

Tughluqabad, third interim report: gates, silos, waterworks and other features

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An early fourteenth-century capital of the Delhi sultanate, Tughluqabad, built between 1321 and 1324, is not only a significant historical site of Delhi, but also a prototype for the planning of many towns built later in India. Laid out on a Perso-Islamic plan, Tughluqabad has three fortified areas: the citadel (*arg*), situated to the south; the fort (*qal'a*), about six times the size of the citadel, to its west; and the town itself (*shahristān*), spread towards the north and the east of the fort and the citadel. The ruins of Tughluqabad represent the extent of the architectural design and the engineering skills of its time, and the well-preserved town walls, the street layout and other urban features provide us with the earliest existing example of Indo-Muslim urban planning and its architectural components (fig. 1).

The programme to survey the remains of Tughluqabad¹ began in 1986, and was followed by two further seasons in 1990 and 1992, the report of which² was published in 1994 dealing with the remains of the palaces, the royal square and other buildings in the citadel and the fort as well as the Jāmi' mosque and the remains of a house in the town. The report of two further seasons, of 1994 and 1996, was published in 1999 and recorded some of the other key features in the fort, including the main market street and a *madrasa* in the town, and the series of windowless chambers, known as the Dungeons, built inside the platform of the palaces in the citadel, and also a sophisticated escape route from the citadel to the outside through the fortification walls.³

The 1999 report also included a study of the only well-preserved gate, known as the Andherī Gate (the Dark Gate), but the survey of other gates was left for a subsequent season. In the spring of 1999 the sixth season of fieldwork was carried out, during which the remains of two of the gates in the fort and some of those in the town were recorded, as well as the silo structures which are attached to some of the gates. In addition the residential areas of the north of the town were further investigated and the foundations of a complex which appeared to be a sizeable mansion were surveyed. In the fort the remains of a reservoir, apparently the main water supply, were also recorded. One of the prominent features in Tughluqabad is the lake created to the south of the town as part of the original design concept, not only to provide water but also to create a micro-climate with increased humidity which would have moderated the temperature during the dry season. The water of the lake was controlled by a single sluice gate with a sophisticated design concept, but which was simple to operate. Although this feature had been surveyed in the past a fresh survey was carried out to provide more detailed

¹ The programme has been supported by the British Academy and the Society for South Asian Studies.

² Mehrdad Shokoohy and Natalie H. Shokoohy, 'Tughluqabad, the earliest surviving town of the Delhi Sultanate', *Bulletin of the School of Oriental and African Studies (BSOAS)*, LVII/3, 1994, 516–550, pls. I–XVI.

³ Mehrdad Shokoohy and Natalie H. Shokoohy, 'The Dark Gate, the Dungeons, the Royal Escape Route and more: survey of Tughluqabad, second interim report', *BSOAS*, 62/3, 1999, 423–61, pls. I–XI. In addition a study of the urban morphology of Tughluqabad has been published as a separate paper, see Mehrdad Shokoohy and Natalie H. Shokoohy, 'Pragmatic city versus ideal city: Tughluqabad, Perso-Islamic planning and its effect on Indian towns', *Urban Design Studies*, v–vi, 1999–2000, 57–84.

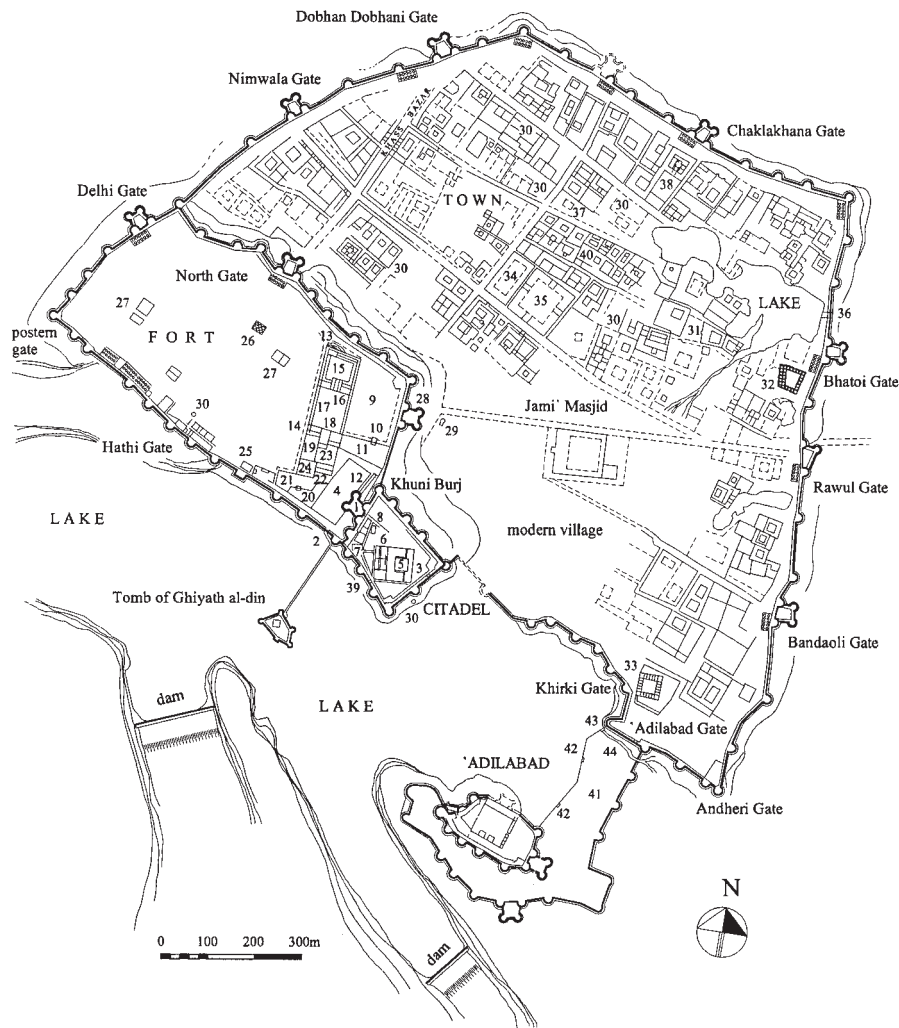


FIG. 1. Tughluqabad town plan:

Key:

1. Citadel gate; 2. Gate leading to the causeway of Ghiyāth al-dīn's tomb; 3. Postern gate; 4. Quarry made into a tank; 5. Stepped pyramidal platform with remains of the Jahān-namā pavilion above; 6. Basement chambers at both sides of a corridor; 7. Main reservoir of the citadel; 8. Small mosque; 9. Royal square; 10. Ruins of gateway with a standing arch; 11. Walled area; 12. Courtyard with standing arcade; 13–14. Streets; 15. Forecourt; 16. Gatehouse; 17. Court of public audience; 18. The audience *īwān*; 19. East court connecting the southern buildings to the audience *īwān*; 20. Street; 21. Court south of the palace complex; 22. Courtyard with two halls; 23. Larger hall; 24. Building with square court and a smaller hall; 25. Reservoir; 26. Hāthī Khund; 27. Pavilions in the open area of the fort; 28. Probable site of an urban square; 29–30. Wells and step-wells; 31–32. Two buildings, probably mosques, orientated towards the *qibla*; 33. Building, probably a *madrasa*, around a courtyard within a larger compound; 34–35. Probable sites of market squares; 36. Tunnel under wall; 37. Prayer ground, probably on the site of an old shrine; 38. House; 39. Royal escape route; 40. House; 41. Fields between the dam and the outer walls of 'Adilābād; 42. Steps on the dam descending to the water level; 43. Sluice gate; 44. Canal.

information, particularly with regard to the operation of the system. This feature and others noted above are presented in this report.

In 1999 the tomb of Ghiyāth al-dīn Tughluq and the citadel of 'Adilābād were also investigated. These two features lie outside the perimeter walls of

Tughluqabad and have been studied in some detail in the past.⁴ Although these monuments were not initially intended to be covered by our survey and are not discussed here, a monograph on Tughluqabad could not be considered complete without referring to them, and their inclusion in the final report is planned. It should, however, be noted that a fresh study of the tomb of Ghiyāth al-dīn was carried out together with a new set of drawings emphasizing details which had been omitted from or lightly discussed in earlier publications. The result of this work is in print as a separate paper elsewhere and need not be discussed here.⁵ In 'Ādilābād the palace was investigated but as time was short the full survey of the remains was left for a subsequent visit.⁶

The gates

Two of the better preserved gates of Tughluqabad are the North Gate of the fort, which opens to the western quarters of the town, and the Andherī Gate, the only gate which has preserved its roof. The present names of the gates do not seem to be original, and were perhaps given subsequently by local farmers and later squatters, when the original names had already been forgotten.⁷ Amongst the main gates of Tughluqabad the North Gate is particularly interesting, as not only was it one of the grandest but its design is based on a principle which has also been applied to most of the other gates. During the 1999 fieldwork the North Gate and the Hāthī Gate were surveyed and sketch plans were made of some of the others, where their ruins were still sufficiently extant. These include the Bandāolī and Rawul gates as well as the gate to the citadel. Other gates are no more than heaps of rubble, and without excavation it would be difficult to provide accurate sketches of their plans.

