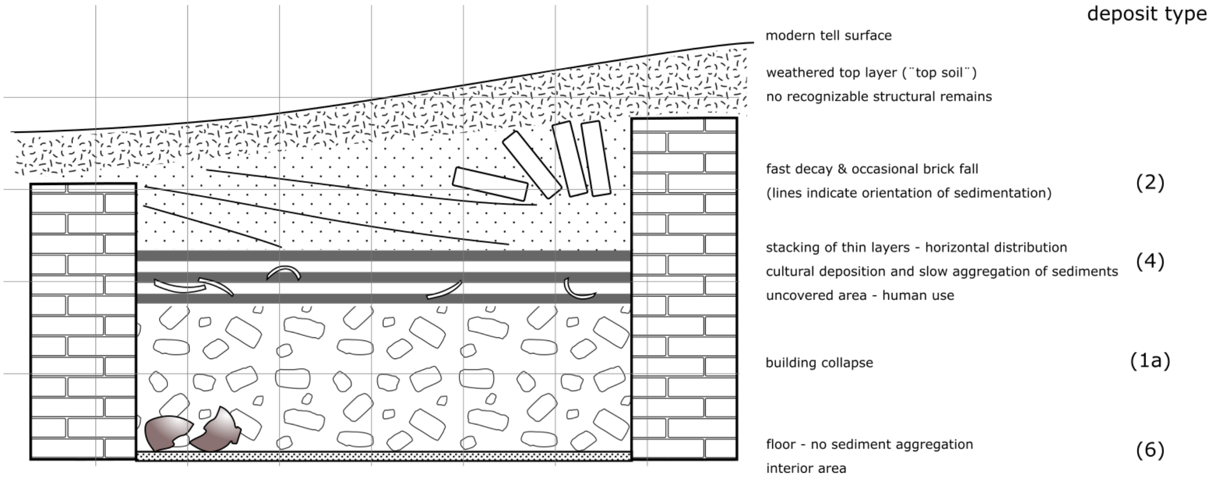
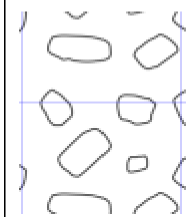
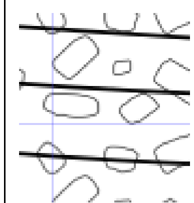
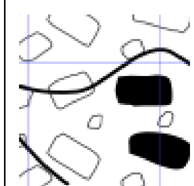
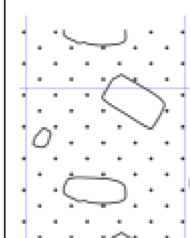
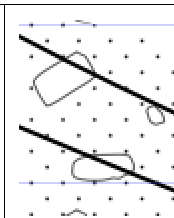
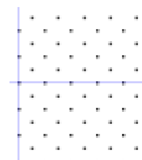
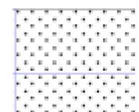
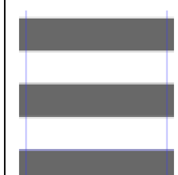
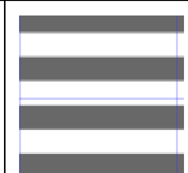


Figure 21. Example of a deposit sequence graph: a standardized and simplified representation of the order of deposits (grid-size: 50 cm).

The table below is a general classification of the deposit types found in the *Dunnu* of Tell Sabi Abyad.

	Description	Name	Mode of deposition	Interior/exterior	Symbol	Examples
1.	a. High amount of recognizable mud brick debris – complete or large parts of broken mud bricks. Patchy with lenses of different loams.	Collapse deposit.	a. Fast decay / demolition – collapse of construction materials.	Predominantly interior	Uniform:  With internal stratification: 	Rooms of residence and tower. Rooms in the northern wing.
	b. With burnt or carbonized construction materials. Ash or carbon lenses.	Collapse deposit with fire.	b. Fast decay – conflagration - collapse			
2.	Low amount of recognizable mud brick debris – mostly broken bricks. Largely uniform soil matrix, some stratification. Strata are over 20 cm in thickness.	Fast decay deposit.	Fast gradual decay due to erosion and occasional brick fall amounting to voluminous deposits. Early state of degradation. May follow on, or precede deposit type 1.	Exterior and formerly interior areas, e.g. after main collapse phase or roof removal.	Uniform:  With internal stratification:	Most low, e.g. single floor buildings

						
3	a. Loose homogeneous deposit of loam without recognizable mud brick debris. Some patches of ash/charcoal/white mineral.	Backfill deposit	Deliberate backfill (most probably)			Room NW-3d,
	b. Same as 'a' but dense/more compacted	Dense backfill deposit				
4.	Sequence of strata 10 – 20 cm with some debris. Cultural material and ashy layers in varying concentrations. Irregular surfaces: 'wavy'. Some more level. Varying thickness of strata.	Medium fast decay deposit.	Medium fast decay – nearby buildings erode fast but do not collapse. Advanced state of degradation. No or little maintenance, but human use takes place.	Exterior, and formerly interior areas, e.g. after main collapse phase or roof removal.		The fosse. The large court after it lost its original function. Unpaved exterior areas in the eastern *Dunnu*.
5.	Sequence of strata 2 – 10 cm. No or very few recognizable mud brick fragments. Cultural material in varying concentrations. Wavy and	Slow decay deposit.	a. Slow decay – human use and maintenance. 'floors' ie natural surfaces.	Generally exterior, possibly formerly interior areas, e.g. after main collapse		Generally, in smaller outside areas, such as the alleyway in the southern part. Sloping areas in the east, during advanced state of decay of the fortification wall.

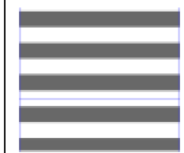
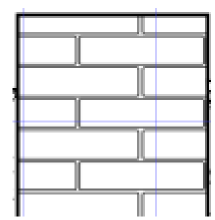
	patchy. Occasionally more level. Varying thickness of strata.	Slow decay deposit, advanced state.	b. Very advanced state of degradation. Not much material left to deposit. Or sheet deposits in sloping areas.	phase or roof removal.		Also most areas in later phases, in level 3 and 2 exhibit such sequences.
6.	a. Sequence of strata < 6 cm. Level surfaces. Uniform thickness of strata.	Very slow decay deposit.	Very slow decay. Regular maintenance. Floor renewals?	Uncertain. If completely open, one would expect greater accumulation of material.		
	b. Same as a, only the colour of strata alternates between just two colours.	Very slow decay alternating deposit.	Very slow decay. Regular maintenance. Uncertain interpretation. Floor renewals?			
7.	Single hard and compact layer of loam or calciferous material. May be integrated in layered deposits type 5 or 6.	Constructed floor.	Floor construction activity	Mostly interior. Exterior uncertain.		
8.	Bonded stacking of mud bricks.	Constructed wall.	Wall construction activity.			

Table 3. Deposit types in the Dunnu related to architecture

The interpretation of deposits as suggested in Table 3 above is based on the general theory of deposition as outlined in the former part of this chapter. Based on this we assume that during use more material is deposited in open areas than in covered spaces during the use phase. Gradual accumulation indicates absence of cleaning and formation of deposits under influence of erosion and gravity (decay), air-based sediment, and human trash producing and construction activities. The thickness and morphology of the individual layers within a gradual deposit tell something about the speed and conditions of deposition. So, we may see slow gradual accumulation of fine and regular layers in less dynamic areas: either in a more sheltered position, less used for refuse producing activities, or both. Thicker layers with irregular morphology indicate a more volatile mode of deposition: moments of rapid decay and absence of cleaning/maintenance. This can be seasonally based, as in winters more water-based erosion and sedimentation will occur, while in the dry summers wind contains many airborne particles.

Whether these deposits will remain depends on human cleaning activities or conditions for further transportation of sediments over ground. Typical places within the *Dunnu* where we can see gradual accumulation of deposits are the narrow alley running along the southern side of the central buildings, and the large courtyard after it fell out of use as high social status area. It is indicative of both absence of maintenance, rapid decay, and refuse disposal, or sediment producing activities such as small domestic constructions. In other open or semi-open spaces we see also some gradual accumulation but on a much slower rate.

This is even the case in an area in the south-western corner that is intensively used for oven-based activities, which involves regular demolition and rebuilding of loam constructed ovens. The accumulation of sediments is clearly observable, but its rate is relatively slow in comparison to the alley that runs alongside it. In fact, some of the architectural modification seen here, the closing of some doorways into this alley, or the construction of new retaining walls, may be a response to the asymmetrical rise in ground level. It is interesting to note, that the fast-rising deposits inside the *Dunnu* are very similar in terms of layer thickness and morphology to what is found in the fosse.

The infill in the fosse, is a good benchmark. It is a good example of the rapid development of deposits in conditions where walls enclose an open space. Unless a rigorous maintenance and cleaning regime is in place, open spaces will fill up. It is therefore notable how little this happened inside the walls of the *Dunnu*, and when it did occur the *Dunnu* had clearly entered a different phase of use (e.g. post *Dunnu*) or in an area associated with intensive food production and other domestic activities. Elsewhere in open spaces we see modest accumulation of thin deposits resulting in limited ground level rise, which indicates that these areas were kept relatively tidy and that the surrounding architecture was maintained. However, a natural influx of deposited material will always occur. Although these are sometimes referred to as series of floors (e.g.

'constructed') in the excavation documentation, they are more likely surfaces created by natural sediments, compacted and levelled through regular usage. That such 'floor series' usually occurs outside, is a good indication for the latter hypothesis.[33]

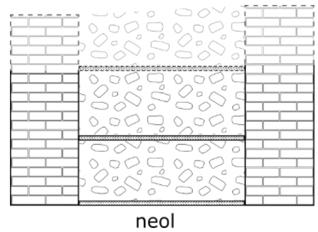
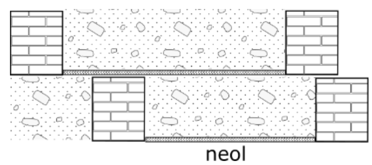
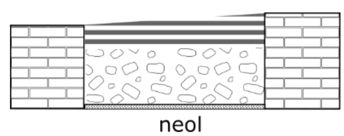
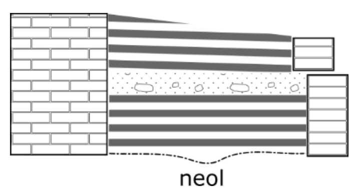
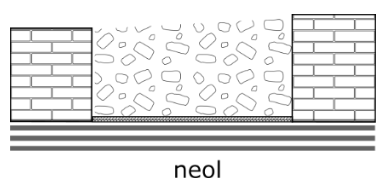
A lot of the deposited material, if not most of the excavated volume, originates from the surrounding architecture, either as products of weathering and erosion or by instantaneous collapse. The debris deposits form the largest volumes of all, especially inside buildings. They occur in a couple of varieties: as unstratified deposits between floors, limited in thickness, or as more massive volumes, often stratified implying multiple moments of deposition. As will be argued below, in the first case, there are good indications these are evidence of controlled demolition and levelling preceding a new construction activity. In the latter case, the deposits are caused by proper collapse, either natural decay or with some human help. The fact that the primary settlement phase is ended by a fire that affected half of the *Dunnu*, clearly implies the purposeful destructive action behind it. Further demolition of the building may have followed it. In a few cases large pieces of bonded brick, fallen wall fragments, were found (Figure 22), which is suspicious since the natural tendency of heavy walled mud brick buildings is not to collapse, but to gradually disintegrate. These wall fragments are always found on top of a debris layer, so the event occurred after the initial destruction. And in many cases the intact walls fragments occur after or just prior to the secondary use-phase, which indicates that if they represent further demolitions, it was instigated by the later inhabitants of the ruins. In buildings where clear phasing in the collapse is recognized, we can detect a gradual decrease of mud brick content towards the top implying the transformation from a more collapse mode of deposition to one with a higher contribution of erosion and sedimentation. The diagonal orientation of the layers allows us in some cases to tell from which wall they originate.

[33] And where they do appear to occur inside, there are good indications that this is because a later roofed space was unroofed at an earlier point in time. See below, deposit sequence pattern 6.

Figure 22. Wall segment found high up in the fill of a room in square L08 (photo: Tell Sabi Abyad project/Peter Akkermans).

