

Building Project Documentation in Ancient Mesopotamia

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Keywords

Mesopotamia (ancient), Building, Drawings, IT, Contracts, Performance contracts

Abstract

A wide range of project and contextual documents for building construction from Ancient Mesopotamia is collected, analysed and interpreted. The 'documents' include drawings, models, contracts, laws, ratios, and various kinds of texts, including cultic. Their use in design, construction and as records is explored, particularly to see how they might have performed as an ensemble. It is suggested that absence of construction contracts can be explained by the use of performance contracting.

Introduction

The content of building project documentation is influenced by what needs to be said, what doesn't need to be said, what can be said, and what cannot be said. All depend on context, including culture, economy, building technology, education, law, trade, information technology, literacy, and numeracy. For the purposes of this paper, the timeline for ancient Mesopotamia runs from ca 5000 BC, to 331 BC. Here the timeline is collapsed, treating the whole of ancient Mesopotamia as one cultural unit. A longer exposition would allow some breakdown e.g. between Ubaid, Sumerian, Akkadian, Babylonian,

Assyrian and Achaemenian, but this is not attempted here.

Ancient Mesopotamia's construction and information technologies were both clay-based.⁵ Thousands of clay tablets have been excavated, most featuring cuneiform inscriptions and on a huge range of topics, including building documentation. They were made to be held in the palm and so were often quite small, no bigger than 60 x 70 mm. However, it is worth remembering that larger but less durable media were also used, mostly for ephemeral records – including papyrus (Driver, 1976: 16), and waxed timber writing boards (Wiseman, 1995). In this short exposition many illustrative examples have been omitted for lack of space, as has discussion of some peripheral (but important) issues such as trade, use of cuneiform, and the sexagesimal system.⁶

Projected Documents

Ancient Mesopotamia is well represented with examples of building-specific documentation across a broad spectrum of types – existing plans,

plans and elevations, models, quantities, contracts for supply, reports of work-in-progress, workshop records, metrological texts, dedicatory inscriptions and contracts for sale of buildings. Specifications of work, and contracts for construction are conspicuous by their absence. Not all that survives is before-the-fact project documentation – indeed it is not clear that any of it is. Most of the documents are familiar to us – even omens live on, as *feng shui*.

Setting out

The buildings themselves contain documentation, to assist with erection. For example, Oates (1961) argued that the foundation courses at Fort Shalmaneser were laid by skilled labour, followed by brickwork '*laid by less skilled labour*' – in other words, the first few courses were set out by the '*master builder*' as a form of in situ documentation.

Otherwise, setting-out marks do not survive in the ruins of the clay architecture of Mesopotamia, but they were probably used. Marks for locating faces and centrelines of walls, for centrelines of columns, and positions of doors do survive in the stone architecture of the Achaemenians, as direct evidence of the design (and presumably the documentation) of buildings (Roaf, 1978).

⁵ The only other example of such a convergence that comes to mind is the use of rice paper in Japan for partitions and documents.

⁶ From which we have 60 seconds in a minute, and 6 x 60° in a circle, for example.

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George notes that it was ‘*the custom of royal rebuilders of temples in the Neo-Babylonian period to keep exactly to the former dimensions of the structure in question, for both practical and cosmological reasons*’ (George, 1993: 743). Indeed, Esarhaddon says of the E-sagil temple ‘*I laid its foundation platform directly on top of its ancient footings, according to its original plan: I did not fall short by one cubit, nor did I overshoot by half a cubit.*’ (George, 1993: 743). Other dedicatory inscriptions by other kings make similar remarks where something similar has happened. So for some (reconstruction) projects, floor plans were largely redundant.

Koliński argues that, for domestic architecture at least, ‘*earlier structures were used only if they fit the projected plan and were ignored if their layout differed from it*’ (Koliński, 1996: 140). From this and other archaeological evidence, he suggests that professional builders were routinely involved in house construction, working to pre-existing plans.⁷

Fitter’s marks

Erection of the 4 m high glazed brick panel of Shalmaneser III was facilitated by fitters’ marks, painted in thin glaze on the top of most of the bricks, defining the course and the position in the course for each brick. The marks were also colour coded to indicate which of five sets of seven courses each brick belonged to. Similar marks are found for glazed brick assemblies at Khorsabad and Babylon (Reade, 1963).