The Andherī Gate has many features similar to the other gates and its preservation in an almost intact condition helps our understanding of the form and construction of the other gates. While it has been discussed in detail in our second interim report, a brief account here may be helpful for understanding the configuration of the plans of other gates. The Andherī Gate, situated at the south-east corner of the town (fig. 2), is entered on the town side through an arched portal facing west and a short vaulted corridor with its floor sloping

⁴ For the study of 'Ādilābād see Hilary Waddington, 'Ādilābād, a part of the fourth Delhi', *Ancient India*, 1, 1946, 60–76. The Tomb of Ghiyāth al-dīn is mentioned in numerous publications, but for the main studies see *Archaeological Survey of India Reports* (Cunningham Series) (*ASIR*), 1862–5 (Report for 1862–3), 213–14; A. Cunningham, 'Report of the proceedings of the Archaeological Surveyor to the Government of India for the season of 1862–63', *Journal of the Asiatic Society of Bengal*, xxxiii, 1865, Supplementary Number (addenda to the main number), lxxii–lxxiii; Maulvi Zafar Hasan (comp.) and J. A. Page *et al.* (ed.), *Monuments of Delhi, lasting splendour of the Great Mughals and others* (four volumes), Archaeological Survey of India, Northern Circle, 1920, reprinted Aryan Books International, New Delhi, 1997, 2–5; Friedrich Wetzel, *Islamische Grabbauten in Indien*, Ausgabe, 1918, reprinted Osnabrück, 1970, 24–32; Tatsuro Yamamoto, Matsuo Ara and Tokifusa Tsukinowa, *Delhi, architectural remains of the sultanate period*, Tokyo, ii, 1968, 34–56 and pls. 32–4 at the end of the book.

⁵ Mehrdad Shokoohy and Natalie H. Shokoohy, 'The tomb of Ghiyāth al-dīn at Tughluqabad: pisé architecture of Afghanistan translated into stone in Delhi'. In *Cairo to Kabul, Afghan and Islamic studies presented to Ralph Pinder-Wilson* (W. Ball and L. Harrow ed.), London, 2002, 207–21, figs 22.1–22.10.

⁶ The 1999 season was planned to be the concluding fieldwork of the present programme and the authors are now preparing the final report which will include a discussion on the palace of 'Ādilābād. It is hoped that the opportunity will arise to complete the survey of this palace by the time the final report is complete.

⁷ The names of the gates are recorded in Gordon Hearn, *The Seven Cities of Delhi, a description and history*, 2nd ed., revised, Calcutta and Simla, 1928, plan facing p. 36; and in Hasan and Page, *Monuments of Delhi, lasting splendour of the Great Mughals and others*, iv, 1. This source also gives an engraving of the exterior view of the Andherī Gate, which shows it to have been in a similar condition as it is today. However, the tower to the west of the gate was still intact at that time, but a large portion of the tower has now fallen.

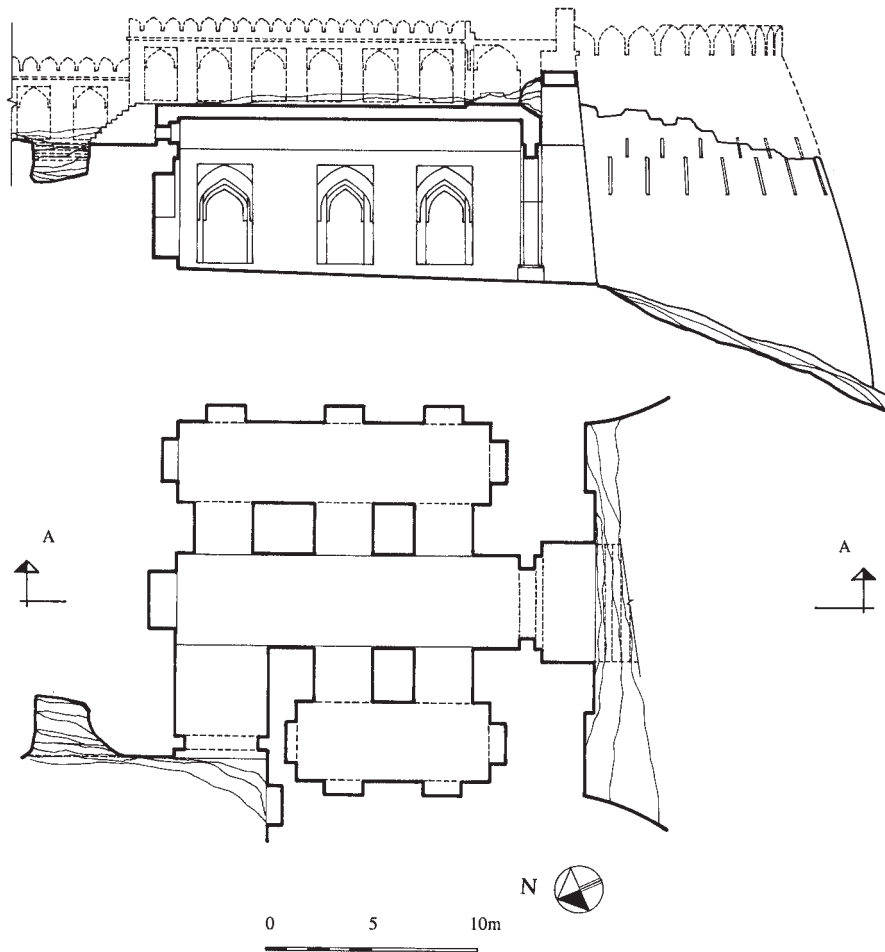


FIG. 2. The Andheri Gate in the south-west corner of the town, ground plan and longitudinal section A-A. Dotted lines in the section represent the upper part of the eastern tower, the galleries around the fortification walls and the roof of the gate, now partly in ruins. The reconstructed outlines are based on similar features existing in other parts of the fort.

down and leading to the main corridor at a right angle to it (pl. I). The main corridor has a pointed vault built of roughly dressed stone, and at its northern end is a large niche built into the walls corresponding with the opening to a grand portal at the south. The name 'Dark Gate' seems to have arisen from the dark and windowless galleries at either side of its corridor. The gallery at the eastern side runs along the whole length of the main corridor, but the western gallery is shorter, allowing for the space of the corridor of the inner gate. The two galleries are vaulted, in a similar way to the corridors, but their floors are level, and the difference between the floors of the galleries and the sloping floor of the corridor can be seen in our section. Side galleries are common features in most of the other gates of Tughluqabad, and in spite of their darkness they must have been designed to house the guards. While the galleries of most gates also seem to have been dark and windowless, occasionally they do have windows. An example is the Rawul Gate, described below,

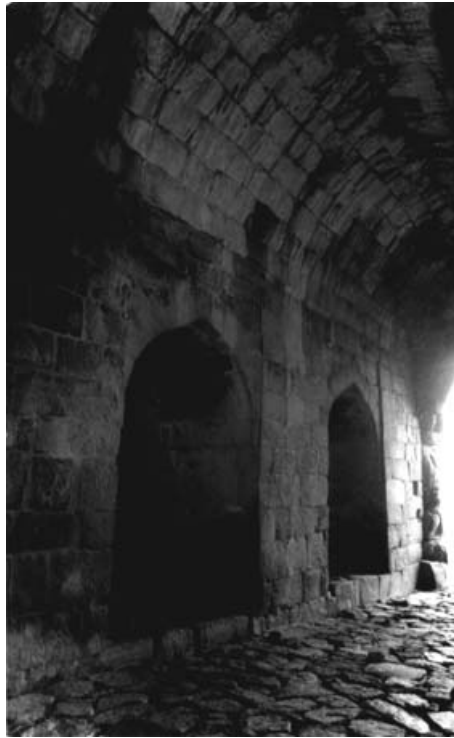


PLATE I. Tughluqabad town. Andherī Gate, interior of the corridor looking south and showing the sloping floor and the pointed vault of the corridor and the arched openings to the eastern gallery. To the right and by the east jamb of the entrance arch the block which holds the pivot of the gate can also be seen.

where several windows are set above the niches of the galleries, opening to the level of the arcade of the fortification walls.

The grand arch of the portal of the Andherī Gate (pl. II) encases a smaller arch which rises over two monolithic engaged columns, and opens to the main corridor. On the exterior the grand arch is flanked by two piers with two rows of loopholes, and behind the loopholes, at roof level, there was originally a vaulted arcade. This is the only gate in which the ruins of the upper vaulted gallery can still be seen on the roof. This arcade sheltering the loopholes is at a considerably higher level than those of the fortification walls and their towers. While the Andherī Gate shares many similar features with the other gates it is smaller and its plan is slightly simpler than the others, most of which have a dog-leg corridor. Outside the outer portal of most of the other gates there is also usually a square or trapezoid outer fortified courtyard with a series of chambers around. Such a court is missing in two of the main gates: the Andherī Gate and the Hāthī Gate, as well as in the smaller postern gates and the ‘Ādilābād Gate. However, the ‘Ādilābād Gate seems to be a later addition built on a totally different layout at the time of Muḥammad b. Tughluq to provide access to a causeway which linked Tughluqabad to his newly constructed ‘Ādilābād citadel. The reason for the omission of an outer courtyard in the Andherī and the Hāthī Gates may be the steep ground in front. It is also likely that such courtyards could have been intended for these gates, but the work was not carried out. From outside the walls, access to the Andherī



PLATE II. Andheri Gate, view from the south-west looking at the grand portal encasing a smaller arch and the south-east corner tower of the town on the right. The stones of the gatehouse are not keyed in to the tower indicating that the gate would have been constructed after the completion of the tower.

Gate was provided by a broad stepped ramp, suitable for elephants to climb, descending to the level of the fields below.

The North Gate

The most impressive gates of Tughluqabad seem to have been the two gates of the fort opening to the town. These were more than defensible access points to the fort, as they also had the symbolic role of being the thresholds (*dargāh*) of the royal palaces. Their grandiose appearance is, therefore, not surprising. However, the East Gate has long been in ruins, as its stones seem to have been systematically pilfered and used in the construction of the houses in the old settlement in the town. In general form and in scale, the East Gate appears to have been comparable to the North Gate. This gate, although itself in ruins too, has maintained its original layout and many of the architectural features which are shared with most of the other gates.