IV.3.2 Deposit sequence patterns

The mapping of deposits revealed a regularity in the order or stacking of various deposit types in relation to the architecture. This means that larger parts of the site, multiple buildings, or groups of rooms, share similar stratigraphic and architectural chronologies. These are called deposit sequence patterns, combined sequences of deposit types that reoccur in the stratigraphy of the site. This is the basis for the model of settlement adaptation proposed at the end of this chapter. Seven deposit sequence patterns have been distinguished, and summarized in the table below. For each we will discuss an actual example.

	Description	Interpretation	Graphical representation
Pattern 1	Walls + floor > Debris > secondary floor inside still standing construction	Construction phase > partial demolition and rebuilding > re-use of same walls	
	(+ repeat)	Possibly indicates vertical expansion of building	
	Instead of debris also homogenous loam layer possible (backfill)		
Pattern 2	Walls + single floor > Debris > new construction over old + new single floor	Construction phase > [decay and] deliberate demolition > new construction phase and use of new building	
	Instead of debris also homogenous loam layer possible (backfill)		
Pattern 3	Walls + single floor > Debris > surface sequence	Construction phase > decay and (violent) destruction > re-use but no renovation of original architecture, roofless	
Pattern 4	Walls + surface sequence	Open area in between buildings or walled courtyards or enclosures	
Pattern 5	Surface sequence > walls on top + single floor > debris	Open area > construction phase covering the area > collapse/fast decay	

5a

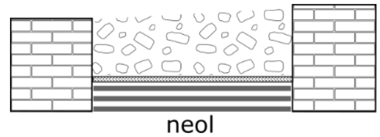
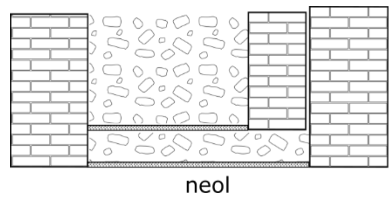
Pattern 6	Walls > surface sequence inside > single floor > debris	Construction phase of open area > area is covered > collapse/fast decay	 5b
Pattern 7	walls + single floor > debris > new floor + new interior wall > debris	Construction phase > partial demolition > construction phase with modifications to upper structure (roof or ceiling) > collapse/fast decay	

Table 4. Common deposit sequence patterns in the Dunnu.

The first deposit sequence pattern is seen on just a few locations in the *Dunnu* during the main use phase, and in the transition to levels 4/3. It is exclusively found in thick-walled architecture, whose walls were re-used in a secondary or tertiary use-phase. In all other deposit sequence types, debris can be clearly connected to architectural renovation or replacement. However, in this case the demolished and renovated part of the architecture could have been above the level of preservation, or the debris does indeed indicate a phase of temporary absence of maintenance and decay. As elsewhere, this absence of maintenance and decay is indicated by wall erosion after the *Dunnu's* main use phase, into the third use-phase. Earlier in the use-cycle, no such erosion could be proven, and it is likely that the debris represents intentional activity, e.g. construction.

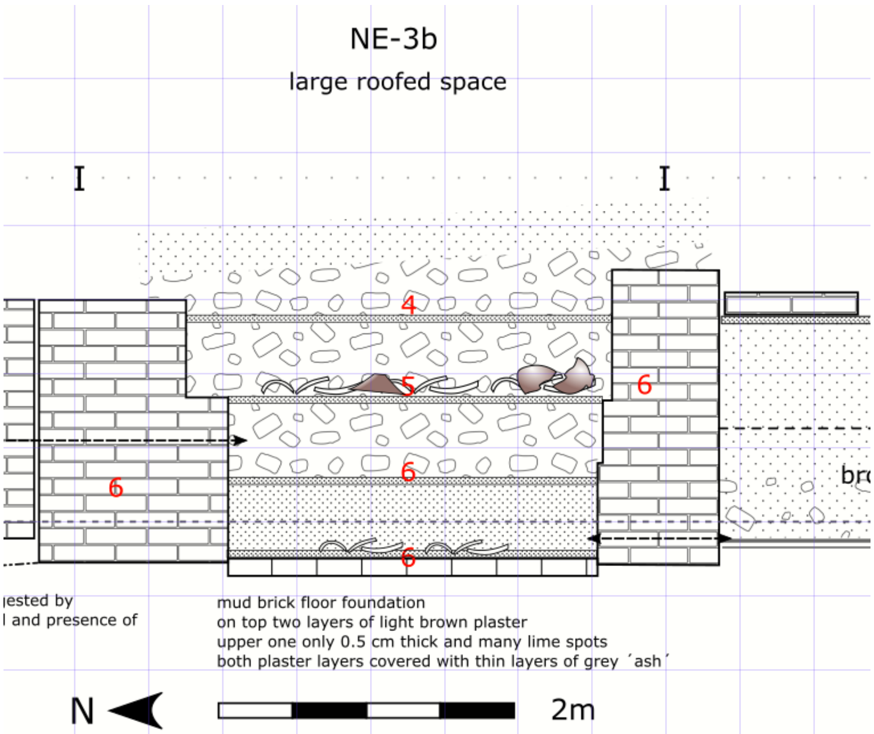


Figure 23. Deposit sequence graph of room NE-3b, example of pattern type 1: multiple floors separated by debris or backfill and re-use of walls.

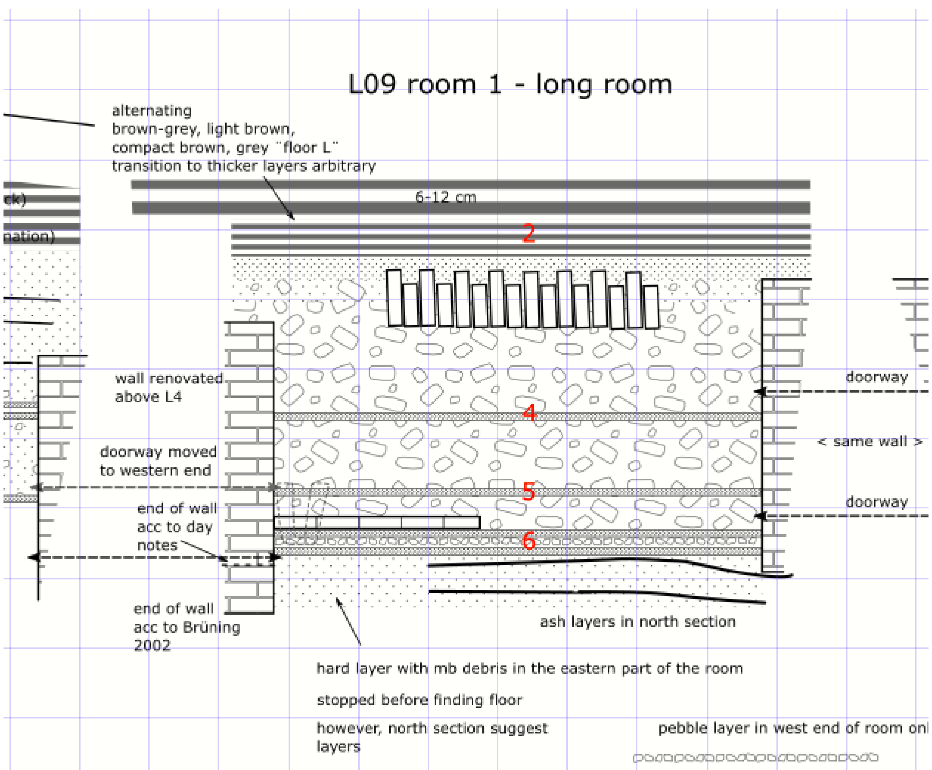


Figure 24. Deposit sequence graph of space NE-3a (L09 room 1), example of pattern type 1: multiple floors separated by debris or backfill and re-use of walls.

The second deposit sequence pattern represents demolition and rebuilding. The debris layer is meant as backfill and is levelled before the construction of new walls and floors. This pattern is found in the tower at the transition from pre-Assyrian to Assyrian (Figure 25). The building is expanded towards the north, and although much of its walls is left standing, the norther wall and connecting interior walls are demolished and rebuild on a different location. It is also found in the south-eastern *Dunnu* during the main Assyrian phase (Figure 26) and in the north-eastern corner of the *Dunnu.* Here, the expansion of the fortification required the demolition of some extra-mural structures.

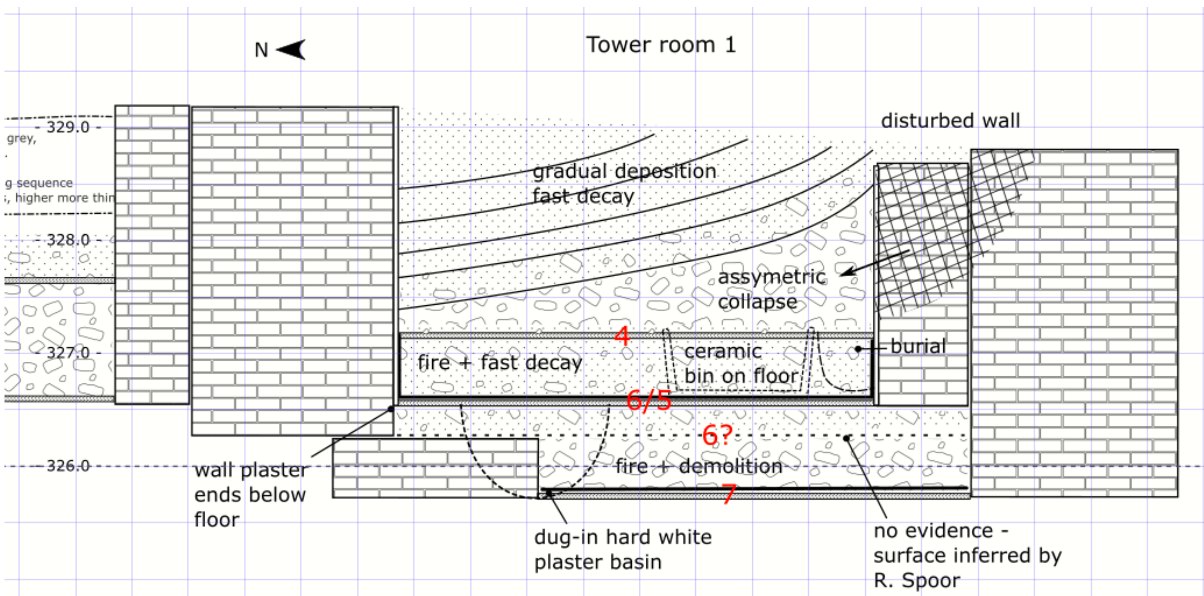


Figure 25. Deposit sequence graph tower room 1, representing deposit pattern 2: controlled demolition and rebuilding. In contrast, the final phase shows different types of deposits, reflecting uncontrolled infill process associated with fast decay.

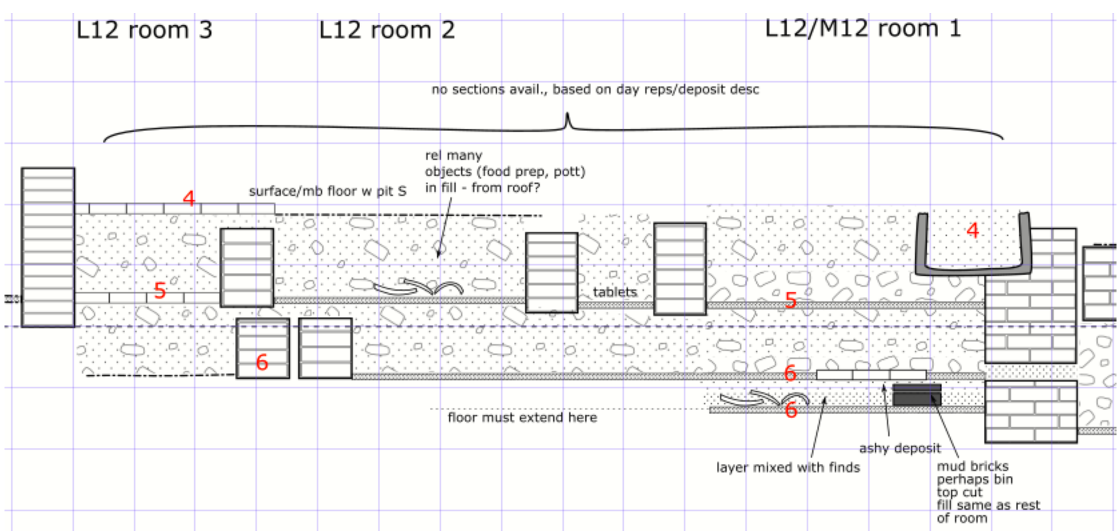


Figure 26. Deposit sequence graph of light walled structures, SE-4 (lower) and SE-5 (on top) found in L12, representing deposit pattern type 2.