Building plans

Around 30 tablets with floor plans of buildings – houses, temples, ziggurats

⁷ Contrast this with the apparent DIY process, and the retention of previous floor plans, seen at Çatalhöyük in Anatolia (Balter, 1998).

– survive (collected in Heisel, 1993). One elevation (of a ziggurat), and several combined plan-elevations (of forts – Unger) also survive. Four of the tablets have plans on both faces and one of these, from Ešnunna, is thought to show a two-level building (Margueron, 1996: 22-3).

They were scribed on clay tablets, usually small (e.g. 50-115 x 65-135 mm; the biggest was 230 x 310 mm). This rather limited their information capacity, so annotation is minimal where used at all. Nevertheless, some of the plans give dimensions, and some give room names.

The quality is variable. Many show walls as a pair of parallel lines, with doorways shown as a break in the wall. Some, though, show walls as single lines, with openings marked by strokes across the lines. Some are neatly inscribed, and some are very scrappy. They appear to have been intended for use in the construction of real buildings, either for client approval (perhaps those without dimensions), or for the builder’s benefit (perhaps those with dimensions), or both. Some, though, appear to be school exercises (e.g. on round tablets).

Decorational details

The Sumerians and Akkadians had words for many relatively complex geometric shapes, which may mean that artisans familiar with these terms did not also need drawings of them. Written descriptions would suffice. Examples include *qaštu* (composite bow shape) and *in alpim* (bovine eye, a biconvex figure constructed from 120° arcs) (Kilmer, 1990).

Models

At least a dozen stylized terra cotta models of whole buildings have survived, but most if not all have a ritual function e.g. as altars, tabernacles and libation vases. It is possible that

similar models were made from time to time for construction purposes, though there is no evidence to support this (Weygand, 2001).

Detail models

Some detail models survive which do appear to have been used in the construction process. Examples include:

- A small Assyrian terra cotta model for a column made to resemble two pairs of palm trunks (Contenau, 1941);
- A limestone model (95 mm high) of an architectonic colossus or genius in the form of a winged human-headed cow (Hall, 1928: plate 58); and
- A set of 99 baked clay model bricks (ca 1:10 scale) from Tepe Gawra, used to work out brick bonding (Tobler, 1950: 34-5).

Quantities

Calculation of quantities, e.g. the number of clay bricks needed to build a house, seems to have been an obsession of the ancient Mesopotamians. So much so that they developed a series of standard coefficients to convert floor areas to the number of bricks, the coefficient used depending on the size of the brick (Robson, 1999). One reason for this concern was the narrow building window (dry season), made narrower by the curing time for the bricks and the availability of labour. Civil works also featured, as in the calculation of resources needed for the construction of canals (Robson, 1999).

Contracts for supply

From Sippar, a contract for the supply of bricks survives.⁸ From Nippur we

⁸ ‘*10,080 baked bricks, property of Samas, are against the account of Samas-zer-iqisa son of Erbaya; he will deliver them at the end of*

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have a receipt for a 7 m long wooden pole (Chiera, 1922: 153).

Mesopotamia imported timber from the Lebanon and elsewhere. One example of how timber might have been purchased comes from an order from Carcemish to Ugarit (neither is in Mesopotamia).⁹ A contract for the hire of a gardener gives some idea of what a building worker's contract might have covered for supply of labour.¹⁰ Penalties, progress payments, the parties, program, and scope of work are all included.

Building products

Some products were inscribed, for example: *'Darius the King says: In (my) house I made these columns'*, and *'Stone window-frame, made in the house of King Darius'*.¹¹ These items were made in the king's own workshop. The labels were, presumably, to ensure that they found their way onto the king's building project.

Sabattu. (Names of witnesses) Sippar, Sabattu, day 7, year 1, Nebuchadnezzar king of babylon." (MacGinnis, 1998: 213).

⁹ "Thus says the king of Carshemish to Ibirani king of Ugarit: Greetings to you! Now the dimensions – length and breadth – I have sent to you. Send two junipers according to those dimensions. Let them be as long as the [specified] length and as wide as the [specified] breadth." (Anon., 1996).