Alongside of the north wall of the fort runs a substantial moat, but the area immediately surrounding the gate has not been excavated (pl. III) and the gate is approached from the town via a stepped ramp at the eastern side of a trapezoid outer courtyard, about 15.50 m. at each side, except the south which measures about 23 m. (pl. IV). The courtyard is heavily fortified with two bastions in front and the walls at either side are set against two massive towers flanking the main entrance portal (figs. 3–5). It seems that there was no other access to the courtyard except that stepped ramp, the ruins of which ascend to a smaller portal opening to the court. The arrangement of the access to this court appears to follow the intended original design, and there was no plan to provide a bridge at this point. Such bridges are not common in front of the Indo-Muslim forts in India, particularly in those of the fourteenth and fifteenth century.

Inside the court there are remains of two small deep niches at either side



PLATE III. Tughluqabad Fort, the North Gate looking south from the town.



PLATE IV. North Gate, the west side of the outer trapezoid enclosure looking at the western and northern niches with the rampart of the western tower to the left.

of the entrance, and around the northern and western sides of the court are corresponding vaulted niches which are well preserved (figs. 3, 5). Each of these niches, 2.30 m. wide and 2.14 m. deep, has the usual arrow slits on the outer facing wall, but the two corner niches at the north give access to the chambers inside the bastions. These chambers are stilted semi-circles in plan, and seem to have been domed originally, although the roofs have not been preserved.

Outer courtyards—although not a common feature in the gates of the later

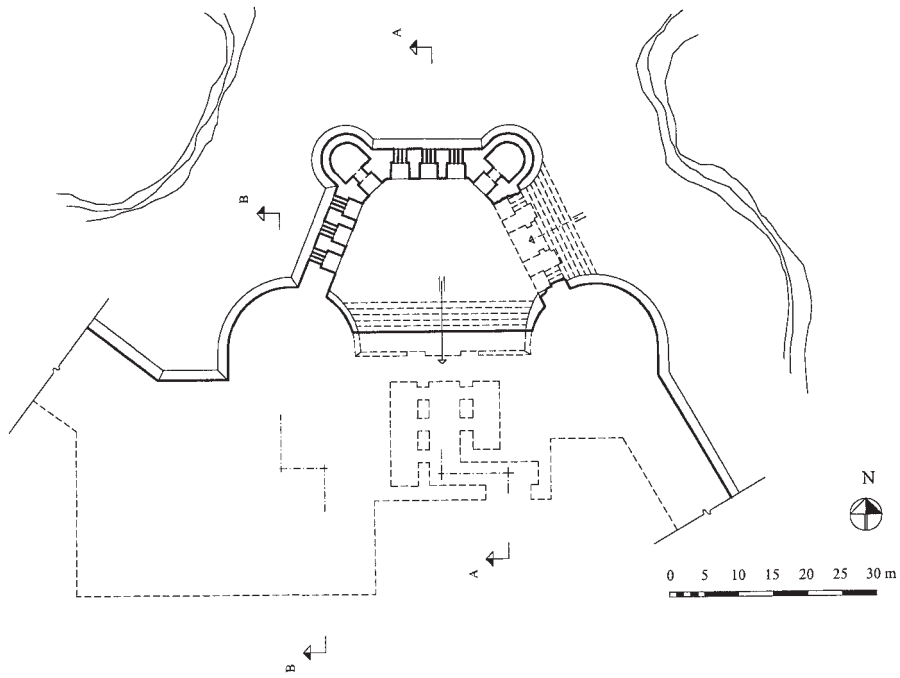


FIG. 3. Tughluqabad Fort, the North Gate, plan of Level 1 showing the outer courtyard.

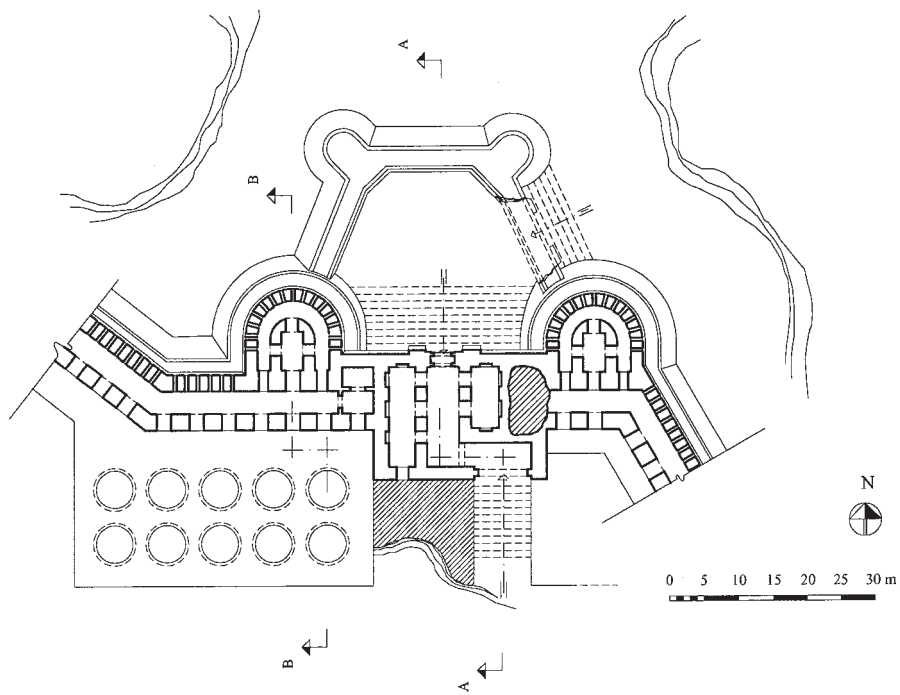


FIG. 4. The North Gate, plan of Level 2, showing the gatehouse, and its flanking towers, the fortification walls and the roof level of the silos.

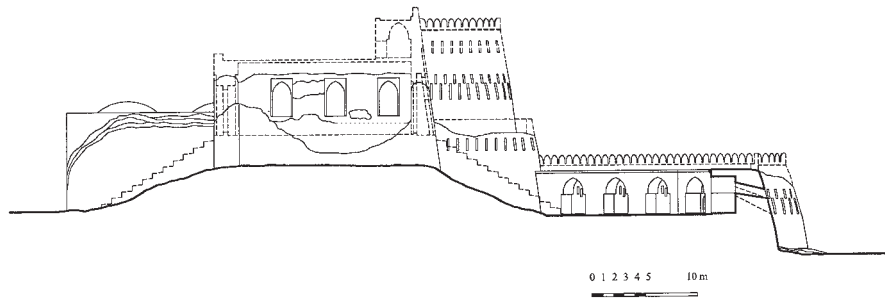


FIG. 5. The North Gate, section A–A through the outer courtyard and gatehouse.

forts—can occasionally be found, and an example in Delhi is the western gate of the seventeenth-century Red Fort. This courtyard has been substantially restored and many of its original features are altered, but its layout is original, and as with the gates of Tughluqabad the wall in front of the main gate is blank and the only entrance to the court is at one side: in this case at the north. An outer courtyard does not, however, seem to have been an innovation of Malik Ayāz. Qal‘a Rāi Pithūrā, the first Muslim capital (of pre-Islamic origin) at Delhi, is also known to have had at least two such features: one in front of the main gate of the citadel and another in front of one of the gates of what could be described as the upper town of post-Ghurid Delhi, both dating probably from the thirteenth century, if not earlier.⁸

At the south of the courtyard another stepped ramp ascends to the grand portal of the main gate-house (figs. 4 and 5). This portal no longer stands, but its ground plan is preserved, and its monolithic threshold is still *in situ*, while some of its other stones, including a lintel (pl. V), lie on the site. The portal stood originally nearly 5 m. above the level of the outer court and was designed to be seen from the town. The appearance of the portal seems to have been similar to the outer portal of the Andherī gate, as well as the eastern gate of ‘Ādilābād, which is also visible from outside standing above the outer fortifications.

The portal leads to a corridor about 12.50 m. long and flanked with galleries, similar in plan to those of the Andherī Gate. However, in the North Gate the galleries appear to have been well above the level of the corridor (pl. VI). The floor of the galleries and the corridor are both disturbed, and the stones have been pilfered, but in the Hāthī Gate, where the floors of the galleries are better preserved, they are also over a metre above the floor of the corridor. In the North Gate, however, it cannot be ruled out that the galleries may have been in two storeys. While the other gates of Tughluqabad all appear to be in a single storey, a probable upper level in the North Gate would not be surprising, as it was customary for the main gates of forts and palaces to have some structures above, the simplest of which were small colonnaded pavilions (*chatris*) or chambers. One of the functions of such upper structures was to house the musicians who at certain times played trumpets and drums to announce the hours of the day as well as to proclaim the entry of nobles called to an audience.⁹ In the North Gate the inner walls of the galleries are partly

⁸ *ASIR*, 1, 1862–5, 181–3, pl. 36; A. Cunningham, ‘Report of the proceedings of the Archaeological Surveyor to the Government of India for the season of 1862–63’, *Journal of the Asiatic Society of Bengal*, xxxiii, 1865, Supplementary Number (addenda to the main number), xlv.

⁹ Muhammad b. ‘Abd’ullāh called Ibn Baṭṭūṭa, *Tuḥfat al-nuẓẓār fī gharā’ib al-amṣār* known as *raḥla*, ed. Talal Harb, Beirut, 1987, 465.



PLATE V. North Gate, lintel with hole for the pivot of the outer gate lying loose on the site.