The third deposit sequence pattern generally marks the transition from the main Assyrian use phase to the post-*Dunnu* use-phase. A floor is constructed, and used, after which a debris layer closes the floor deposit. On top of that a thin layered deposit initiates, which is ended by a fast decay phase. The most likely interpretation is that an area was in its initial phase covered or uncovered and kept clean, after which demolishment took place and a new use-type with corresponding cleaning-regime initiated causing the stacking of thin layers. If the area was initially roofed, then this is certainly not the case in the later phase. The deposit pattern type is generally found inside heavier walled architecture in the northern *Dunnu* (L08 room 1/Figure 27), and western *Dunnu* (NW-4d/Figure 28, NW-3c, NW-3d, NW-1a).

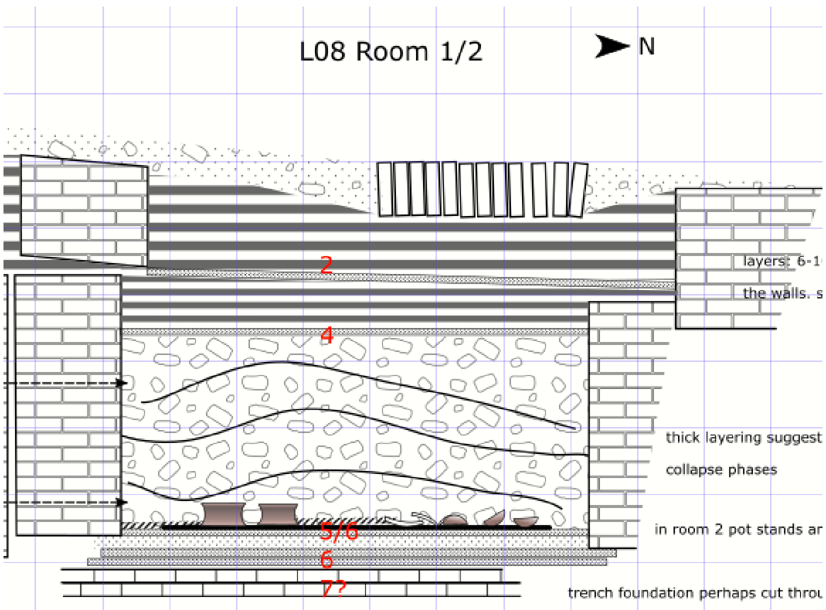


Figure 27. Deposit sequence graph of space NE-2 (L08 rooms 1 and 2), representing type 3: floor and main use phase, collapse, and re-use as open area. Change of maintenance/cleaning regime.

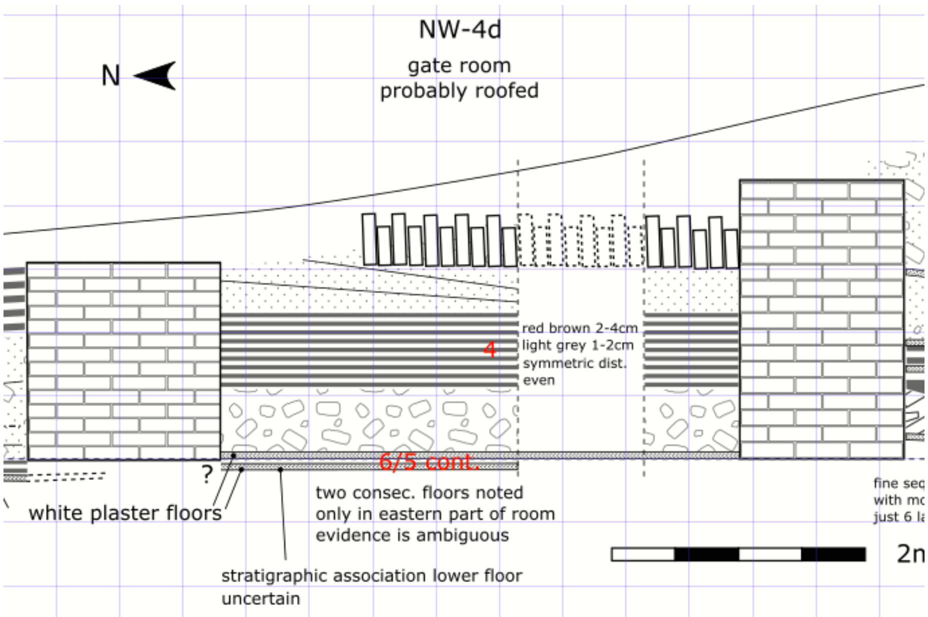


Figure 28. Deposit sequence graph of room NW-4d, representing type 3: floor and main use phase, collapse, and re-use as open area. Change of maintenance/cleaning regime.

The fourth deposit sequence pattern is a typical open-air infill deposit sequence. It is characterised by a sequence of layers, sometimes more constant in thickness, sometimes less. The layering is caused by continuous deposition of cultural (refuse) and natural (sedimentation) origin. Sometimes series of thinner deposits are alternated with thicker deposits containing more debris, representing moments of phases of accelerated decay. At other times concrete use-surfaces are recognizable within these sequences. These are also largely uncleaned areas. During levels 6/5 these are mainly found in the southern *Dunnu*. Here we find a number exterior or semi-exterior areas that had multiple superimposed use-surfaces within the entire time span of levels 6 and 5 (Figure 29). Especially the alley that connected these spaces forms a prime example of such infill process. It shows that from the start of the *Dunnu*, one "phase" seems to have transitioned gradually in the other without clear indication of an abandonment phase in between, at least prior to large site-wide abandonment and the start of the secondary use-phase. Also, there is no clear indication of architectural renewal during this long period, apart from some small adaptations and reinforcements. This is an important observation, because it implies there is no abandonment and decay phase that was used by the excavators to distinguish between 'level 6' and 'level 5' in this area of the *Dunnu*. The light-walled architecture found here would be the first the decay, and in need of rebuilding on return. Since this is not the case, it strengthens the hypothesis that rebuilding activity elsewhere was part of the continuous adjustment of the settlement, rather than a reflection of an abandonment and resettlement phase.

In general, this pattern of gradual infill is very common in the secondary Assyrian use-phase, when architecture seems to have been left to decay and continuous use of exterior areas takes place without too much cleaning. The use of the area of the former large courtyard is a good example of this. As has been indicated above already, it is similar to the gradual infill processes that filled the fosse over time, which also is likely the result of natural sedimentation and cultural refuse disposal.

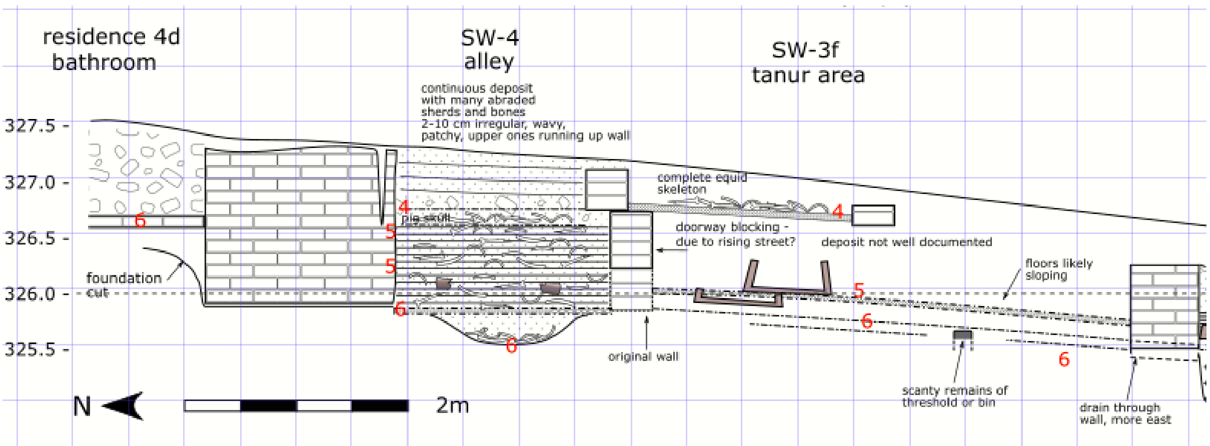


Figure 29. Deposit sequence graph of spaces SW-4d and SW-3f, representing type 4: continuous deposition, little cleaning. On the left the residence with its terraced wall foundations and mud brick collapse fill.

The fifth pattern represents an exterior area with continuous use and deposition, transitioned into an interior area due to new construction. It occurs when a new structure is simply built on a previously unbuilt, but used, exterior area. Example are the rooms of the residence, built against the western side of the tower (Figure 30) and space SW-3g (Figure 31). The case of the residence also shows us there was a considerable period between the construction of the tower and that of the residence, proving the primacy of the former. The pattern is also found in other locations dispersed over the *Dunnu.* L08 rooms 1 and 2 and NE-1a are both spaces constructed in front of the old gate. These show a deposit sequence of relatively modest thickness, reflecting the phase that the area was open during the functioning of the old gate. And in the southern *Dunnu*, space SW-3g reflects this pattern.

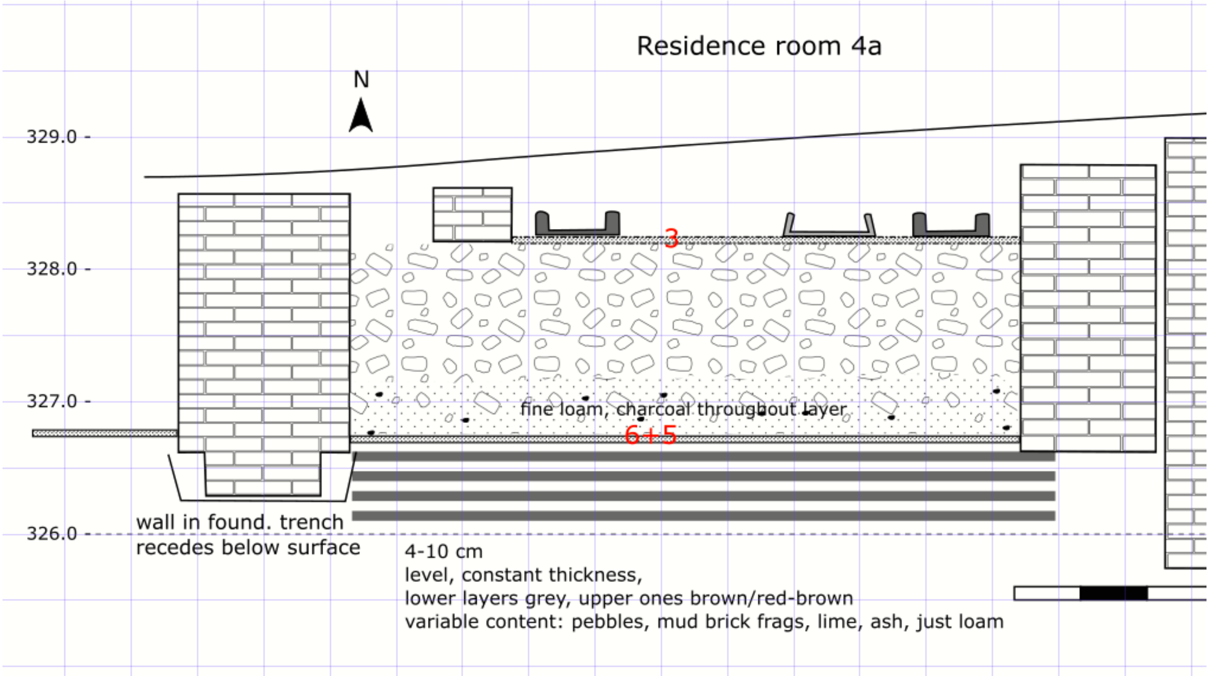


Figure 30. Deposit sequence graph of space Residence 4a, representing type 5: construction in formerly open area. The lower part of the collapse deposit is likely the collapsed roof. On the right side the exterior wall of the tower.