¹⁰ "Gimillum, the son of Appali, has hired for himself Ina-esaggil-zer, the son of Warad-ilishu, as a farmer until the end of the harvest. His monthly wages shall be 1 shekel of silver, and also 2 ½ for his food and 3 ½ for his drink. He shall provide for himself implements and clothing. Should the trees prove unfruitful, he shall pay the money at the regular rate. In the third month he shall begin work. The trees he shall widen and transplant. Should he abandon and go away, he will lose his wages. In account of his wages he has received 1 shekel of silver." (Chiera, 1922: 165-6).

¹¹ www.avesta.org/op/op.htm

Reports

A report from a construction site survives, for a fort, from ca 728 BC. This letter is, according to its translator, *'perhaps the only letter that ... contains direct information about ... the administration of construction projects in general.'* (Parker, 1997: 79).¹²

Workshop records

Records from a workshop archive (van de Mieroop, 1987) indicate that *'doors [were] produced in large quantities'*. Several trades were sometimes involved.¹³ Locks, pivots, keys and hinges were also made in this workshop, as were other building-related products, including furniture and mats. Customers included religious and royal institutions, and other cities.

¹² In part: *"To the king my lord, your servant Duri-Assur. Regarding the work about which the king my lord wrote me. The defensive wall is finished. The natu is [...]. The wooden nasari-frames for the gateway of the guest house have been driven in and the sibirnis have been smeared with hot tar. 28 mahiris have been put in place, the door of the main gate has been installed and the locking mechanism has been made. The drains and the courtyard have been coated with asphalt. ... The outside water storage cistern is very good. As for the inside, the eunuch is going to see how to improve the water of the canal from the Tigris. They are applying the [...]s to the gate. I am bringing the wooden plough(s), the sugurrus, the liquid bitumen, the hamartu and the oxen in to the garrison complex and I am putting them in place. ... I am extending the moat(?) of the Ištar chapel."* (Parker, 1997: 79-80).

The Epic of Gilgamesh contains a short description of the construction process for the boat of Utnapishtim – workers were supplied with meat, wine and oil. Children supplied the bitumen, which could be readily collected from water seepages (Moorey, 1999: 333).

¹³ "1 door made of small boards: its glue is 2/3 mina, it is the work of the carpenters; its white oxhides are 1 and 1/3, its hairy oxhide is 1/3, it is the work of the leatherworkers; (its) bitumen is 15 sila, its gypsum is 4 minas, it is the work of the reedworkers; for the gate of the tower of the wall of the city." (van de Mieroop, 1987: 14).

Metrological texts

A special subset of the topographical texts discussed below is the metrological texts (George, 1992). One set of metrological inscriptions records the number of bricks along wall sections of the E-sagil temple in Babylon, broken up into pilasters, rebated door jambs, recesses and doors.¹⁴ There is sufficient detail for the plans to be reconstructed from the text. Indeed, George suggests that replication at Uruk of the original temple, and its associated ritual, was perhaps the intent of the inscriptions (George, 1995: 194). It is interesting that the dimensions are given in terms of bricks rather than cubits – perhaps this was seen as more resistant to the vagaries of metrology. Other metrological texts were perhaps surveys done for reconstruction projects. Some texts may have been intended to supplement a characteristically bare drawing.¹⁵

¹⁴ In part: *"The wall of the chapel of Uraš: [3 ½: rebated jambs] 5: the gate of the side-room(?) of Uraš 3 ½: rebated jambs 6 ½: shallow pilaster 9: recess 6 ½: shallow pilaster 3 ½: rebated jambs 4: the gate... 3 ½: rebated jambs*

Total: 45 bricks." (George, 1995: 196).

¹⁵ For example, from the E-sagil tablet come some figures which could have been read alongside an un-dimensioned ziggurat plan (in part):

"The dimensions, length, breadth and height, (of the ziqqurat): its name being Ziqqurat-Temple of Babylon:

15 nindanu the length, 15 nindanu the breadth, 5 ½ nindanu the height: the bottom platform; 13 nindanu the length, 13 nindanu the breadth, 3 nindanu the height: the second storey; ... 4 nindanu the length, 3 ¼ nindanu the breadth, 2 ½ nindanu the height: the upper sanctum, the seventh story, (and) the šahuru." (George, 1992: 117).

There is sufficient information in this text for a reconstruction to be possible (Vicari, 1985).

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Dedicatory inscriptions

Many temples and palaces are accompanied with dedicatory inscriptions built into their fabric, recording the inception, construction and completion of the building project, and the rituals associated with all this. Some were displayed, but others were on the reverse of wall panels, out of site, presumably serving just a ritual function. They vary in the allocation of responsibility for the work – some give the impression that the king personally did everything; others give credit where it is due.