PLATE VI. North Gate, interior seen from the east, with the ruins of the gallery and niches of its western wall side. Although much of the stone has been pilfered, the floor line can still be seen on the wall and part of the original plasterwork is also preserved. In the foreground is the longer portion of the dog-legged corridor.

preserved. On the wall at the western side the floor line can be seen (fig. 5). There are three shallow arched niches on the western wall, as well as the traces of a niche at the northern wall and remains of a niche or an opening at the

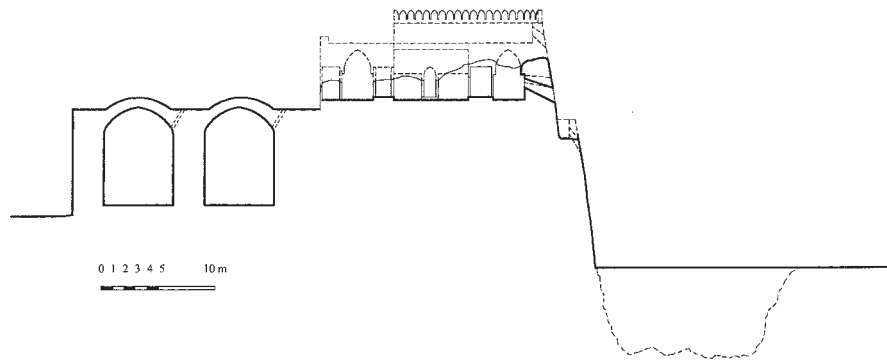


FIG. 6. The North Gate, section B–B through silos and western tower of gatehouse.

southern wall. On the southern side of the gallery there are the remains of some structures adjoining the silos (figs. 4 and 6), filling the space between the silos and the access to the inner portal of the gate. An opening at the south side of the western gallery would have brought light to the otherwise relatively dark interior of the gatehouse or perhaps could even provide access to the roof of the structure outside, which adjoins the roof of the silos. Subsequently this roof, which still preserves some of the surviving flat domes of the silo chambers, provided a terrace in front of the platform of the arcade which runs alongside the northern fortification wall.

Inside the gatehouse, the gallery at the eastern side is not well preserved, and the upper parts are lost while the lower parts are filled with debris. At the roof level the structure behind the gallery is also buried under rubble and the details are not clear. However, the outline of the gallery itself is fairly clear and it seems that behind the gallery at the roof level of the fortification arcades there were some chambers, probably connected to the arcade. As with the Andherī gate—and indeed any other gate in Tughluqabad which has preserved these features—the galleries flanking the central corridor are not of the same size. In the North Gate the eastern gallery is shorter than that on the west to provide room for the dog-legged end of the corridor. This space contains a set of steps and a long stepped ramp separated by a landing, and descending to the ground level of the Fort (pl. VII).

There are a number of features in the North Gate which need further consideration. The gate is set at an angle to the fortification walls, which differ in their direction at either side. Not only does the planning of the gate adjust itself to the discrepancy in the alignment of the walls, but it also allows it to be oriented to face the Khāṣṣ Bazaar, one of the main streets of the town. The two towers flanking the gate seem to be part of the design of the gate, as they are designed to soften the change in the angle between the two sides of the wall, and to match to the arcaded gallery which runs alongside the walls. At this level the gallery runs around the towers, and in each tower surrounds an inner rectangular chamber in its core. On the exterior of the Andherī Gate too it can be noticed that the construction of the gate and the walls has not been carried out at the same time, but in this gate—and many others—the towers are built together with the walls rather than with the gate. On the façade of the Andherī Gate, while the builders have made an effort to match up the lines of the stone work with those of the towers, the joints between the two are clear. In fact there has been no attempt to key in the facing stones of the



PLATE VII. North Gate, seen from the area of the Fort to the south of the gate, showing the path in the foreground which leads to the inner portal. At the left are the ruins of the structure adjoining the silos. The monumental scale of the gate with the galleries standing well above the level of the fort can be felt even in its ruined state.

towers to those of the gatehouse (pl. II)—a clear indication that the gate and the towers were built separately, and one after the completion of the other.

The North Gate seems to have been designed to express the majesty of the fort and its royal buildings, which would have remained inaccessible to most of the population of the town. To achieve such an impression a false sense of height between the ground levels of the town and the fort is produced by raising the floor level of the outer court and again the level of the main gatehouse. From the town, therefore, the gate is seen to stand well above the level of the town. In most cases in Tughluqabad and elsewhere the gates are at the same level as the ground inside. In the North Gate therefore it would be natural to feel that the level of the fort is significantly above that of the town. This is not, of course, the case, as at this point the ground of the fort is only a few metres above that of the town, and a stepped ramp had to be provided at the south corridor to bring the level back to that of the ground within the fort. These arrangements indicate that the concerns of the designers were not only with utilitarian military functions, or even engineering solutions to the discrepancies in the alignment of the walls and structural details. Much thought was evidently given to the creation of grandiose and imposing monumental features.

Hāthī Gate

Opposite the North Gate in the fort is the Hāthī Gate. An avenue which could have linked the two gates in a straight line would have divided the open fields in the fort almost in half, and would have passed by the side of a feature known as the Hāthī Khund (fig. 1, no. 26), described below. The Hāthī Gate differs from the North Gate in some details—the most striking difference is that it does not have the outer courtyard. From what is left on the exterior the gate seems to have been accessed by a stepped ramp leading to a grand



PLATE VIII. Hāthī Gate, remains of the exterior portal with flanking towers which are unusually close to the portal. Through the opening of the portal, part of the sloping corridor and the arched openings to the collapsed western gallery can also be seen.

outer portal (pl. VIII) which no longer stands, but its floor plan (fig. 7) and parts of the stones of the jamb have survived. It appears that, as usual, the outer portal consisted of an outer arch surrounding the inner arch, which supported the actual gates, the fittings for the pivots of which still survive (pl. IX). Judging from the standing remains it seems that the portal—and particularly its outer arch—was unusually tall (fig. 8), perhaps accounting for the traditional name Hāthī Gate (elephant gate), although all the main gates of the town and the fort seem to have been large enough for elephants to pass through. The portal opened via a number of steps to a corridor, about 16 m. long and 4.25 m. wide (pl. IX) with a dog-leg at the northern end turning west and leading to the inner portal. In this gate the floor of the corridor was, unusually, lower than the floors of the flanking galleries (fig. 8). These galleries seem to have been in a single storey, but were apparently taller than those of the Andherī Gate. The layout of the galleries, with the eastern one larger than the western, follows the general principle seen in the other gates.

The inner portal of the Hāthī Gate is somewhat unusual as it does not seem to have had a pronounced exterior standing on open ground, instead it opened to a street about 8.9 m. wide with buildings at either side. The street may not have been part of the original plan, but was created when a number of auxiliary buildings were added at the south side of the fort. The level of the street seems to have been higher than that of the inner portal of the gate, and at this point street level was apparently brought down by three steps to compensate for this. The layout of the street and function of the buildings is not clear, but from what is left it seems that opposite the inner portal of the gate there was another vaulted corridor about 10.50 m. long with arched openings at both ends. The arch at the northern end of this corridor would have been seen from the open fields in the fort standing in front of the probable avenue, which connected the Hāthī Gate to the North Gate.

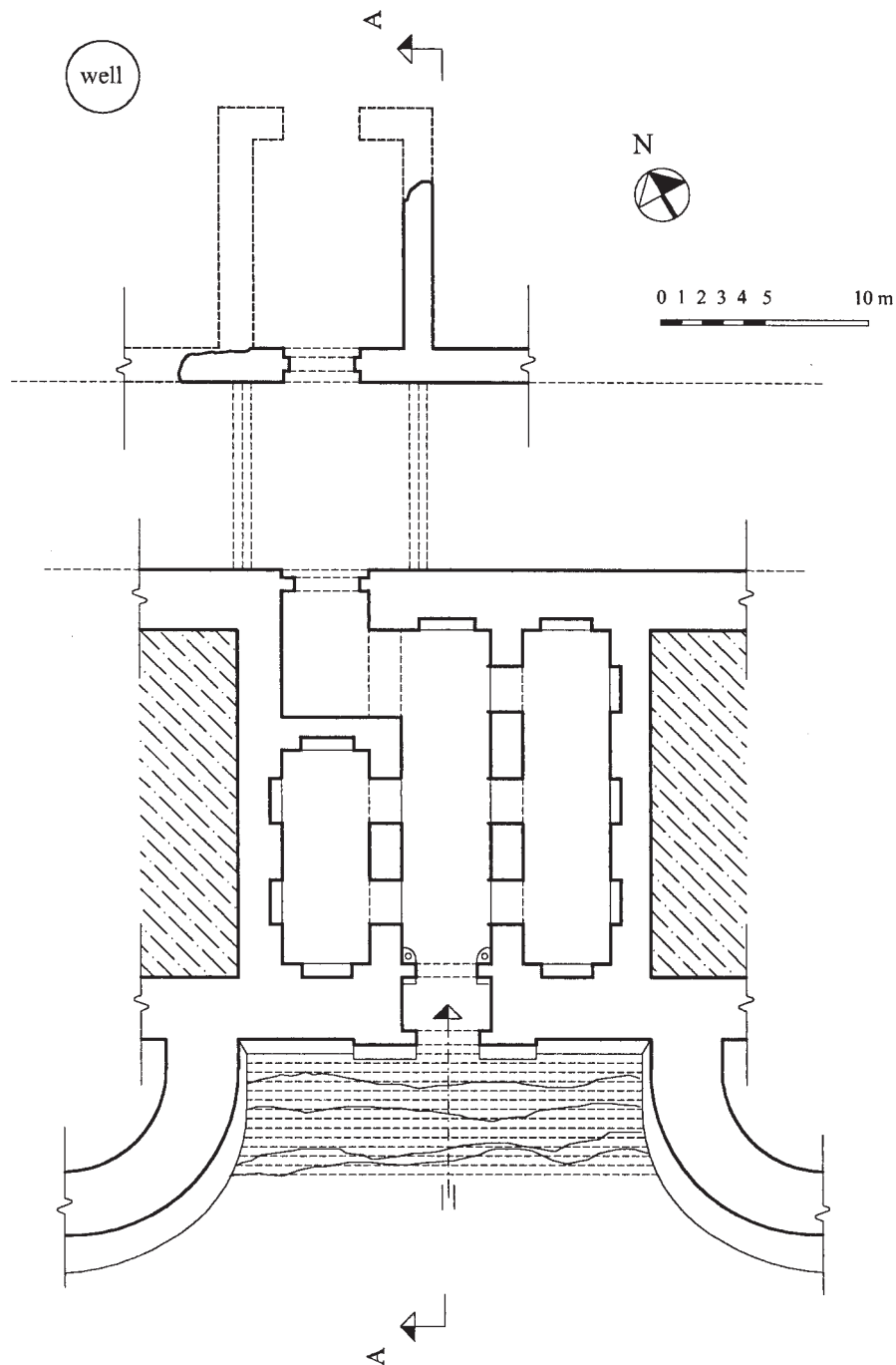


FIG. 7. Hāthī Gate, plan, showing the gatehouse, the street to its north and the well.