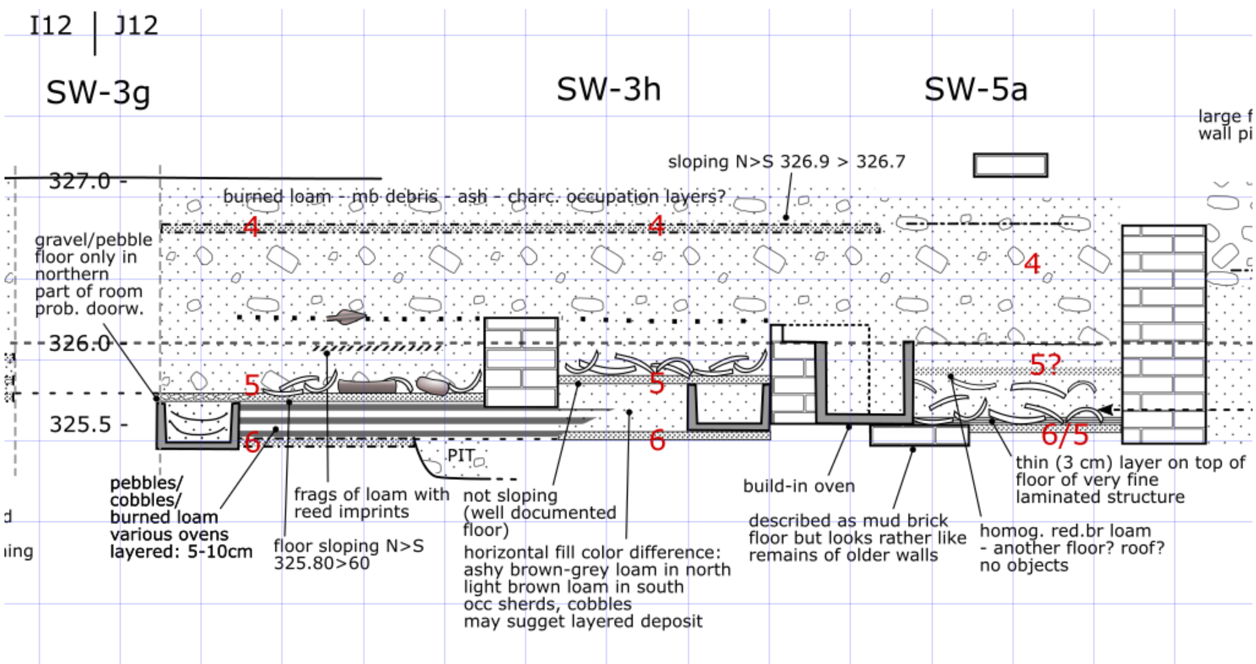


Figure 31. Deposit sequence graphs of spaces SW-3g, SW-3h and SW-5a. SW-3g is an example of a sequence characteristic of a formerly open space with gradual deposition, halted by the construction of a roofed structure.

The sixth pattern is represented by a single example, but remarkable and clear enough to justify its own type. Room 5 of the tower shows a layered deposit with thin regular layers, indicating gradual deposition at a constant rate and use-surfaces (Figure 32). A thin debris deposit follows, on top of which walls are constructed and a new floor. The gradual deposition does not return. This seems to suggest room 5 of the tower started out as an open area, a courtyard, and was subsequently turned into a roofed space. The new walls on all sides of this room also indicate exactly this, as the most likely interpretation for their construction is as roof support.[34]

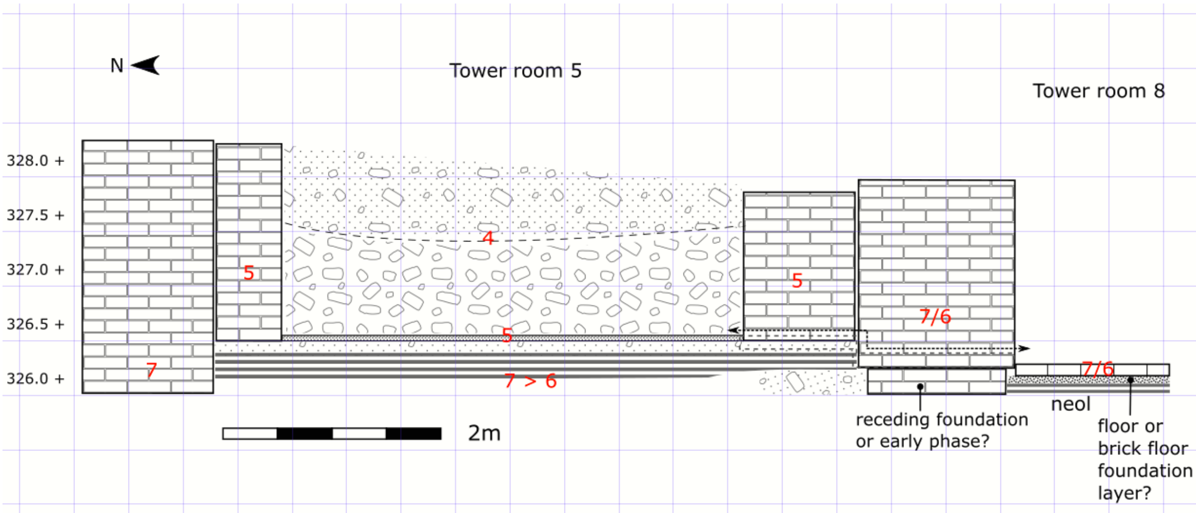


Figure 32. Deposit sequence graph of tower room 5, representing type 6: open area turned into closed area.

The seventh pattern represents cases where interior architectural modifications took place after partial demolition. The sequence starts with a building, followed by a levelled debris deposit on the ground on top of which another floor is constructed, associated with a newly constructed interior wall. The pattern is found in rooms 1, 4, and 7 of the tower. In room 1, discussed before, the debris deposit has already been associated with partial demolition and rebuilding (Figure 25). But besides the replacement of the northern wall, a wall was constructed as an abutment against the old southern wall. In room 7 the debris layer could be associated with the demolition of an older partition wall that had cut the room in two separate rooms. On top of this levelled debris layer the abutting wall was constructed. In room 4 there is no clear indication of demolition, but a similar abutment along its northern wall was constructed. These abutments are a hint at the type of architectural modification that may have taken place during this time, which is discussed later on. There is just a single example outside the tower which shows a similar deposit sequence and that is M11 room 2, which has a similar abutment on its western wall. Another interior modification preceded by either a homogenous backfill or a mud brick debris fill is found in spaces L09 room 1 and NE-3b. Surprisingly,

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[34] And not as the excavators suggest 'wall reinforcements or repairs'.

this is the sole case were an interior modification involved the partitioning of a larger space by a new partition wall.

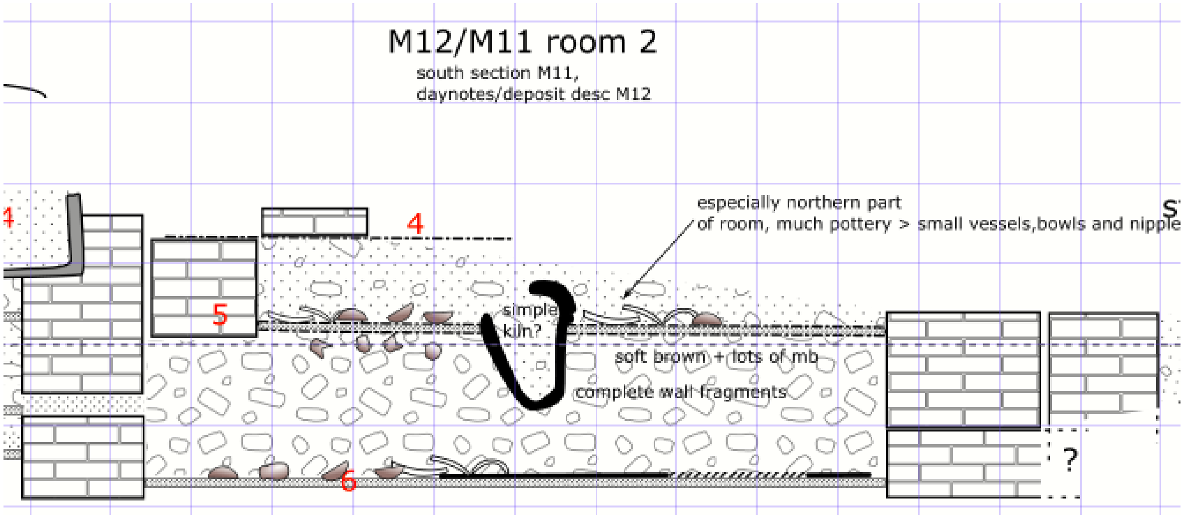

Figure 33. Deposit sequence graph of space SE-2c (M12/11 room 2), representing both type 2 (demolition and rebuilding on top) and type 7 (interior modification).

IV.3.3 Collapsed roof deposits

Occasionally, collapsed roofs may be identified archaeologically. Generally, this is the case when the roof material is easily recognizable, such as in collapsed vaults. In other cases, fire may have preserved also less well identifiable structures such as flat loam terrace roofs. A recent study shows that with finetuned archaeological methods and observation it is possible to identify also less obvious contexts (Friesem, Tsartsidou, *et al.*, 2014). The methods as proposed by Friesem *et al.,* including micro-stratigraphic, were not used during the excavation of the *Dunnu.* Nonetheless, the descriptions of stratigraphy in the day reports do contain some evidence as to the presence of roof collapse deposits. Two types have been identified. One case is space SW-6b, which is destroyed by a catastrophic fire (Figure 32). In this space, the excavators documented large slabs of burned loam in the fill of the room, in one case with a still observable layered build-up. In addition, the contents of the room, large storage vessels, generally with only the bottom half preserved, indicate that something heavy had come down that crushed the top half. The other type of evidence of roof collapse deposits is represented by a thin layer of white fibric material, found in the deposit just above a floor level (Figure 35, Figure 36). This is most likely a phytolith layer, the remaining silica structures of decayed plants, probably straw or reed. It is possible that these are remains of roof construction material, although in theory it could also originate from matting on the floor or walls. However, the field descriptions seem to indicate that such material is often found intermingled with other objects and deposits found on the floor, rather than underneath them, implying that it more likely came from above. It is possible that the top of such roof or floor collapse layers have been misidentified as intentionally constructed new floor levels. An example of this is room SW-8a (Figure 35), which appears to show a thick roof collapse deposit, on top of which a walk surface is created. Here, the context of the collapsed second floor or roof walk surface and the new ground floor walk surface may be intermingled. Above all, in this case the new walk surface has been assigned to level 5, which has considerable historical repercussions. It is possible, like in various other buildings in the *Dunnu*, that the use of the first ground floor surface spans the historical period covered by both construction levels 6 and 5. The surface created on the collapsed roof deposit, may therefore just as well be part of a later phase after the demise of the original *Dunnu*. Considering the stratigraphical sequence in the neighbouring buildings, for instance SW-6b or SW-6a (Figure 34 & Figure 36), this may be a more likely course of events.

The concrete examples cited above all come from the southern *Dunnu*, which probably tells us something about the processes of decay and abandonment in this area. Although 'whitish fibre' or 'plant fibre' material has been mentioned elsewhere, the stratigraphic context often does not allow for the identification of a potential roof collapse. In fact, many of the deposits in the *Dunnu* are probably roof collapse deposits, but due to the documentation methods used in excavation, these are hard to distinguish from any other type of building collapse.