Nebuchadnezzar's inscription is an example of the first type.¹⁶ Others include those of Gudea (temple of Ningursu, ca 2125 BC), Sennacherib (Palace without a rival, ca 700 BC)¹⁷ and Nabonidus (ziggurat, ca 540 BC). Darius I's trilingual inscription at Susa (palace, ca 490 BC) is an example of the second type.¹⁸

¹⁶ In part: "Of the house, the foundation of the heaven and earth, I reared the summit with blocks of noble lapis lazuli: to the construction of Bit-Saggatu my heart uplifted me; in abundance I wrought the best of my pine trees which from Lebanon together with tall Babil-wood I brought, for the portico of the temple of Merodach: the shrine of his Lordship I made good, and interior walls with pine and tall cedar woods: the portico of the temple of Merodach, with brilliant gold I caused to cover, the lower thresholds, the cedar awnings, with gold and precious stones I embellished:" (Rodwell, 1901: 253).

¹⁷ Though he does give credit to 'the plan of wise architects' in the inscription for the armoury at Ninevah (Luckenbill, 1924: 129).

¹⁸ In part: "This is the palace which at Susa I erected. From afar its ornamentation was brought. Down the earth was dug until rock-bottom I reached. When the excavation was made, rubble was packed down, one part 40 ells in depth, the other 20 ells in depth. On that rubble a palace I erected.

And that the earth was dug down, and that the rubble was packed down, and that the brick was moulded, the Babylonian folk, it did that. ... The stone-cutters who wrought the stone, those were Ionians and Sardians. The goldsmiths who wrought the gold, those were Medes and

The story of the Tower of Babel¹⁹ may record a folk memory of the linguistic chaos that must have followed the use of foreign workers on the more ambitious of the Mesopotamian building sites such as, indeed, the so-called Tower of Babel (the Babylonian ziggurat for Marduk, known as E-temen-anki). For such projects, traditional clay-and-timber construction was supplemented with exotica (see for example the inscription of Darius I, quoted in Note 14).

Contracts for sale

Though no contracts for the construction of buildings appear to survive²⁰, several contracts for the sale of buildings do, and they give some idea of how a construction contract might have described the building.

Other contracts (e.g. for sale of slaves or dates) survive in large quantities, so the nature of Mesopotamian contracts is well understood.

Egyptians. The men who wrought the ishmalu, those were Sardians and Egyptians. The men who wrought the baked brick, those were Babylonians. The men who adorned the wall, those were Medes and Egyptians.

Says Darius the king: At Susa, here, a splendid task was ordered; very splendidly did it turn out." (Frankfort, 1996: 349).

¹⁹ "They said to one another, 'Come, let us make bricks and bake them hard'; they used bricks for stone and bitumen for mortar. ... The LORD came down to see the city and tower which they had built, and he said, 'Here they are, one people with a single language, and now they have started to do this; from now on nothing they have a mind to do will be beyond their reach. Come, let us go down there and confuse their language, so that they will not understand what they say to one another.'" (Anon., 1989: Genesis 11).

²⁰ At least, in scouring a dozen books and articles on 'contracts' I have failed to find any. However, the 'specification' for Utnapishtim's boat is given in the Epic of Gilgamesh: "Tear down your house, I say, and build a boat. These are the measurements of the barque as you shall build her: let her beam equal her length, let her deck be roofed like the vault that covers the abyss; then take up into the boat the seed of all living creatures."

Johns gives a couple of contracts for the sale of houses, one for a house of 1 2/3 sar (unit of area) in Sippara from the first dynasty of Babylon (Johns, 1904: 241), another from Erech in Assyria. For the latter, Johns notes that the description is 'rarely so full'.²¹ Apart from this actually quite meager description, the contract gives the price, the location, the buyer and seller, the date, the witnesses, bars future claims on the house from the vendor's family, and gives the penalty for their attempting to reclaim the house. According to Johns, the size of the house is usually not given in Assyrian contracts for sale - this contrasts with Babylonian practice, where the area was usually given.

Doors

Doors are always named in Assyrian contracts for sale, because the 'doors, bolts, posts, and a lintel are ... often put in by the tenant and, like the beams, taken away by him' (Johns, 1904: 239). This is why the contract mentions the door and crossbar. This concern arose because decent timber was in short supply in Mesopotamia – where the cost could be justified, timber was imported from the highlands (Moorey, 1999: 348).