Khiṛkī Gate

Amongst the town gates of Tughluqabad this gate merits some attention, as it has a quite different layout from the others. This gate, located to the east



PLATE IX. Hāthī Gate, interior view of the corridor from the point of the dog-leg at the north-west looking south with the remains of the eastern gallery to the left. The openings to the galley are well above the original floor line of the corridor. The arch of the opening at the far end is preserved, but does not appear in this view. The jamb of the inner arch of the outer portal with its pivot stone can also be seen.

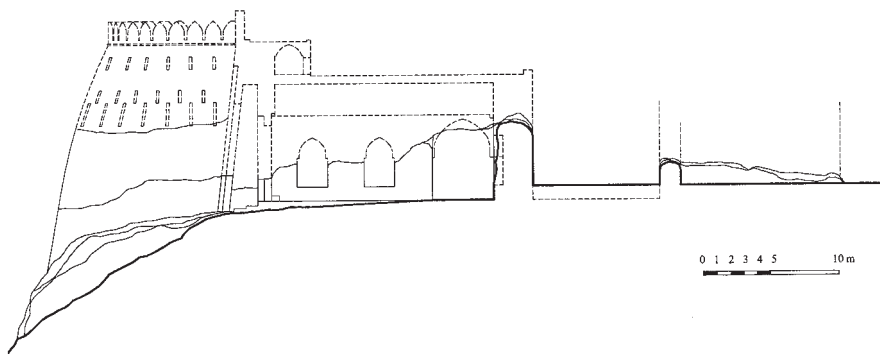


FIG. 8. Hāthī Gate, section A–A through the corridor of the gate.

of the citadel at the south of the town (pl. X) does not have the outer court, and from its arrangement it is clear that there was no intention to construct such a court for it. Instead the gate opens directly onto the lake with a set of stepped platforms (*ghats*)—traditional in India—leading down to the water level and giving the public access for fetching water, washing clothes, or bathing (pl. XI). Another interesting feature is the arch of the outer gate, still standing and close in form to that of the Andherī Gate.

Other gates

Apart from the gates at the south side of Tughluqabad—none of which have an outer courtyard—the other town gates are similar in design principles and



PLATE X. Tughluqabad Town. The southern wall of the town with the Khirkī Gate and the *ghāt* leading down to the lake.



PLATE XI. Khirkī Gate, from the steps of the *ghāt* looking east towards the south-eastern outflank of the town walls.

include an outer courtyard, but are on a slightly smaller scale than the North and East Gates of the fort. The modern urban developments of the last few decades at the west of Tughluqabad have had an adverse effect on the gates at the north and the west of the town. The most damaged are the Delhi, Nīmwālā and Dobhan Dobhanī Gates (pl. XII). Not only have many of their stones been pilfered, and houses built leaning against their ramparts, but their sites have also been disturbed by being continuously trampled on by the



PLATE XII. Ruins of the Dobhan Dobhanī Gate at the north-west of the town, looking south-west along the walls with the fort in the background to the left, and the suburb encroaching on the walls to the right.

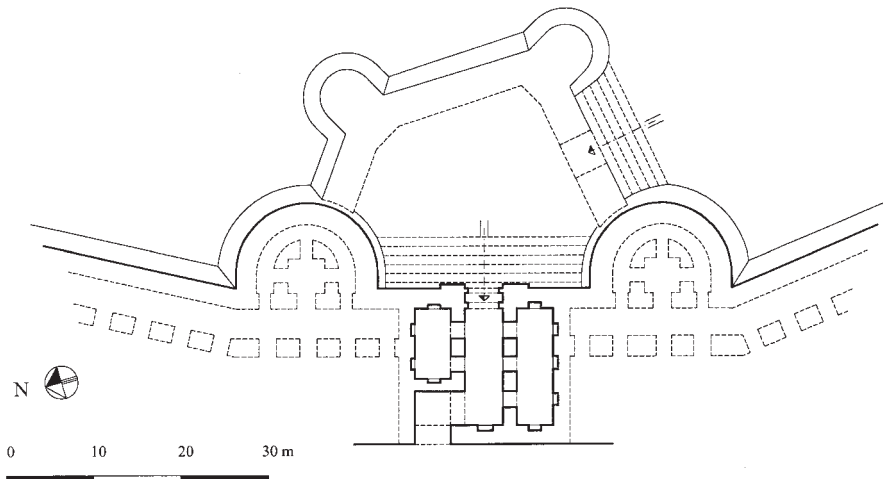


FIG. 9. Bandāolī Gate to the east of the town, sketch plan.

residents of the neighbourhood who use the area as a rubbish dump and open latrine. Those at the eastern side of the town are better preserved, and the general similarity, and individual variations in the design of Tughluqabad's gates can still be observed in these examples. The Bandāolī Gate (fig. 9), for example, has an asymmetrical trapezoid outer courtyard which was originally entered from the south. The gate-house itself consisted of a corridor with a dog-leg turning northward at the town side, flanked with the usual galleries, with that to the south larger than that to the north (pl. XIII). This gate seems to have remained in use throughout the life of the old settlement in the town and in recent years the path which passed through the ruins of the gate has been converted to a metalled road.



PLATE XIII. Bandāolī Gate, looking from the road outside at the east of the town to the outer court and the ruins of the portal.



PLATE XIV. Chaklakhāna Gate, at the north of the town. View from the outer courtyard looking south. On the right are the remains of the western tower with the arches of the corridor around its central chamber still standing, with some remains of the arcade of the outer courtyard at the lower level on the far right. At the centre stands the south wall of the western gallery of the gatehouse with the remains of the vault clearly preserved. On the left is part of the standing eastern tower.

An arrangement similar to the Bandāolī Gate can also be found in the Bhatōī Gate and the Chaklakhāna Gate (pl. XIV), but in the case of the Bhatōī Gate the outer courtyard was on a relatively symmetrical trapezoid layout. Although the configuration of the corridor and its galleries appears to



PLATE XV. Bhatoī Gate at the east of the town, view from the outer courtyard looking south-west towards the ruins of the gatehouse with the remains of the southern tower on the left and the walls of the southern gallery of the gatehouse on the right.

be similar to the other two gates, here the collapsed roof of the corridor and the galleries have blocked the passage, and unlike most other gates little attempt has been made by the local settlers to maintain a way through. Although at present a satisfactory survey of the Bhatoī Gate is not possible, it seems that many of the original features of the gate are preserved under the debris (pl. XV).

Rawul Gate

Between the Bandāolī and Bhatoī Gates stands the Rawul Gate (fig. 10), which differs considerably in detail from them. In this gate the outer court is triangular, with a single tower at the north-east, and was apparently entered from the north side. The gate-house itself is better preserved and it appears that the galleries flanking the corridor were taller than in some of the other town gates. On the walls are the usual arched niches but above them are openings at roof level, providing light and air. These galleries would not have been as dark as those of the Andherī Gate, indicating that the galleries of some of the other gates might also have had similar openings. In this gate the dog-leg of the corridor again turns towards the north, making the northern gallery smaller than that at the south, but an interesting feature is a second vaulted gallery to the north of the northern gallery (pl. XVI). This additional gallery opened only on the west side with a wide arch, but the function of the gallery is not known. The Rawul Gate was, of course, one of the main gates of the town as it opened to the street which passed the Jāmi' mosque and led to the East Gate of the fort. Extra chambers may, therefore, have been useful for the guards, but the true reason for the construction of this extra gallery may have been that the segment of the town wall north of the gate seems to have stopped shorter than planned and, as the extra gap was larger than could be filled in economically with masonry, the designers of the gate had to adjust their design by adding this gallery. If this is the case the gallery is one of the

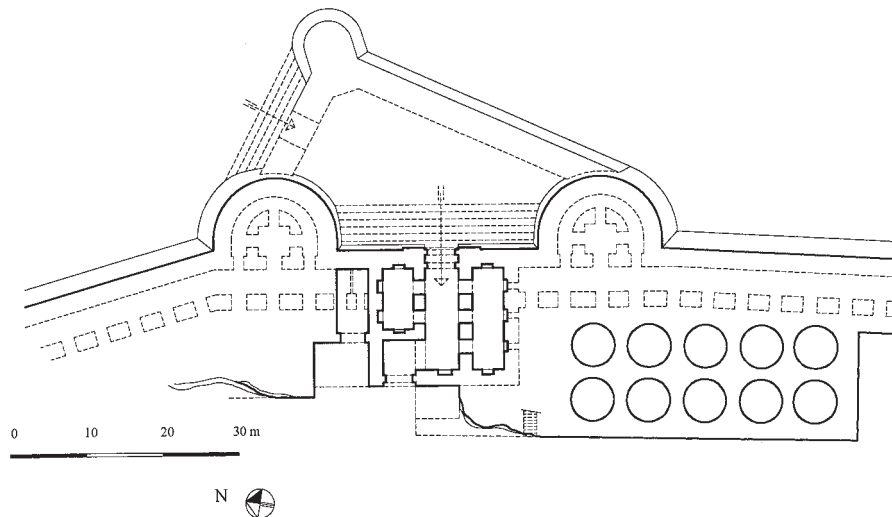


FIG. 10. The Rawul Gate, at the east of the town, sketch plan.