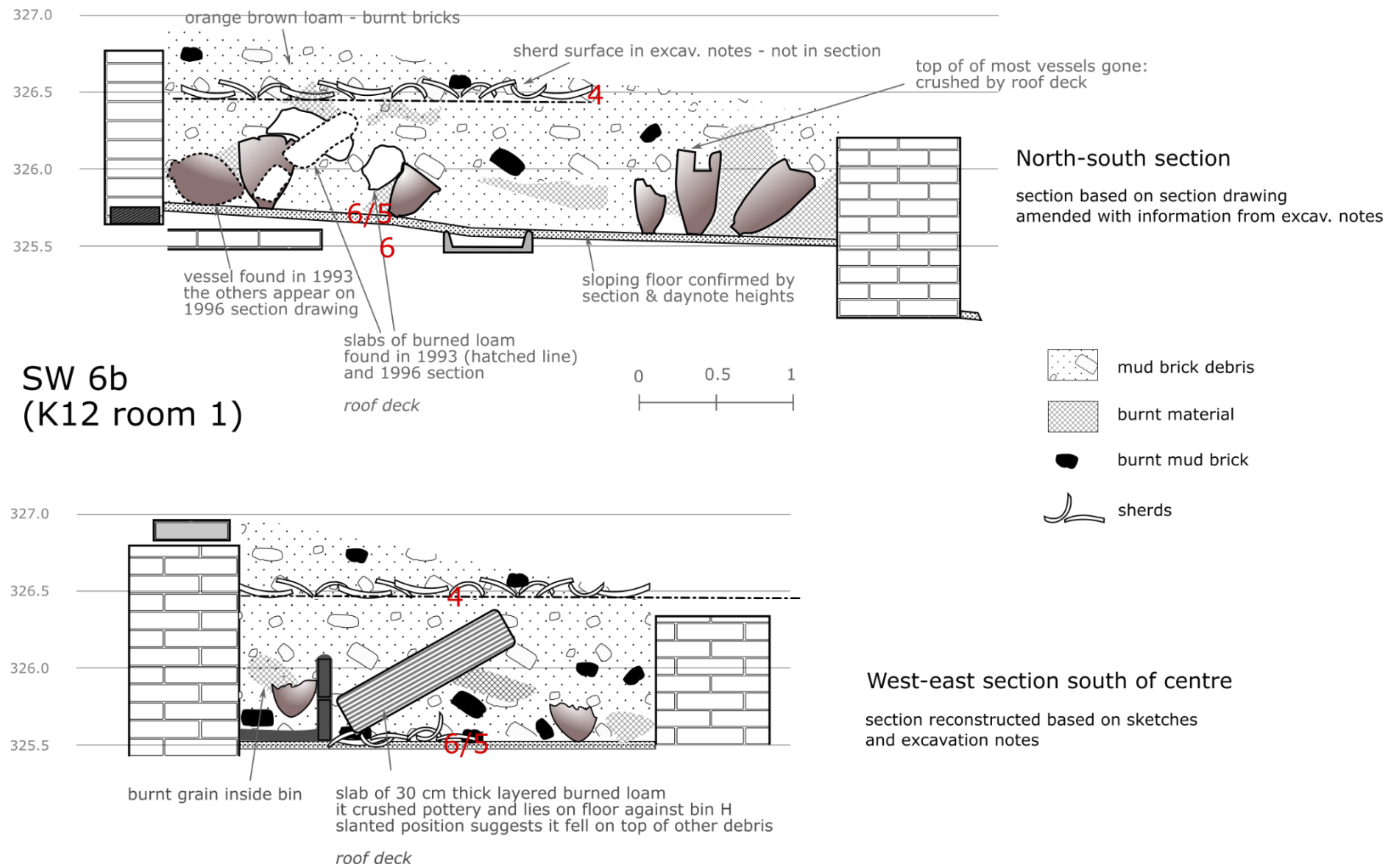

Figure 34. Sections through the burnt room SW 6b.

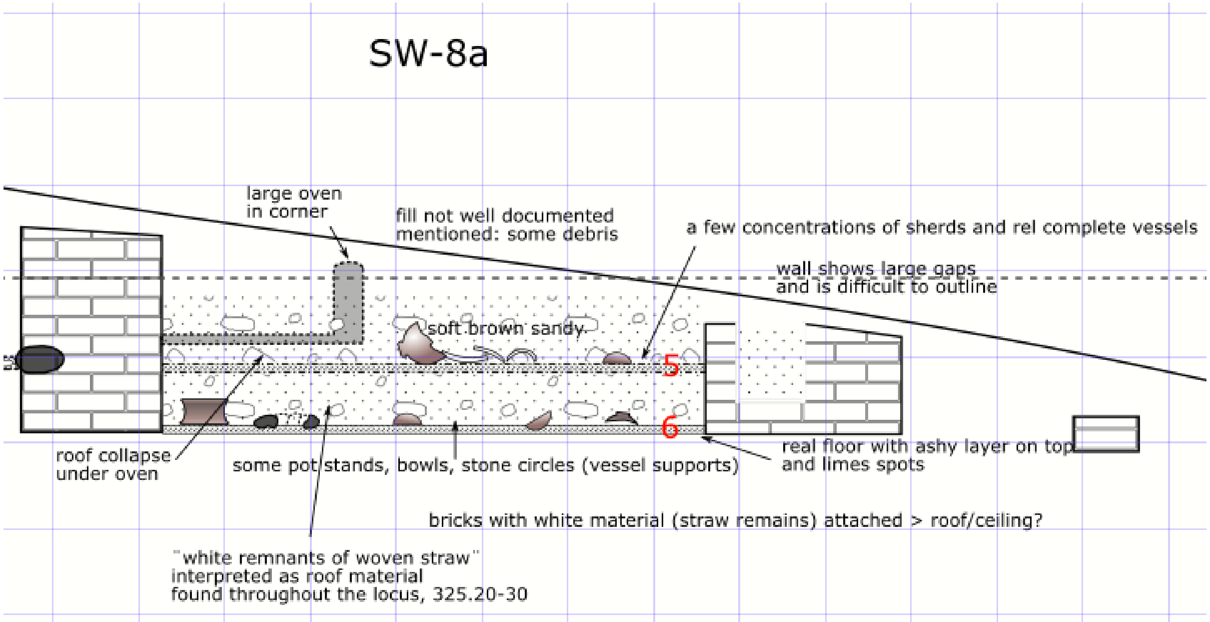

Figure 35. Deposit sequence graph of space SW-8a, showing possible evidence of remains of decayed roof construction material on top of the floor.

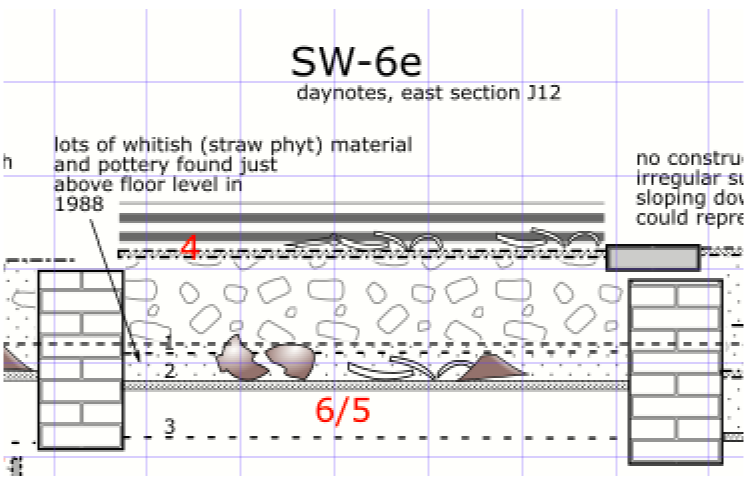

Figure 36. Deposit sequence graph of space SW-6e, showing possible evidence of remains of decayed roof construction material on top of the floor.

IV.3.4 The *Dunnu*'s deposit patterns and architectural development: concluding remarks

The analysis of deposit sequences reveals some important patterns. First, the deposits reflect the difference between in and outside quite well. Exterior areas generally show a gradual accumulation of cultural and natural deposits, even if it is just in very small amount in areas kept relatively clean, or in more sheltered locations or smaller spaces (Figure 37). Interior spaces on the other hand generally show large amounts of mud brick debris. These observations correspond to the general theory of deposition which indicates gradual deposition in exterior areas, and construction collapse inside buildings. Although we may expect some debris to end up on the outside of buildings, the tendency is that it falls to the inside as result of the instability create by the roof collapse (Figure 14, top left). Also, when people demolish a building on purpose, it is most practical to have the debris fall on the location of the building.

The difference between gradually developing stratified deposits on the outside, and clean floor deposits on the inside, makes it also possible to identify some of the chronological differences. For instance, it reveals that the tower and the residence are indeed constructed in a different layer and therefore date to a different phase. The residence was constructed on top of a series of exterior surfaces of an actively used area that had already developed next to the tower. In a few other cases, this helps us as well to identify a relative sequence of events with some certainty. Such patterns are not always clear, since very little material may have been deposited in between the construction events. A problem is that we do not always know for certain whether this was caused by a short period of time between the construction events, or by the fact that cleaning and erosion has kept an area on more or less the same level.

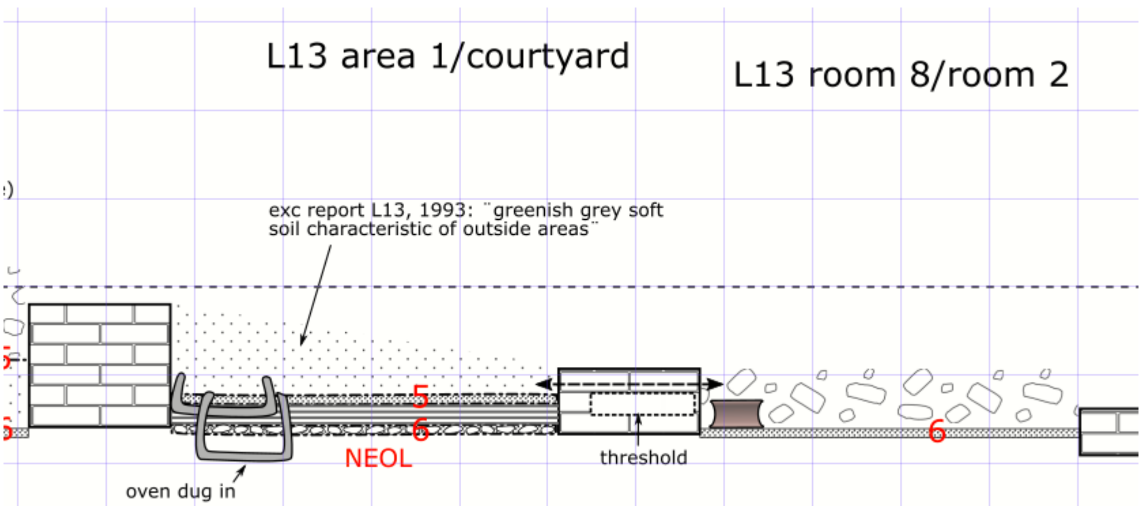

Figure 37. Deposit sequence graph of space SW-4f and SW-8d (L13 area 1 and L13 room 8), illustrating the difference between in and outside deposits.

Another important observation is that debris deposits of the earlier phases, before the larger site abandonment and contraction, can be associated to architectural change. It is highly likely that these deposits were created intentionally and were the effect of a demolition activity. In parallel to general development of mud brick settlements elsewhere, people demolish, level and construct again. In the *Dunnu* this pattern does not reflect a cyclical generational rebuilding of the same house. In all cases the spatial layout or structural properties of the buildings change after the demolition phase. This suggests that buildings were demolished not primarily because they were in a state of dilapidation, but because the occupants of the *Dunnu* required a new type of building. Something about the spatial distribution of functions, or how circulation needed to be managed, had changed, so the built environment had to be adjusted. Exactly how, will be analysed in chapter 5.

In contrast to the debris deposits of the earlier phase, debris deposits of the later *Dunnu* reveal a different mechanism. In many spaces we see the effect of a big fire, and debris deposits in these areas also contain burnt fragments. The gradual nature of these debris deposits is also clear as towards the top, the amount burnt materials decreases. Moreover, in many sections of these debris layers a clear layering is visible indicating multiple collapse moments, or gradual collapse periods. Moreover, the asymmetric distribution of these layers within a space indicate the uncontrolled nature of the mechanism behind it. Another interesting feature of the collapse deposits higher up, that means during or at end of the post-*Dunnu* phase, entire wall segments were found in the fill. Both the condition they are found a flat surface, and the fact that walls generally do not fall over until an earthquake or human pushes them, seems to suggest that the last of the still standing ruins were actively demolished. Some of it can be associated to a rebuilding event in the post-*Dunnu* phase, some of it can be associated with its abandonment.

The last important conclusion of the systematic study of the deposit patterns, is that there is no evidence for a synchronous *Dunnu* development. There is synchronisation, defined as the same sequence of deposits, but this is not global, but localised. That means that sections of the *Dunnu*, share a similar deposit sequence. As has been argued above, this is connected to the construction and demolition cycle of a particular building or group of related buildings. Although at times construction events seem to have covered a large part of the entire settlement, even the larger events did not affect all buildings. It means that some buildings saw continued use without a break or modification, while other were modified or demolished. This conclusion may seem quite obvious, but it is important to confirm this here because it is in conflict with the idea of levels and of building events connected to historical events.

IV.4 Deposit sequence patterns per area

In the map below, the *Dunnu* has been segmented in areas which have a shared deposit sequence until the occurrence of the collapse and decay deposits that introduced a new archaeological level representing the farmstead phase. A notable difference is apparent between the western and eastern *Dunnu*. Also, the two large buildings in the centre have their own depository sequence, and even showing different sequences for their northern and southern parts.