Rent and repair

Barton gives a contract for the rent and repair of a house, from 487 BC. For this work, the contract – which is the closest thing I have found to a contract for building work – merely has: 'Because of the payment he shall repair the weakness (of the house), he shall close up the crack of the wall.' (Barton, 1904). The contract also covers payment for the repair work, progress payments, and a penalty for

²¹ "The house of Ina-ēshi-etir, son of Nabū-etir, a well-built house, furnished with door frames, a roofed house, the door and crossbar of which are firm, in the quarter of Bit Kuzub-shamē-ersiti, which is in Erech; ..." (Johns, 1904: 244).

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late completion, as well as the parties, the date and the witnesses.

Cracks must have been commonplace – after all, collapse seems to have been.²²

Contextual Documents

There are also ancient Mesopotamian examples of building-related contextual documentation such as isopsephia, omens, laws, ratios, metrology, standards (indirectly), city plans, and topographical texts. However, some classes of this sort of documentation, such as building manuals, are not known.

Isopsephia

Contenau observes that the Mesopotamians commonly used a system whereby each sign in their syllabary had a numerical equivalent. For example, the number 3600 (60 x 60) had the Babylonian name *šar*, which means ‘the king’. Such a system is known generally as isopsephia or gematria. This is what Sargon meant when he said ‘*I built the circuit of the [perimeter] wall [at Khorsabad] of 16,283 cubits, the number of my name*’ (Contenau, 1954; 166). It seems that such considerations dictated architectural design to some extent.

Omens

A series of Akkadian omens deals with various aspects of domestic construction, including:

- making bricks for a new house;
- tearing down an old house;

²² “The day on which I send this, by tablet, to my lord, 7 lengths of Sagaratim’s wall collapsed, the bastion to the north of the city has fallen. In the district there is no house-builder. Dagan-asraya [...] who has now been dead for quite a while. But even when he was living, the man knew nothing. ... Let my lord command that a housebuilder of supe[r]ior abili[ti]ty, who can repair the two walls of the two palaces, be sent to me.” (Mari royal archives, Sasson, 1968: 47-8). See also Note 22.

- building the new house;
 - observations of the finished structure;
 - interior features and furnishings; and
- building and repairing the household’s cultic structures (Guinan, 1996).

The omens assume that one’s future can be read from the physical form of the structure one occupies – so, like Chinese *feng shui*, these omens would have been used in the design and construction of houses.²³ Some of the omens encourage good or neighbourly design practices – one wonders to what extent the authorities had a hand in their promulgation. The more people relied on such omens, the less they would have needed formal regulation. The last tablet in the series deals with the king’s building projects and his care of the cult. There is an ominous link between domestic and royal construction. For example, some architectural features (e.g. rooftop sanctuaries) are reserved for the king.²⁴

Laws

Though the most famous of the Mesopotamian law codes, Hammurabi’s is neither the oldest, nor the last (Roth, 1997). Mesopotamian law codes were unstructured affairs tackling many subjects, including

²³ For example: “If the threshold of the house is high with respect to the courtyard, the owner of the house will be placed above the lady of the house.”

“If the foundation of a house encroaches upon the city square, the inhabitants of that house will not agree with one another.”

“If the appearance of a house keeps changing on the outside, its owner will change. If the appearance of a house remains constant on the outside, its owner will grow old.” (Guinan, 1996: 63, 65).

²⁴ “If there is a sanctuary either on the roof or in the courtyard of a man’s house, ... the gods will abandon the house, they will let it become impoverished, and it will go to ruin.” (Guinan, 1996: 66).

various aspects of construction. Fixed prices for property, services and products are stipulated in some codes. For example, from the laws of Ešnunna (ca 1770 BC) we have ‘40 silas of bitumen [can be purchased] for 1 shekel of silver’ and ‘A wagon together with its oxen and its driver – 100 silas of grain is its hire.’ (Roth, 1997: 59). Builders were expected to source their own clay.²⁵ The Hammurabi law code famously features eye-for-an-eye provisions. Builders are not exempt – but note the emphasis on structural collapse. Fire, amenity and the like are not dealt with at all.²⁶

Planning

In the same vein, Sennacherib threatened to impale any homeowner on a stake over his or her own house if that house encroached on the royal

²⁵ “If a man digs(?) [a pit] and makes bricks in a plot not his own and they prove the charges against him and find him guilty, he shall give ‘triple’ the plot; they shall strike him 50(?) blows with rods; he shall perform the king’s service for [x days].” (Roth, 1997: 180).