PLATE XVI. Rawul Gate, view from the town looking east, showing the entrance to the corridor and the remains of an additional gallery on the northern side with its upper level incorporated into the arcade of the fortification walls.

best indications that the gates were built after the completion of the walls as a general strategy for the construction of the town, already described.

‘Ādilābād Gate

Although apparently a later addition and different in layout from all the other gates of Tughluqabad, from many points of view this gate merits attention. The gate has retained the arch of its outer portal which, although it has a smaller span than the Andherī and Khiṛkī Gates, is similar in scale and



PLATE XVII. ‘Ādilābād Gate, interior of the single straight corridor from the north-west leading to the main portal, also showing a niche in the wall of the corridor to the left, instead of an opening to a gallery which is absent in the design of this gate. There is a corresponding niche on the opposite side.

proportion, indicating that the form and proportion of such arches were perhaps characteristic of all the other portals in Tughluqabad. However, in other details there is little similarity between this gate and the others. The portal opens to a short and straight vaulted corridor which does not have the usual dog-leg configuration; nor does it appear to have had flanking galleries. Instead there are simple arched niches at either sides of the corridor (pl. XVII). The inner portal opening to the town has not survived but its piers are preserved, and correspond with those of the outer portal, showing that the two arches had a similar span, but judging from other gates the height of the inner portal could have been lower than the outer one. The outer portal of the gate is not flanked by the usual towers, but due to the choice of its location there is only one tower at its east (pl. XVIII). There is no outer courtyard and the gate opens in a location set between the dam at the south side of the lake and the outer defensive walls of ‘Ādilābād. There is a relatively flat open space about 300 m. long and 100 to 150 m. wide stretching between this gate and the east gate of ‘Ādilābād. This area, protected by the defensive wall at the eastern side, looks over the expanse of the lake, and with easy access to water could have been made into a garden (figs. 1 and 14).

The silos

One of the striking features in Tughluqabad is the large number of silos built next to the walls, both in the town and in the fort. Ibn Baṭṭūṭa¹⁰ remarks that such silos provided grain for the people during the famine of Delhi. He notes that silos or storehouses (*anbār*) were common in the fortifications of the cities

¹⁰ Ibn Baṭṭūṭa, *Tuhfat al-nuẓẓar*, 437–9. He mentions in particular the grain silos of old Delhi (Qal‘a Rāi Pithūrā) which contained rice and other grains, but the town walls of old Delhi and the silos—presumably the prototypes of those in Tughluqabad—have not survived.



PLATE XVIII. 'Ādilābād Gate, view from the south showing the outer portal, the single tower to its east and ground between the gate and the lake, with the causeway to 'Ādilābād added later to the right. The stonework of the gate—a later addition—does not match that of the tower and the loopholes of the gate are arranged differently, and not at the same level as those of the tower.

of Delhi, and some still had edible grain from the time of Balban,¹¹ although it had turned black. However, no examples of such silos have survived elsewhere in Delhi and their structural form is not known, nor their numbers within a town. In Tughluqabad the large number of silos seems to have been part of the precautions taken by Ghiyāth al-dīn to prepare his capital not only for famine, which regularly struck north India, but also for withstanding a long siege in case of a possible Mongol invasion, of which he had had personal experience when commanding the Khaljī army prior to his enthronement, although such an invasion did not recur at later dates. The silos are massive but simple structures, and as an example one of the better-preserved silos associated with the North Gate of the fort was surveyed in some detail (figs. 4, 6).

The structure is built within the fort and attached to the west side of the gate in the form of a massive platform about 10 m. high, accommodating ten circular domed chambers which, as we have noted, would have been grain silos. The chambers are 6.50 m. wide and 9 m. deep, and set 1.5 m. apart from each other. The walls are solidly constructed with rubble-stone and mortar. The floors of the silos are about 1.50 m. above ground level, apparently to ensure a dry environment inside. The flat domes are fairly visible on the roof which, as we have noted, provides a large terrace accessible by a few steps to the arcade which runs around the fortification walls.

¹¹ At the time of Balban the capital was still Qal'a Rāi Pithūrā together with its extension towards the east. Most of the walls of this town and almost all of the walls of the Khaljī capital Sīri are now lost. In the remaining walls of Qal'a Rāi Pithūrā no structure similar to the silos of Tughluqabad can be found. The extensive structures of Tughluqabad may have been an innovation of Aḥmad b. Ayāz, and in the earlier forts simpler chambers within the bastions or underground pits might have been used as grain silos. For an example of a pit excavated near the Badaon Gate of Qal'a Rāi Pithūrā see *Annual Progress Report of the Superintendent, Muhammadan and British Monuments, Northern Circle*, 1912, 22, pl. 2; 1917, pl. 10b.



PLATE XIX. Interior of a silo to the north-west of the Hāthī Gate, now filled with debris almost to the springing of the dome. A chute for filling the silo can be seen in the centre, and a row of gaps in the stonework to hold the scaffolding at the time of construction of the dome have not been filled, indicating that a fine finish was not required on the interior.

There was originally no access to the silo chambers themselves, but to one side of each of the domed roofs there is a sloping chute by means of which the chambers could be filled gradually at harvest time, and a central hole at the top of each dome for monitoring the level of the grain. When a chamber was full the hole in the dome and the chute could be sealed, and there are a number of blocked chutes and domes still to be seen both in this silo and those associated with other gates, such as the Hāthī Gate (pl. XIX). The silos would, therefore, have been inaccessible and the grain protected against theft or misappropriation. As we have seen from Ibn Baṭṭūṭa's account it seems that the seal of the silos could only be broken by the order of the sultan at the time of famine or perhaps siege. Ibn Baṭṭūṭa's remark that when the silos were opened the grains were blackened but still edible may have been due to the lack of ventilation in the chambers.

The structure of the silo at North Gate seems to be based on a prototype design which was used with little alteration at most of the other gates, as we see at Rawul Gate (fig. 10) and the Bandāoli Gate (pl. XX). In addition to those at the gates a number of other silo structures in the fort and in the town could be identified, amongst them three set near each other—consisting of thirty silos altogether—at the southern wall of the fort, west of the Hāthī Gate, and one attached to each of the corner towers at the north of the town. In most of the silos not only are the measurements similar but also the number of chambers is the same. How far these silos were actually filled with grain during the reign of Ghiyāth al-dīn is not certain, but in no other fort in India have such features been found in such a great number. Inside the citadel of 'Adilābād and near its western gate there are again four square domed chambers which may also have been designed as silos, but these chambers



PLATE XX. Ten silos south of the Bandāoli Gate, looking north-west with the modern village in the background.

have not been excavated, and their form indicates that they may be a bath house.¹²

Further investigations in the fort

The eastern side of the fort is occupied by the public palace buildings which have been studied in some detail in our first report. To the south-west of the palaces and alongside the fortification walls the foundations of a number of buildings can be found stretching westward towards and beyond the Hāthī Gate. The original function of these structures is not certain, but they could have been a collection of utilitarian structures such as royal kitchens and accommodation for palace servants. Some seem to be later additions, and there are traces of haphazard additional walls which indicate that the sites have also been used by later occupants.

The reservoir, the well and the cultivated fields

A main feature in the area which is evidently of the Tughluq period is a deep stepped reservoir (25), with its retaining wall lined with dressed stone (fig. 11, pl. XXI). The reservoir is roughly rectangular, measuring about 18 × 20 m., comparable in size to a similar tank in the citadel (7). At the northern side the wall curves outwards slightly, and at the eastern side are the remains of the steps which gave access to the water. The reservoir is over 16 m. deep, and it is likely that the original depth was far greater at its deepest point at the northern side, now filled with debris. At this side the stone brackets for a wheel or pulley are still preserved in the form of massive superimposed stones extending over the water. This type of apparatus is usually for drawing large quantities of irrigation water, which is hauled up in big leather buckets by

¹² Hilary Waddington, ‘‘Ādilābād, a part of the fourth Delhi’’, 71 and fig. 5.