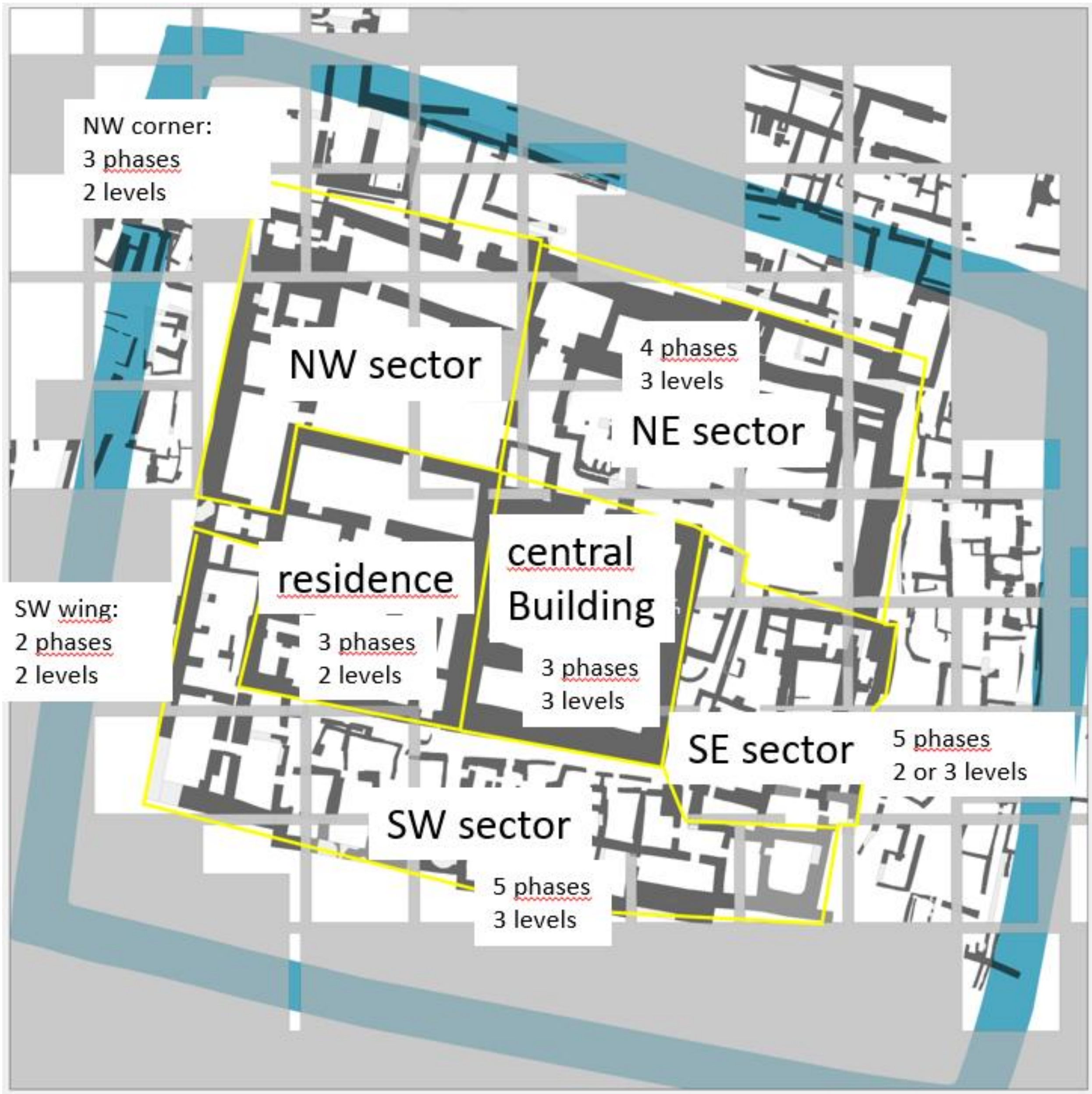

Figure 38. The Dunnu subdivided in areas of similar deposit sequences. 'Levels' refers to construction levels in which (parts of) the area was demolished and rebuild or left open. 'Phases' refers to stratigraphical layers inside the building or open area that indicate different use phases.

IV.4.1 Northeastern *Dunnu*

The northeastern *Dunnu* is the area north and northeast of the central building, starting with the old gate until the eastern fortification wall. The depository evidence shows a higher number of construction, collapse/demolition, and new construction phases than anywhere else in the *Dunnu*. Due to this, it is the most confusing and difficult to interpret architecturally and above all to establish the chronological links internally and to other sections of the *Dunnu*. But in terms of deposit patterns, it offers also a highly instructive case to help our understanding of the relation between physical structure and deposit patterns, and construction processes and deposit patterns.

Characteristic of the northeastern *Dunnu* are that within the walls of buildings we see a sequence of floors separated of each other with rubble or other mixed deposits. As we will come to see, elsewhere architecture generally has one distinct floor level, and perhaps a second surface related to a secondary use-phase. Part of the explanation for this phenomenon must lie in the fact that we are dealing with massive architecture that stood for a long while and saw multiple phases of repurposing.

The stacking of floor and rubble deposits is nowhere as noticeable as in space NE-3b, a large room adjoining the older fortification wall. Within this space we have evidence for 4 cumulative floors or temporary surfaces, including the level 4 floor that can be connected to level 4 surfaces in surrounding rooms. Rubble is found between the second and third and third and fourth floor, indicating thorough demolition or collapse. There are no indications of deposits caused by gradual decay/building erosion, thus we may suggest that rebuilding activity quickly followed upon these phases. It is likely that the first phase of collapse may have been intentional, and consequence of rebuilding related to a repurposing of the area. Between the first floor, a neat mud brick floor coated with loam plaster, and the second, which is an ephemeral horizon or surface of some sort, no rubble deposit is found but a thick homogenous deposit with smaller fragments of mud brick and lime. This deposit must have been put into this space rather than naturally developed and can thus be classified as backfill. This occurrence may be related to an architectural transformation of the surrounding spaces and structures.

Other spaces, such as NE-2a/b, show a somewhat different deposit pattern, related to their architectural history and context. These spaces are part of a building that is appended on the outside of the fortification wall. Since it stands snugly against the eastern pier of the old gate on one side, and against another exterior expansion on the other, it is clearly constructed within the given limitation of space, and hence to be chronologically later than the structures it abuts. This is visible in the deposit pattern as well. It starts with what seems to be the start of a layered deposit with at least two floor levels, and beneath that a badly understood mud brick structure of at least two layers. At the height of the floor levels, photo's clearly show a thinly layered deposit. This depository sequence and the presence of ovens and a kiln indicates that this was an outside area in front of the fortification wall just around the corner from the old gate. A new floor was laid when the actual building was constructed, and this floor keeps being in use during the entire remainder of the primary settlement phase. Many remaining objects on the floor and high concentrations of charred wood indicate abandonment, which was followed by a massive collapse deposit. With a thickness of 1.5 meter, this belongs to the thickest collapse deposits found in any building of the *Dunnu*. The collapse deposit is roughly stratified, which indicate a phased collapse rather than a single large one. On top of this, still between the same walls, a new surface is deposited, which is where level 4 starts. However, as a layered deposit indicative of an open area now initiates, we can infer that the use of the space had changed, and that the roof was likely never restored. The exact same deposit sequence is found the neighbouring room NE-1a, a space created in front of the old gate when this gate went out of function. The massive volumes of the collapse deposits here are almost certainly related to the vicinity of the two phases of fortification wall and the old gate. That it has been preserved so well here, is because during later post-*Dunnu* phases, new architecture was constructed on top adding massive amounts of new material that protected the layers underneath.

Another typical feature of the northeast was already alluded to, namely that of external architectural expansion. To the northern fortification wall, various buildings were added. Twice a new outer fortification wall is constructed, each time extending the surface area of the *Dunnu* a little bit. These expansions form an interesting case to test the hypothesis that over time deposits form near standing walls, due to both natural and cultural processes as outlined in the general model of deposition in the beginning of this chapter. Hence these new walls, should be on a stratigraphically higher position, if there has been no excavation prior construction. The cross-sections, one already made in the field for this purpose and one reconstructed, do indeed confirm this stratigraphic relation. In fact, observation and interpretation is greatly helped by the fact that older LBA structures that apparently stood in front of the fortification wall are demolished and overbuilt by the expansions. This is the case with the first addition, the long building along the fortification wall in the northeast which is very likely a supporting structure for a staircase (see V.5.7.2). And it is the case with the second addition, which extends the area of the *Dunnu* significantly. As said, the main reason for their elevated position in relation to standing architecture seems to be a case of architectural demolition of the smaller structures these expansions overbuilt. Gradual accumulation did not make an obvious impact, but it must be said there are no good field drawn sections available that pertain to these early phase structures.

Layered deposits were however also discovered in a test trench along the fortification wall in room NE-1a, the room in front of the old gate and below the previously discussed rooms NE-2a/b next to it. It thus shows that while the old gate was in function, a slow gradual accumulation took place here slightly raising the surfaces. Part of these surfaces are high in lime/gypsum content, which may indicate regular whitewashing of the northern fortified façade of the *Dunnu,* including the floors (see V.5.3.9). Likewise, from the big section through the fortification wall that was made during excavation, it seems also clear that the latest phase of expansion was preceded by a layered deposit, then a rubble deposit and then a new buttressing wall. This rubble deposit may very well be related to the toppling of structures in front of the fortification wall, as seen elsewhere.

In conclusion, we have observed that including level 4 there are at least 4 floor phases separated by backfill or demolition deposits, in the eldest architectural structure in the northeastern *Dunnu*. A lesser number of such phases suggests that a structure has been added at some later point in time, in which case we find demolition or layered deposits belonging to a previous phase underneath. In other cases where not 4 distinct phases are attested, such as NE-1b and NE-4c, we must assume that the architecture did not see the same number of modifications. In yet other spaces not discussed here, such as NE-3d and NE-3c, excavation never went deep enough to uncover the entire deposit sequence. At the same time there are at least 3 distinct construction phases expanding the *Dunnu* northwards. Including the initial phase of construction, the number becomes 4. As will be argued in the chapter on construction, these exterior expansions and other observed interior modifications must in some way be related to the floors and rubble deposits in NE-3a and NE-3b.

IV.4.2 Southeastern *Dunnu*

In the south-eastern corner the architecture is somewhat lighter in nature, which may hence explain the pattern observed here. There are at least 3 recognizable floor phases including level 4, during which phase everything seems to be an outside surface. Again, there are well defined collapse/demolition deposits, with floor deposits separating them. But what is very characteristic and typical for this area, is that after the first architectural phase the buildings are filled with collapse/rubble deposits of various thickness, and than a completely new architectural phase follows. These new walls are constructed over the old ones. This is different from the north-east as we have just discussed, where the same architecture remains to be used with new floors within the same walls, while new architecture is added on the exterior of the fortifications. What took place in the south-east is that buildings were demolished completely but for the base of the walls. What is noticeable is that the different volumes of rubble deposits within these older walls correlate with the slope of the ancient tell, the deeper it goes, the more rubble is found. Hence it seems that it was a conscious effort to get the entire sector up to the same level, prior to rebuilding. The previously standing buildings may have been in a state of decay or not, the rebuilding itself, which turned out to have a new architectural layout, clearly indicates that this area had been repurposed. Hence, we should not assume that this phase of rebuilding, as is often suggested, necessarily reflects a *dunnu* in a state of decay.

On two places surfaces or floors have been recovered that seem to precede the older architectural phase discussed here. Hence, there was a phase during which some of the lighter walled architecture in this case, may not have been constructed yet. The deposits on top of these surfaces seem to be gradual decay deposits, hence developed under outside conditions and normal use, or possible backfill. If we include this phase, we may set the total number of distinct depository phases related to architectural modification at 4, like in the north-east. Some issues exist with how this relates to modifications directly to the exterior of the fortification wall, but that discussion is left for the chapter on architecture.