²⁶ “If a builder constructs a house for a man to his satisfaction, he shall give him 2 shekels of silver for each sar of house as his compensation.

If a builder constructs a house for a man but does not make his work sound, and the house that he constructs collapses and causes the death of the householder, that builder shall be killed.

- If it should cause the death of the son of the householder, they shall kill the son of that builder.
- If it should cause the death of a slave of the householder, he shall give to the householder a slave of comparable value for the slave.
- If it should cause the loss of property, he shall replace anything that is lost.

Moreover, because he did not make sound the house which he constructed and it collapsed, he shall construct (anew) the house which collapsed at his own expense.

If a builder constructs a house for a man but does not make it conform to specifications so that a wall then buckles, that builder shall make that wall sound using his own silver.” (Roth, 1997: 125).

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road, echoing the omen quoted in Note 19 (Guinan, 1996: 66, note 15). While this may not constitute a formal planning law, we can be sure that homebuilders of the time took it seriously.

Ratios

Kubba (1998) demonstrates that the preliterate Ubaid culture made wide use of standard geometries in the setting out of its buildings, notably the square, and the 3:4:5 right-angled ('rope-stretcher's) triangle. Simple ratios continued to be used throughout the Mesopotamian era. For example, the 3:4:5 triangle was still in use ca 3000 BC.²⁷ Student exercises using this and other ratios are extant.

Metrology

The Ubaid culture appears to have also used a standard unit of length, of 720 mm (see analysis in Kubba, 1998; Appendix 4). Three cubit measures were used in late Assyria – a standard cubit (515 mm), a 'big cubit' (566 mm) for religious works, and the rare 'cubit of the king' (552 mm) for royal works (ratio 30:33:32) (Guralnick, 1996). A cubit of 521 mm was used by the Achaemenians (Roaf, 1978). Though different units were used in different times and places across the ancient world, there is some evidence that they were easily converted, for continuity and trade.²⁸ For linear dimensions, the

²⁷ "... it can be assumed from the measurements of the city wall and some of the houses that a triangle of the proportions 3:4:5 was well-known and used for drawing ground plans." (Kohlmeyer, 1996: 100). For more esoteric ratios, see Margueron (1985).

²⁸ On trade, for example, we have: "... the relation between ... Attic foot: Doric foot: Samian foot: Samian cubit/Egyptian royal cubit ... can be expressed via the following whole number progression: 27:30:32:48." (Jones, 2000: 104). See also Rottländer (1996), for a more speculative system of linear interconvertibility. Units of weight were readily

colophon to the E-sagil tablet is of interest, as it provides conversions between old-style units and new-style units. A warning precedes it: '*May the initiate instruct the initiate! The uninitiate must not see!*' (George, 1992: 118).²⁹

Standards

Standards as such do not survive, but that they existed, for bricks at least, is evidenced in a statistical analysis of brick sizes (Robson, 1999: Appendix 6). Robson identifies 12 Old Babylonian 'mathematical' brick types, and shows that surviving bricks broadly conform to them. The most common brick shape is square, and the most common lengths are 18 or 20 *šusi* (1 *šusi* ≈ 17 mm). Other common shapes are $\frac{2}{3}$ and $\frac{1}{2}$ bricks. 15 *šusi* is another common length.

City plans

Several plans of cities survive, in whole or in part. Most are small, and most are annotated. The most famous is the Nippur plan (235 x 175 mm) from ca 1500 BC. This (controversial) plan and others are illustrated in Heisel (1993). Some individual buildings are shown e.g. temples. Functions seem to have been ritual, or military in some cases.

Topographical texts

A large body of ritual texts, describing the topography of cities and major buildings, survives (collected in

interconverted (Mederos & Lamberg-Karlovsky, 2001).

²⁹ Unfortunately this particular 'initiate' made some arithmetic errors (George, 1992: 433) – what's new? Contenau suggests that this sort of prohibition means, "we are forced to conclude that the recorded dimensions are only symbolical and contain some esoteric meaning." (Contenau, 1954: 166). This seems a bit extreme – the dimensions were probably both actual and esoteric.