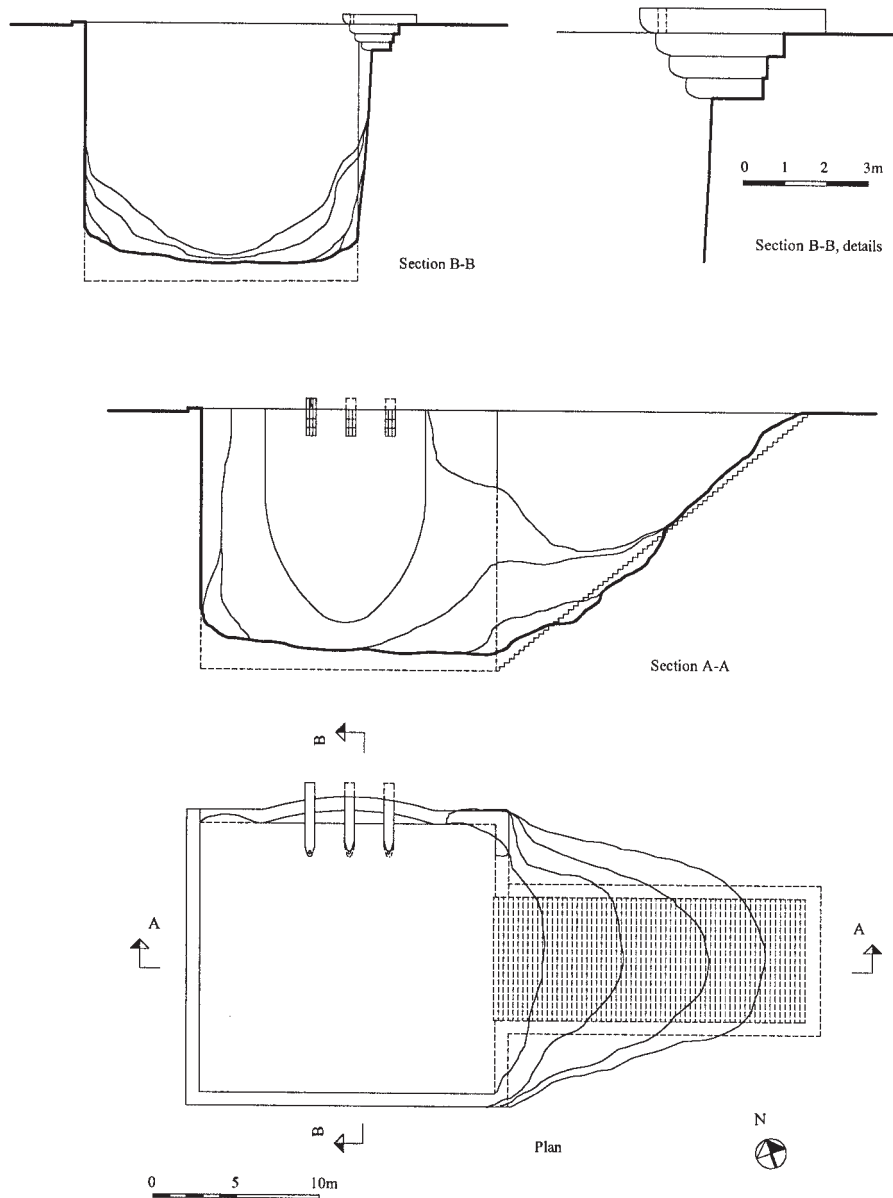


FIG. 11. Tughluqabad Fort. The reservoir, plan longitudinal Section A-A, transverse section B-B, and details of the stone device for drawing water.

bullocks or buffaloes and it is likely that this was a major source of water for the farmlands, while drinking water was provided elsewhere.

Near the reservoir and to the north of the Hāthī Gate is a very deep circular well (fig. 1 no. 30 and fig. 7), and this may have provided the drinking water (pl. XXII). The well is now dry and partly filled with debris, but it is not unlikely that it originally reached the water table at the level of the lake. It was the usual practice for builders constructing forts on rocky hillsides to excavate wells down to the water table to ensure a permanent supply of potable



PLATE XXI. Reservoir 25 in the fort from the south-west, with the corbelled stones extending over the water in the centre and the ruins of the lower end of the eastern steps at the far right.



PLATE XXII. Deep circular well north of the Hāthī Gate.

water. An elaborate version of such a well, with multi-storeyed underground halls, is in the citadel of Bust in Afghanistan,¹³ and another, probably dating from the time of Akbar, is still in use in the Red Fort of Delhi.¹⁴ Simple wells, such as that in Tughluqabad, are numerous.

Apart from the palaces and the structures near the southern wall of the fort, the rest of the area—which is over two-thirds of the total surface—seems to have been fields probably never intended to be occupied by buildings. This vast area of about 60 acres is likely to have accommodated gardens and orchards, as well as cultivated fields, providing a pleasant retreat for the sultan during peace time, and food for the palace in case of a long siege. Farm lands within the walls of Persian and Central Asian forts are mentioned in the histories, for example in the *Tārīkh-i Bukhārā* in association with the rise of Hāshim b. Hakīm known as Al-Muqanna' and his white clad followers against the Abbasid Caliph Al-Mahdi:¹⁵

On Mount Sām in the region of Kash there was a fort enormously strong, and inside it there were running water, trees and farmers (residing), as well as another fortification, even stronger than the former. He ordered to restore the fort and accumulated there untold wealth and plenty of provisions (*ni'mat*) and set up watches, and (his forces) arrayed in white (*sepīd jāmigān*) increased in number.

The inner fort seems to have been a citadel, and the self-sufficiency of the fort is claimed to be the reason for the survival of the movement, which eventually ended in 163/779–80 when in a dramatic episode the fort was captured and Al-Muqanna' took his own life to avoid being captured.¹⁶ He and his fort became part of the legends of the early Persian struggles against Arab dominance.¹⁷ Such cultivated areas are also common in the forts of India,¹⁸ two of the largest being that of the fort of Bidar¹⁹ which occupies a village and a semi-natural lake and that in Chanderi, where the unbuilt area of fort is larger than the town.²⁰

¹³ Warwick Ball, *Archaeological gazetteer of Afghanistan*, Paris, 1982, II, 427; Baba Murad Furughi, Tarmīm-i chāh-i Qal'a-yi Bust, *Bāstān Shināsī-yi Afghānistān*, IV, II, 1981, 136.

¹⁴ The Akbarī Mahal in Agra Fort, *Archaeological Survey of India Annual Report for 1907–08*, Calcutta, 1911, 10–12, pls. I–III.

¹⁵ Abū Bakr Muḥammad b. Ja'far al-Nirshakhī, *Tārīkh-i Bukhārā*, ed. Charles Schefer, Paris, 1892, 66; ed. Mudarres Raḍawī, Tehran, 1972, 93. Mount Sām at Kash was near Narshakh, the native town of the author of the *Tārīkh-i Bukhārā*.

¹⁶ *ibid.*, Paris, 72–3, Tehran, 101–2; Abī Ja'far Muḥammad b. Jarīr al-Ṭabarī, *Tārīkh al-rusul wa al-mulūk* known as *Tārīkh al-Ṭabarī*, ed. Muḥammad Abū'l-faḍl Ibrāhīm, Cairo, VIII, c. 1967, 135. Al-Ṭabarī gives the date of the establishment of the fort at Kash as 161/777–8, see *ibid.*, VIII, 144.

¹⁷ The history of al-Muqanna' was recorded in a book, the *Akhbār Muqanna'*, now lost. However, a part of this work has apparently been summarized in a manuscript of the *Tārīkh-i Bal'amī*, now in Vienna, (ms. no. 374), and has been published as an addenda in Abū 'Alī Muḥammad b. Muḥammad b. 'Abd'ullāh al-Bal'amī, *Tārīkh-nāma-yi Ṭabarī gardānīda-yi manšūb bi Bal'amī*, ed. Muḥammad Raushan, Tehran, 1989, III, 1594–98.

¹⁸ Apart from the existing examples the fort of Sīrī in Delhi also seems to have had such fields. Barnī records that when Ibn Khalīfa Amīr Ghiyāth al-dīn, a descendant of the Abbasid Caliphs, came to the court of Muḥammad b. Tughluq, the sultan gave him the palace of Sīrī (*kushk-i Sīrī*) together with the revenue from the cultivation within Sīrī's fortification walls. See Ḍiyā' al-dīn Barnī, *Tārīkh-i Firūz Shāhī*, Calcutta: Bibliotheca Indica, Asiatic Society of Bengal, 1862, 496. Ibn Battūṭa, *Tuhfat al-nuẓẓar*, 479, mentions that the whole revenue of all houses, gardens and farmlands within the town was also given to him, presumably referring to crown property rather than that of private citizens.

¹⁹ G. Yazdani, *Bidar, its history and monuments*, Oxford: Oxford University Press, 1947, map of the fort in front of the title page.

²⁰ *ASIR*, II, 1862–65, (Report for 1864–65) 405–12, pl. 3; see also R. Nath, *The art of Chanderi*, New Delhi, 1979, 26–27; K. V. Soundara Rajan, *Islam builds in India*, Delhi, 1983, 137–41.

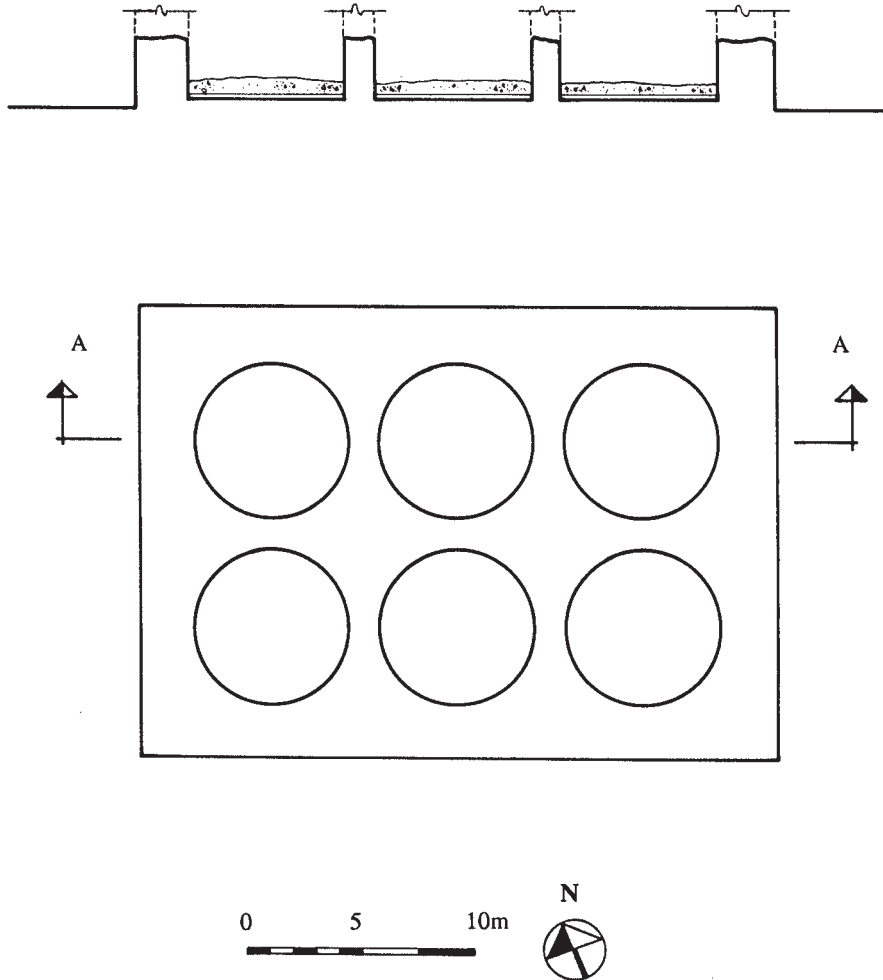


FIG. 12. Remains of six circular pits known as Hāthī Khund in the fort between the North Gate and the Hāthī Gate, plan and section.