Layered deposits are found in a few places only. They are found where expected in in-between-area or courtyard SE-1c, where we see gradual rising of surfaces. They are also found in the large open courtyard area NE-4a. Although a large part of this area is left to be excavated, a few soundings on its northern side leave no question: the area filled up with a layered deposit characteristic of exterior conditions and some domestic use. Other areas that have always been considered courtyards or other unroofed spaces such as SE-3b and SE-2d contain no evidence of such deposits. Hence we must assume these spaces were either roofed after all, or simply kept clean. Considering the spatial position, near the back entrance of the *Dunnu*, they might have had some social or economic significance which may be related to the absence of gradual decay deposits prior to the large collapse deposits that afflicts the entire area, and *Dunnu*. Layered deposits do however again appear on top of these collapse deposits, as the architecture is rapidly eroding, while people are still also using the surfaces. Another great example of how in- and outside conditions result in distinct deposit patterning is the difference in infill between alley SW-1c and the adjoining spaces SW-2g and SW-1f. The alley reveals a layered deposit, while inside the adjacent buildings massive collapse deposits develop. It is clear that these buildings had started to collapse inside themselves, as is often the case, while the area outside it quickly fills up with eroded building material. The large difference in layer thickness within the layered deposit indicates an erratic process of occasionally less or more material deposited at once.

Concluding, the southeast is perhaps the most strongly spatially modified area. Its construction phases are clearly represented in the demolition deposits that were intended to level the area after the first building phase. Its end comes as everywhere with massive collapse deposits followed by layered deposits caused by eroding ruins and small-scale human activity.

IV.4.3 Central building

The large central building, or tower, has its own depository and thus constructional history. That does however not mean that what occurs here, is completely independent of what happens directly outside its walls in the eastern half of the *Dunnu*. Particularly interesting is that although we seem to deal with one large building, deposit sequences vary between the rooms, which indicates varying constructional and decaying histories. Interpreting it from this perspective, a somewhat different picture emerges than has been concluded in the extensive documentation relating to this building. In the final stratigraphy reports, the stratigraphy of the tower has been somewhat forcefully pressed into the three-level mold: level 7, level 6, level 5. Thus, each of the rooms was given a floor related to each of these levels, even when no floor was observed or if floors were so close they are likely part of the same continuous use-phase. The suggestion of a uniform construction and use history is not warranted by the re-analysis of the documentation. Nevertheless, it is equally unlikely that each room went through a construction and decay history completely independent from the next, since they are part of the same larger structure. The deposit model in combination with the constructional logic model can clarify matters.

Rooms 1 and 2 have similar deposit sequences, caused by a shared construction history. Room 3 is related to them since it follows the same construction history, but since it is a staircase, collapse and decay processes act differently causing a different stratigraphic pattern. Rooms 1 and 2 both have 3 distinct floor deposits including level 4. Room 3, the staircase just 2. That means that prior to the great collapse and decay deposits that preceded level 4 floors, there are just 2 floor phases in rooms 1 and 2, and 1 in the staircase. What is most interesting is what caused the large rubble deposit between the eldest and second floors. This becomes immediately clear when looking at the deposit sequence graph of room 1. The north wall is moved northwards at a certain point, and the remaining cavity between the old north wall and the south wall of the room is filled with rubble. This is likely demolition rubble, intentionally left here to cover up the stub of the elder wall. Constructional analysis reveals that in fact the entire north wall of the tower is a later addition, hence causing in all three rooms the need to cover up the remains of the older wall. In room 2 this resulted in a similar rubble deposit. In room 2 however, the top of the old wall became the floor of the corridor that led to the stairs. There is also an important difference between rooms 1 and 2 in type of floor deposit, which indicates different use and architectural conditions.

Room 5 is a completely different story. On top of Neolithic remains, it starts with a thinly 'layered deposit', interpreted as a series of floors, but what is in fact a naturally rising surface under influence of domestic/industrious activity, slow decay and possibly some eolian sedimentation. Its thickness, 20 cm, and number of layers suggest an extended period over which these developed. To put it briefly, this was an open space within the large building, a kind of central courtyard. The development of this deposit stagnates when a relatively thin rubble deposit covers it, on top of which a new floor deposit, and new walls on all sides are constructed. All the evidence suggests that from now on, the space is covered.

Rooms 6 and 7 also share a similar deposit sequence. This is caused by the fact that both these rooms once had a separation wall. The demolition of these walls caused again a rubble or backfill deposit to fill the cavity between the wall stubs and the other walls of the room, to create a sufficiently stable and level basis for a new floor. Again, the thickness of the deposit is dictated by the amount of wall left standing that needed to be covered up.

Both rooms 8 and 9 have a relatively simple deposit sequence. Both just have evidence for one floor deposit, in both cases a mud brick floor. Loam layers interpreted as 'floors' right on top of just beneath these floors are very badly preserved and could be part of its continuous use, or part of the mud brick floors' construction and do not really indicate architectural modification.

Neither of the six southern rooms, room 4-9, has evidence for significant activity after the great collapse/fast decay deposits. There are no level 4 surfaces as there are in the three northern rooms.

In conclusion, the deposit sequence patterns of the rooms in the tower are most likely interpreted as particular architectural modifications occurring in each of the rooms. In rooms 1-3 there have been two such phases, one with the extension of the northern wall, and one with the small modifications in level 4 when activity took place on top of a significant collapse deposit. Some of the other rooms also show one large modification, and a deposit related to construction/levelling activities or a change of mode of deposition turning from open to roofed conditions. The remaining rooms show no modification and related deposit at all. Their architectural structure remained unchanged throughout their entire existence, whatever their – likely changing – use was. How all these architectural histories combine in one history of construction and demolition of the large central building will be discussed elsewhere.

IV.4.4 Northwestern *Dunnu* and residence

The northwestern *Dunnu* includes the entire intramural area west of the old gate, including the residence, but not the area directly south of the residence. What is typical of the deposit sequences found here, is that before the large collapse/fast decay phase that ended the primary settlement phase, there are no thick deposits of any kind. In a simplified representation of what happens here we can state that a building is constructed, including floor, it is used continuously, and then the large fast decay/collapse deposit is formed. There is no evidence for large-scale architectural modifications, but for two new walls in the long western wing running along the fortification wall, and some minor modifications in the residence (that by the way do have significant implications to access patterns). In the mean time, it seems that some open areas like the large paved courtyards and the roofed architecture are kept clean, while in others some gradual deposits can accumulate. A large part of the western wing falls into the last category, suggesting this was largely an open space. Accumulated height is modest and measures between 10 and 20 cm, which probably means that it is relatively well-maintained area. However, some of these layers might be related to backfill but it is hard to say as the documentation on these layers is limited.

Most of these architectural foundations are found directly on the Neolithic tell. The residence however, diverges from this pattern. In soundings below the floors of the residence in rooms 9 and 5, various features are found that indicate use of the area before the residence was built. The deposit type is a layered deposit, a combination of constructed and naturally accumulated surfaces that indicate an outside area. The deposit seems to gradually merge with the Neolithic, and it is possible that some intermixing had taken place. It is certain that during the construction of the residence significant digging and levelling activities had taken place (see chapter on construction) which could be responsible for the muddled picture.

The deposit patterns of the decaying residence hold another prime example of how differing architectural conditions cause diverging deposit sequences. After the fire, the residence collapses, and fast decay and collapse deposits follow. In most of the spaces, these deposits fill the room until the top of the remaining walls. However, the large east-west oriented paved space, filled in a different way. Here, some collapse deposits are formed, primarily on the south side, the area that is near to the main building. The building's collapse may have spilled somewhat in the forecourt. But the thickness is not nearly as thick as elsewhere. Above that collapse, a layered deposit initiates that closely follows the pattern also seen in the great court, with occasional walls, ovens and bins being constructed. The explanation for the difference with the rest of the residence may be clear by now: this was originally a paved open courtyard, and thus did not fall victim to massive collapse of building materials. The walls surrounding it were not so much affected by the fire, but simply gradually decomposed over time, causing the surfaces within this ruined but inhabited structure to raise.

In the northwestern corner of the *Dunnu* the interpretation in this study diverges significantly from that of the originally proposed sequence of settlement plans (Akkermans and Wiggermann, 2015). In terms of deposit sequence pattern, there is no good evidence for a long drawn phase before construction of the office building in the northwestern corner, the new gate and related fortification walls. There are no layered deposits, backfill deposits, fast decay or demolition deposits that indicate that an area was modified. Since such deposits are found everywhere else where construction happened, indicating that the formation of such deposits is part of the customary working methods of the bronze age builder, it seems that the entire northwestern sector was planned and built up in a single phase of construction. In addition, there are multiple constructional arguments and pieces of evidence that also point in this direction (see V.5 and V.6).

Most of the spaces in the northwestern *Dunnu* thus have little evidence for construction activity within the primary use phase. There are no secondary floors within the same building which point at repurposing or renovation. As noted earlier, there are some instances where there are multiple floors near to each other, but these must be seen in the light of a layered deposit, hence a continuous use-phase. The only space with good evidence for another floor phase during the primary use-phase of the *Dunnu* is space NW-1a directly south of the office building. Initially it is part of the large elongated area that runs along the western fortification wall, with which it shared the same floor or exterior surface. Some accumulation occurred over time, although the documentation does not allow us to establish the manner of deposition. Than a wall is constructed, cutting off NW-1a from the larger space, and it receives a pavement with the same kind of tiles found in the great court. Hence, a secondary floor within the same space separated by the original floor is only warranted by the architectural modification, the construction of a separation wall. Also one room of the office building has a secondary floor, however, as will be argued next, this floor is of later date belonging to the post-abandonment phase of the *Dunnu* and not to the primary use-phase.

The office building is an especially interesting case in terms of depository patterns, and how these reflect the architectural context. In its original construction it is a three-roomed building (on ground floor), accessible from the great court. A narrow corridor leads to a square room to the right and a bathroom to the back. Construction-wise it all looks quite neat, with tiled floors and a proper double-spaced bathroom for some privacy. As said, all these constructions are found near the Neolithic layers of the tell and seem to be part of the first LBA constructions on this particular spot. The deposit on top of these floors is especially interesting, as it contains many cuneiform tablets relating to the administration of Tammitte, the last steward (hence the label of the building "the office"). In his thesis, Victor Klinkenberg has convincingly argued that these tablets do not lie on the floor, but are randomly spread inside the deposit above the floor. The deposit contains little debris and is otherwise relatively homogenous, which may indicate that we deal with a backfill deposit. The architectural context would also make collapse deposits less likely. For instance, the corridor was certainly vaulted, which collapsed much later, as can be observed in the sections. An additional argument in favour of the idea that the deposit was placed there rather than naturally developed is found in the relationship with architectural modifications. The corridor was in fact blocked at its western end, closing off access to the former bathroom while the former bathroom was now made accessible by cutting a new passage in the southern wall. The bottom of this new passage as well as the bottom of the blocking are found on the same level as the top of the deposit containing the tablets. Moreover, the thickness of the deposit exactly covers the tile 'base board' of the bathroom hiding just from view all indications of this room's previous function. The deposit is therefore put there as part of the modifications of the spaces, and not the result of random collapse.

What happens next is in fact a pattern of deposition that has been observed repeatedly. The former bathroom, in use for a short while as servicing room for a pottery workshop, starts to collect sediments and cultural refuse. A layered deposit is formed indicating that the "room" was unroofed henceforth.

The former corridor is different. The infill here also indicates a layered deposit, but without human interference. As said, this space was vaulted, and after the deposit with the tablets, it became very low. Perhaps significantly, an unusually rich cremation burial was placed in the room the corridor used to give access to, although the passage into this room would now have been very difficult. It is thus unlikely that it was used a lot. The deposits found inside distribute asymmetrically in the width of the corridor but are reasonably thick, which indicates instanced natural sedimentation, like fast decay rather than slow gradual accumulation of sheets. It may belong to a much later phase during which the vault had perhaps started to fall apart and developed a gap through which debris could fall into the corridor. It is also possible that some of it came through the eastern doorway, which had never been blocked as far as we know, although it was narrowed at the same time as the blocking on the other end.

The square third room of the office also fills up in an unusual way in view of all the other spaces discussed so far. Again, no collapsed rubble is found here. The layering indicates a layered deposit, and considering the thickness of the layers, possibly a fast decay deposit. As the layers contain reasonable amounts of sherds, bone, charcoal and lime it is also possible that it was used as a dump at the same time, which is the excavator's hypothesis. Fast decay and dump deposit often go together since it indicates a neglect of architectural maintenance.

The limited amount of debris found in all of the rooms of the office may suggest that the building was never really that high to begin with. But above all, it indicates that the surrounding fortified architecture stood solid for a very long time before it started to crumble. If real collapse ever occurred, the evidence for it has been removed by erosion long ago. This is in stark contrast with observations near the old gate, where the fortifications had started to collapse soon after abandonment.