George, 1992). Just as the metrological texts may have been read alongside building plans, so the topographical texts may have been read alongside the city plans.

Reading The Documents Together

None of the documents should be examined in isolation. We might expect the project-specific documents to be read together (so that drawn information should not also be in the written description). Likewise, we'd expect the contextual documents to be borne in mind when reading the project documents (so that if the law stipulates something, then it should not also be stated in the project documentation). Table 1 provides conjectural uses for each of the documents described here. It seems that reading the documents together might not have been the norm.

Design

Magic drove the design of buildings large and small in various ways – isopsephia and omens are examples. Though law codes may have had little impact on building design, laws did not necessarily need to explicitly deal with such matters – many could be left to omens. Some of these were rooted in pragmatic concerns, after all. Some matters could be left to custom, too. A good example here is the reuse of existing floor plans in reconstruction, or even for replication elsewhere. This might have been for expedience (e.g. to reuse existing footings, or because the building worked structurally), but might also have been done for more esoteric reasons (e.g. because the building worked in terms of ritual or magic).

Otherwise, proposed new floor plans were probably drawn up for approval, at least some of the time. Some that survive were sketches, and some were annotated with room names, both of

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which are typical of our expectations for design-stage drawings. Elevations were also used occasionally e.g. for multi-level work such as ziggurats. Floor plans were set out simply, using whole units and simple ratios, to facilitate construction. For example, the 3:4:5 triangle was used to generate not only right angles, but also wall lengths (this triangle may even have had magical connotations itself). Constructional constraints such as practicable roof spans, and standard wall thicknesses, would also have dictated room sizes. To some extent, then, dimensions on floor plans and elevations were not needed – they would have been self-generating.

Construction

No documentary contracts for construction appear to be extant, so it is suggested below that buildings were contracted using performance or ritual. Omens influenced the construction process, again sometimes from a pragmatic base. Law codes appear to have influenced building construction rather more than building design, and the law in general terms could be influential – court cases to resolve various disputes are well attested. However, the law codes are thought by some to have had ‘little or no impact on the daily operation of

legal affairs’ (Roth, 1997; 5), except perhaps for the fixing of (minimum) wages and (maximum) prices. Guarding against collapse was seen as more of a constructional issue than a design issue. Certainly for small-scale projects, structural design and detailing was the builder’s responsibility. In other words, buildings were procured under design-build to this extent at least.

Building plans were sometimes dimensioned, presumably for both calculation of quantities, and for setting out (e.g. where non-standard). Use of whole units and simple ratios simplified the construction process,

‘Document’	Project			Non-Project	
	Pre Construction Design	Construction	Post Construction Record	Ritual	School Exercises
Isopsephia	‡			‡	
Omens	‡	‡		‡	
Laws	‡	‡			‡
Setting out	existing floorplan	fitter’s marks			
Building plans	without dimensions?	with dimensions?			round tablets
Metrology, ratios	‡	‡		‡	‡
Standards		‡			
Quantities		‡			‡
Models		detail models		building models	
Contracts for supply		‡			
Building products		‡			
Reports		‡			
Workshop records		‡			
Metrological texts		‡	‡	‡	‡
Dedicatory inscriptions			‡	‡	
Contracts for sale of building			‡		
City plans			military	‡	
Topographical texts			‡	‡	‡

Table 1: Conjectural contemporary uses of ‘documentation’

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both horizontally and vertically, as did standard brick sizes (also beneficial to calculation of quantities and required resources). Reuse of existing floor plans required their survey for constructional purposes, recorded in the metrological texts, again for both quantities and setting out. Building plans may have supplemented these texts, though the texts appear to have been self-sufficient.

That is, it is probable that they were prepared as stand-alone documents. Likewise, dimensioned drawings could have been stand-alone. Many, if not all, products were fabricated off-site specifically for the project (i.e. stockpiling of standard products does not seem to have occurred), sometimes in specialist workshops. The erection of complex items needed the use of fitter's marks, presumably because drawings of such items were not prepared for erection purposes. Likewise detail models were prepared for some complex items, and to resolve brick details at complex junctions. Finally, accounts were kept during fabrication and construction, and reports of both were made. Construction was a business and not left to amateurs.