There is one building remaining that we should discuss for its particular deposit sequence pattern. This is the long space behind the new gate. We will not discuss the phase preceding it, or the main floor phase, which is pretty straightforward. Its infill process is more interesting as it is unusual in the sense that it contains a collapse deposit of some thickness, e.g. 50-60 cm. This deposit is fairly evenly distributed throughout the room, but gradually rises toward the eastern and western sides of the room, indicating that it is no backfill deposit or levelling layer. On top of this, the mode of deposition changes into a finely layered deposit seen with for the deposits observed in the *Dunnu* unique properties. It consists of interchanging red-brown and light grey layers, the first averaging 2-4 cm, the second 1-2 cm in thickness. The excavator interpreted it as a series of floors, although this is quite unlikely considering that nowhere else floors are found in such a sequence with these properties. The main evidence for human occupation and use, some walls and other structures, is found at the lower part of this layered deposit, and in fact seems to stand on the collapse deposit. The layered deposit thus developed around these features, possibly during or after their primary use. In other words, it seems to be layered deposit like elsewhere, a natural raising of the surface under influence of human occupation and gradual decay. However, the relatively fine lamination, regular morphology and systematic colour switching remains to be explained. One possibility is that we should seek the explanation in the characteristics of the surrounding architecture. As noted, it did only collapse partially, and we must imagine a relatively narrow but high-walled space. This space was open to the sky, but relatively sheltered and perhaps this is the explanation for the development of sediments with such a fine and structured lamination. In that case, these sediments indicate abandonment, because as we have seen when human use and interference takes place, the deposits take much more irregular forms.

The typical pattern of deposition of the great court has been described before. It serves as a prime example of how a domestically used area naturally raises under the influence of minor wall and feature construction and decay, trash disposal and sedimentation due to building decay.

In conclusion, the northwestern sector was a place that must have been kept quite clean because the lion share of the finds everywhere come from the abandonment deposits on top of the floors. These are characterised by a very messy layers with spread out remains of a big fire that concentrated on the north side of the residence. The presence of burnt construction wood in the courtyard may indicate it had been moved there which can thus be taken as evidence for scavenging activities. Other indications are broken tiles and stones neatly separated from each other on piles against the side of the court, indicating that people have been selecting materials. The great court thus seems to have acted as a centre point of this activity. The only area in the northwest where surfaces are allowed to rise, albeit very minimally are in the area west of the residence (NW-1a/b). This is not related to domestic use and would simply be the result of slow sedimentation, or perhaps floor construction for some other reason. The collapse and fast decay deposits found on top of the floors in the residence – which has some interesting patterns not discussed here – and northwestern sector indicate variable effects of abandonment. This may for a large part be related to architectural conditions, such as whether a space is covered or the size of a room.

IV.4.5 Southern *Dunnu*

The southern *Dunnu* again has its particular deposit sequence patterns that reflect closely the architectural conditions and type of use. Architecturally, a large part of the south seems organically planned and consists of light-walled architecture, e.g. walls of 1 or 1.5 brick-width. There is also heavier architecture here, that is unfortunately less well preserved, but it does again reveal some interesting differences in deposit formation processes as compared to the lighter architecture.

The first aspect that is important to note is that the deposit sequences already starts before the large part of the light-walled architecture has been put in. This shows that the area was used, that material was brought in, discarded and sediments of decaying loam features and surrounding architecture could develop. It is similar in character to what has been tentatively found below the residence on some places, and we may reconstruct a phase during which such activities took place near to the central building, in an open environment.

This type of use, and the related cleaning regime or absence thereof, continued also after the light-walled architecture was constructed. In several spaces mainly concentrating in the southwestern half, the formation of layered deposits, or raising surfaces continues. These are open or semi-open spaces, e.g. with partial cover and large openings in their walls, permitting a dynamic interaction with exterior conditions. Also in this part of the *Dunnu* we can point at one example of where the increased thickness of the deposits is related to architectural modification. Like elsewhere, backfill has been used to cover up the stub of a demolished wall, effectively levelling the area to create a new surface. In all these areas there is at some point a moment that the mode of deposition changes significantly, and a thick fast decay or collapse deposit forms. On top of this we see again activity, including construction, which sometimes uses previous walls and at other times superimposes previous walls. It is typical of the level 4 type of use of life between the ruins, as has been observed in the north of the *Dunnu*. Although stratigraphically disconnected from the north, this pattern of fast decay and reuse is typical enough to assume contemporaneity.

Now returning to the main use-phase, we may note that nowhere do surfaces accumulate as quickly as in the long "alley" that runs along the southern walls of the tower and residence. The alley must have been the main passage giving access to most of these structures and leading the way out of the neighbourhood. The type of deposit is a thick layered deposit with layers ranging from 2-10 cm and irregular interfaces. Much sherd and bone material has been found throughout this deposit, which has undoubtedly to be explained as discarded trash. Until the fast decay deposits start appearing, with which we see an increase of the thickness of the layers to over 20 cm, the surface in the alley rises about a meter. What we see in the alley is very similar to what may be observed in the great court after its demise, only the deposit in the alley had certainly been formed during the primary use-phase of the *Dunnu*. What happened is that one finds a narrow space next to a large eroding surface – the massive south walls of the residence and tower – that is used additionally as a trash disposal area. Hence, it rose much quicker than the areas it gave access to, even if they were open and domestically used. There is additional evidence that this rise occurred during the primary use-phase of the *Dunnu*, as there are several architectural modifications that seem to have explicitly dealt with the problem of raising surfaces and the difference in floor levels that it caused between alley and architecture. Openings were closed, and steps were created on several places. This pattern of deposition thus resembles a common feature seen in the archaeology of urban settlements, in which architectural compensation for raised surfaces is a common dynamic (see IV.1.1). This tells us much about the nature and function of the southern *Dunnu* which is the most 'town-like' of all sectors.

But there are also spaces in the south without evidence for raising surfaces. These spaces concentrate more towards the eastern half of the south. The same as elsewhere, there is the occasional indication of pre-architectural activity, that was at some point overbuilt. But as soon as the architecture is constructed, and a floor is deposited, there is no additional deposition taking place but for a massive mud brick collapse deposit. In some of these cases we have even good evidence for collapsed roofs (see IV.3.3). These spaces contain noticeably more dense mud brick rubble in the collapse deposits. All these facts indicate that these structures were roofed buildings, potentially with a second storey. The deposit patterns indicate that they were constructed, used and destroyed. The massive amounts of large complete vessels – but broken – that have been found on these floors underline the permanent effect of the last event. Note that although in the documentation pertaining to the excavation and analysis of these structures, often additional floor constructions are inferred, suggesting a kind of architectural phases. While carefully draughting and summarizing the evidence all these inferences had to be dismissed and it is now clear that these buildings simply had one ground floor phase throughout their existence.

Now turning to the heavier walled architecture in the south. This architecture is built against the southern fortification wall and forms the southernmost extend of our archaeological evidence. There is one 24-meter-long building located against the fortification wall consisting of the series of spaces SW-7a (actually two spaces), SW-7b, and SW-7c. As far as we can tell this building is part of the original construction of the *Dunnu*, as it is structurally well integrated with the fortification wall. The original and earliest floors, proper loam floor constructions, have been uncovered everywhere. There is no evidence in the deposit sequence for a phase preceding the architecture, as floors and architecture lie directly on Neolithic layers. The deposit sequence on top of that seems to vary. In room SW-7c, a dense rubble deposit is recorded. In rooms SW-7a and SW-7b, a lighter rubble/collapse deposit follows. However, various object horizons are found inside it with many broken sherds and small objects. Although interpretations found in the documentation assigned these horizons 'floor' status, the evidence is shaky. It is for instance remarkable that the excavators could never for sure determine a floor associated with the sherd scatters, but for the initial floors of the building. Rather than that we deal with a layered deposit formed under outside conditions, the fact that occasionally roof materials in the form of reed phytoliths and imprints are found within these layers as well, suggests that these are rubble layers with collapsed material from the second floor. On top of these, new activity takes place and a large oven for instance is constructed in SW-7a. In the official interpretation, this phase was allocated to level 5. However, for the reasons just cited, it seems that we have already entered a phase during which habitation of ruins took place. What the deposit sequence pattern seems to reveal is that this medium heavy and probably tall building did not suffer the massive demolition/collapse seen elsewhere. Rather, it decayed relatively quickly after abandonment, perhaps as a result of roof and floor beam dislodgment and removal, but did not collapse right away due to its stable construction and support of the fortification wall.

Also, in the heavier architecture in the southwestern corner, comprising spaces SW-2a, SW-2b, SW-2c, SW-2d, and SW-2e, no evidence for additional floor levels is found above the first floor belonging to the construction of the architecture. Underneath these floors, specifically those of spaces SW-2c and SW-2d, Neolithic layers start immediately. However, this is only valid for the northern half of the floors, as some bronze age rubble and layered deposits and even a burial is found underneath the southern half of these floors nearer to the fortification wall. It is possible that these are part of construction activities aimed at raising the surface on one side to create level floors. Alternatively, it is possible that this architecture is later than the fortification wall, allowing layered deposits to develop prior construction, but only in the local depression near the fortification wall. In that case it mirrors the process seen elsewhere in the south, where we have evidence of a considerable pre-architectural phase of activity. The rooms are filled with rather homogenous compact loam layer which indicates fast erosive decay rather than collapse. However, that no brick fragments are recognizable is perhaps also possible due to the vicinity of the tell surface. The layer may already have been within the influence of the weathering zone of the surface causing otherwise recognizable mud bricks to disintegrate. Burnt construction wood is found on several places in the lower regions of this deposit as well, which would be more in line with a sudden collapse phase.

What is especially important regarding this context is that the end of the main floor level can be dated quite accurately since the floor was covered with cuneiform tablets, which were part of the administration of baker Paja. The termination date of this group of tablets corresponds with the termination date of the other groups, and hence refer to the end of the written administration of the *Dunnu*. That we have them on a floor that is found directly on Neolithic remains, proves that within the primary use-phase of the *Dunnu* this floor was used throughout the entire existence of the *Dunnu*. It means that in this corner, there is no evidence for a level distinction between 6 and 5, except if we want to maintain that these rooms and floors were only constructed during level 5. This causes all kinds of other issues of correspondence, but more importantly there is no evidence for this.

Recuperating, in the southern *Dunnu* (sector SW) deposit sequence patterns indicate that there were several outside or semi-covered areas where surface levels slowly rose, as is evidenced by the layered deposits. The most rapid rise of surface levels were observed in the alley, both due to its use as thrash disposal area and its natural propensity for sediment collection. Other spaces were clearly roofed, and had one single floor throughout their existence. There are indications that some of the deviating deposits are caused by roof and second floor collapse. All spaces quickly filled at some point with homogenous fast decay or collapse deposits. Previously roofed spaces containing in general more dense brick rubble. New activity surfaces developed on top, with some rebuilding of architecture and some reuse of ruined walls.

What is above all remarkable is the continuity and stability of the architecture that has often been described in the reports as ‘bad quality’ or ‘haphazard’. When looking at the depository sequences, and the architecture itself there is very little evidence for adjustments after the basic structure had been put in. One wall and a few blockings to prevent the piling thrash and wall decay sediments of the alley to flow into the adjacent spaces is all there is. Otherwise, it survives the entire existence of the *Dunnu.* This contrasts starkly with the areas in the northeast and southeast where we have evidence for thorough 'renovation'. This strengthens the hypothesis that the main reason for rebuilding was not renovation per se, e.g. a situation of disrepair, but repurposing due to changing spatial demands of the people using the *Dunnu*.

IV.5 Conclusion

In this chapter formation of deposits were discussed, and what these tell us about the conditions of the architecture and how human (building) activity and deposit formation are closely intertwined. It was established that deposit sequences are not synchronised across the entire settlement, but certain larger sections show synchronic development (Figure 38). This could be explained by at least four main factors: architectural conditions (open or roofed), cleaning regime (cleaned or waste disposal), maintenance regime (maintained or left to decay) and phases of construction activity. Regarding the last factor, the hypothesis is offered that the main debris deposits found during the 'main use phase' of the *Dunnu*, are evidence of localised demolition prior to functionally motivated modifications. This is contrary to the interpretation of these deposits by the excavators, who consider them as evidence for temporary lapse of maintenance and following decay.