Records

On completion, dedicatory inscriptions recording dates and the name of the owner were often made and incorporated in the fabric. For the more important buildings, more elaborate inscriptions were made, describing the rituals followed, the sources of building components and labour, and so forth. On occasion, completed buildings served as models for new buildings, so records were made. Buildings were, of course, sold from time to time, and contracts were prepared for this. These describe the estate in words. It may that building plans supplemented these sometimes. Finally, important buildings such as

gates and temples are recorded in city plans and topographical texts, some of which may have had military functions.

Ritual

The role of ritual has been explored, and ran through the whole procurement process – inception, design, contracting, fabrication, construction and consecration or commissioning. Some documents had a predominantly ritual function. For example, the models of whole buildings that survive appear to have had various ritual functions and no constructional ones. Many other documents had a partly-ritual function.

School work

As mentioned, many of the documents that survive appear to be schoolwork. This doesn't diminish their value. Indeed, it indicates that the training of draftsmen, scribes, quantity surveyors and the like was important to the Mesopotamian economy. It also indicates that these documents were used by the State.

Performance Contracts

Why do we not have specifications and contracts for construction from ancient Mesopotamia? Reasons might include that:

they were destroyed on completion of the work (in which case why do contracts for far more trivial purposes survive?):

- Contracting practice was very standardised so didn't warrant documentation (contracts for other purposes were standardized, but documented nevertheless);
- They were prepared using ephemeral media, rather than clay (unlikely since other more ephemeral products and services are dealt with using clay);

- Work was DIY, or at least 'in the family' (the evidence suggests otherwise); or

They exist but have not yet been found and/or published (unlikely given the number of documents that have been found).

Another reason might be that the construction of buildings was too important an event to be dealt with by mere written contracts. Multi-sensory performance contracting, in front of witnesses, might have been preferred (as in the modern wedding ceremony). Ancient Mesopotamia was to some extent a 'performance culture' – oral contracts, reinforced with ritual, were very much of the present (Hibbitts, 1992).³⁰ This was a carry over from a pre-literate past. The extent to which performance contracting impinged on construction is difficult to estimate but, given the importance of procuring a new building (parallel to the importance of marriage), it is likely that it did. Indeed, for buildings large and small there is evidence to suggest this. For example, dedicatory inscriptions for the larger buildings describe rituals at some length.³¹

Conclusion

Procuring a building in ancient Mesopotamia appears to have been, in some respects at least, a very different process to that followed today. Looking for documents of the exact kind and purpose we use may prove to be a relatively futile pursuit. On the other hand, Mesopotamian practices were often adopted by other cultures, and some of these practices survive

³⁰ For example: 'A Mesopotamian surety could legally guarantee a debt by striking or slapping the forehead of the debtor' (Hibbitts, 1992: para. 2.56).

³¹ As in the offerings and ritual purifications pre-construction, and the post-construction curses, described in the Gudea inscription for the temple of Ningursu (Lambert & Tournay, 1951).

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down to the present, notably the sexagesimal system.

What needed to be said

With a very limited palette of construction materials, small-scale Mesopotamian construction didn't need much documentation. It was very conservative (indeed it is thought that people in the region still build as they did in ancient times). In vernacular traditions, documentation is often non-existent. The expert designer-builder has the plan and details in his head. The need for documentation would also have been reduced by re-use of existing floor plans, use of simple ratios for rooms, reliance on the builder (e.g. for structural design), custom, standards and, most interestingly, by reliance on performance contracting rather than documentary contracting. This suggests that where project-specific documents were prepared, it was because the design stretched these 'avoidance' techniques to the limit.

What could be said

A good reason for avoiding project-specific documentation was that the information technology (IT) of the day was very limiting. The most important example is the very small size of the clay tablets and the crudity of the scribing technology. Heisel (1993; 51) remarks that, in spite of the IT limitations, the drawings are remarkably fine. That is, they wanted to convey more information but could not. As another example, use of written documentation presupposes a literate audience. Folk on site were generally not literate. On international sites this problem was exacerbated – hence the use of fitter's marks, model bricks, and 'avoidance' techniques. Reproduction and portability of clay documents, and use of cuneiform, were other IT constraints faced by Mesopotamians. In short, IT

constrained Mesopotamian documentation and design, forcing a conservative architectural response. This linkage is fundamental to architectural creativity.³²

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³² See Gelder (1996) for more on this.

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