Hāthī Khund

In the open area of the Tughluqabad fort there are the remains of two free-standing structures (27) which may have been garden pavilions, and another structure (26), which appears at present in the form of six circular pits within a massive platform (fig. 12, pl. XXIII). The feature is referred to by the local people as Hāthī Khund (elephant pools), presumably a reference to the possible function of the pits. However, it is unusual to build such pools and make them water-tight only to use them for washing and watering elephants or buffaloes, which would have to climb the platform to get in. It would, of course, be more convenient to dig such pools in the ground—preferably in a natural depression—and more practical to drive animals into them. The function of these pools could not be established, nor could the date of construction be determined, as it is not entirely unlikely that the pits date from the time of later occupiers. The diameter of the pits is comparable to that of the silos, but other surviving silos are all attached to the fortification walls, and to build a free-



PLATE XXIII. Remains of six circular pits known as Hāthī Khund in the fort between the North Gate and the Hāthī Gate.

standing silo would seem to be a departure from the norm. Furthermore, there is not sufficient debris in the site to suggest that the feature had high walls and was roofed, although much of the stone of the structures in the fields has been reused as borders for cultivated plots. The true function of this feature will, therefore, remain uncertain, but it is not entirely unlikely that it had an industrial function, such as dyeing or tanning, which again could be associated with the secondary occupation of the fort, rather than being part of the original Tughluq features.

Residential complex in the town

The best preserved residential area is at the north of the town, where the foundations of many houses can be seen standing on platforms set about 70 cm. to 1.5 m. above street level. The remains of the platforms, built of stone and mortar with a rubble core, also mark the edge of the old streets. However, fieldwork in the area of the old town is a race against time. While the fort and the citadel are protected by the Archaeological Survey of India, the *shahristān* (the old town) itself seems never to have been registered as a protected area.²¹ In addition to the continuous growth of the already existing settlements on the south of the old town, during 1998 and 1999 two more settlements put down roots there: one at the south-east corner, between the site of the *madrassa* and the Andherī Gate, and another at the north of the town, over the site of the old houses east of Dobhan Dobhanī Gate and approaching Chaklakhāna Gate. These settlements started as shanties, but are mushrooming, and it would

²¹ Zafar Hasan and Page record that in 1920 the fort and citadel of Tughluqabad as well as ‘Ādilābād and the tomb of Ghiyāth al-dīn were government property, but the area of the town belonged to the residents of the village which had survived traditionally at the south-east of the old town in the area surrounding the ruins of the Jāmi’ mosque. Apart from newcomers occupying other parts of the old town, in the last two decades the village has also grown rapidly and now covers almost all of the south and central area of the old town. See Maulvi Zafar Hasan (comp.) and J. A. Page *et al.* (ed.), *Monuments of Delhi, lasting splendour of the great Mughals and others* (Archaeological Survey of India, Northern Circle, 1920, reprinted 1997), iv, 1–2, 5.

not be surprising if the makeshift houses were soon replaced with permanent ones—a common pattern for the outskirts of Indian cities. There is little doubt that in Tughluqabad if the present trend of unplanned development is not curtailed the historical sites of the town will soon be entirely buried under new buildings.

In the north of the town the foundations of one of the houses (38) near the Chaklakhāna Gate had already been surveyed and are presented in the 1994 report, but in 1999, in an area not yet occupied, the outline of another complex was identified and recorded. From the foundations alone it is difficult to recognize the function of individual buildings, but it seems that the east and south-east of the town were occupied by houses and the area in the north was clearly residential, built up with clusters of buildings.²² Earlier investigation had shown that as a whole the houses were planned around one or several central courtyards, and the plan of House 38 revealed that at the north and the south of its courtyard there were small *īwāns*, or open-fronted halls. That on the north opened to two large rooms, and that on the south to a small rear chamber connected to two side chambers. To the south of the house a large trapezoid area was found which also seemed to have been built up, perhaps as a second courtyard. However, the scanty surface remains of the foundations were not adequate for establishing the layout, nor to determine whether the cluster consisted of a single dwelling unit or two different houses. In the Middle East and in India grand houses with two or even three central courtyards are common. Where such buildings are single dwellings, one section—usually the larger courtyard—is the public area where the head of the household and other male members could entertain guests and conduct their public affairs, while the other sections include the private rooms occupied by women, children and servants. In Iran and northern India the public area is known as the *bīrūmī* or outer court and the private area as the *andarūnī* or inner court. This arrangement is not in concept much different from that of palace buildings with separate public and private quarters. It is, however, more appropriate to consider that the palaces followed the principle of domestic dwellings but on a much grander scale.

In the second cluster (40) surveyed in 1999 the foundations were better preserved and a complex planning configuration could be observed (fig. 13). The position of doors and openings were mostly preserved and others could be conjectured by comparison. Again it is possible to consider the cluster as two houses: a smaller one at the east and a larger one at the west, but as we have noted the layout fits well with that of traditional Middle Eastern dwellings²³ and it is perhaps more appropriate to consider the complex as a single residence, with what appears to be a series of courtyards (pl. XXIV). The eastern court (3) has a north-facing *īwān* (5), and in spite of its smaller size this is more likely to have been the public area of the house. The central courtyard (4), entered via a long corridor (1) and flanked by chambers at north and south, may have been more secluded, while the long courtyard to the west (2) would be for stables or kitchens and domestic offices. The open space to the south (6) may have had an ornamental pool (7).

²² Shokoohy and Shokoohy, *BSOAS*, LVII, 1994, 542, fig. 11.

²³ The *īwān* is an integral part of the Islamic houses of Iran and Central Asia and follows on from Sasanian house design, itself probably of even earlier origin. For a good example of the planning of Sasanian houses see Massoud Azarnush, *The Sasanian manor house at Hājīābād, Iran*, Florence, 1994, loose plans at the end of the book and particularly pp. 55–88 concerning the *īwān* and the reconstruction of the plan of the manor house by comparing it with other Sasanian and earlier residences.

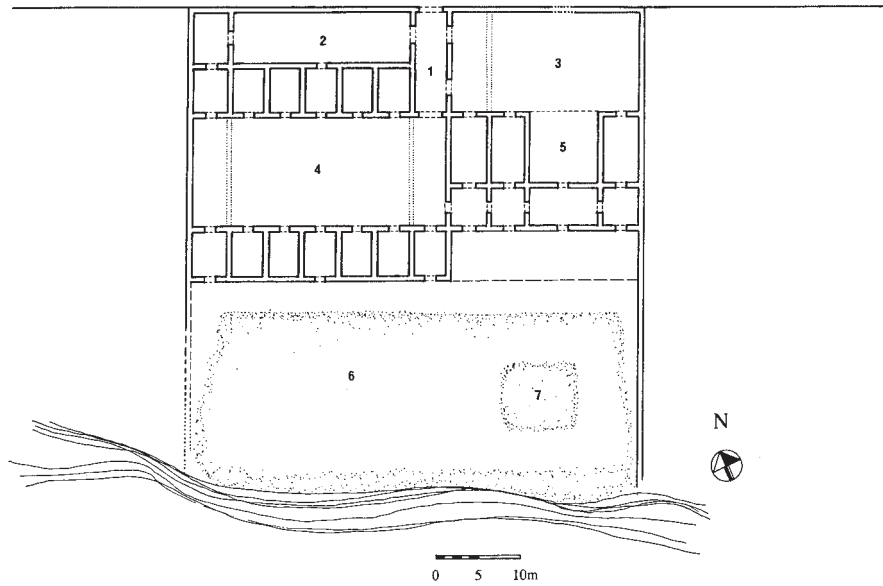


FIG. 13. House no. 40, sketch plan. The house appears to have had a semi-public courtyard with a shady north-facing *iwān* for receiving guests, and two more secluded courtyards with a series of chambers. *Key*: 1. Entrance corridor; 2. Western courtyard, probably stables; 3. Eastern courtyard; 4. Central courtyard. 5. *Iwān*; 6. Open area, probably garden; 7. Depression in ground, probably pool.



PLATE XXIV. House 40, view from the south-west with the foundations of the chambers of the western court on the left, and those of the eastern court to the right.

As no walls stand in either of the two clusters there is not sufficient information to establish whether the buildings were single or multi-storey. Remains of Tughluq palaces in Tughluqabad and elsewhere as well as other

surviving public buildings of the period show that they were built wholly or partly in more than one storey. While no domestic residences of the Tughluq period have survived anywhere, many multi-storey houses of later periods have survived, and it is reasonable to assume that at least some of the houses in Tughluqabad could also have had upper levels.

The two houses surveyed in 1992 and 1999 also indicate that while the general principles of house planning were the same, there was great variety in the detailed design. In general the Tughluqabad private dwellings appear to have included a semi-public space usually in the form of an *īwān* facing north and open to a courtyard. In a Middle Eastern house the *īwān* is usually for the family to gather in the afternoon, as well as for receiving guests. In the colder regions such as Central Asia, the *īwān* usually faced south to benefit from the sun, but in India a northern orientation would be more suitable for the hot climate.

In Bidar, a few fifteenth and sixteenth century religious centres known as *khānaqāh* which were the residences of important mystic leaders and gathering places for their followers have survived, all single-storey with north facing *īwāns*.²⁴ These were traditionally designed on the same lines as houses, to distinguish them from the orthodox religious institutions such as mosques and *madrasas*. In Tughluqabad, excavation would be likely to reveal more information on dwellings difficult to find in early sites elsewhere. The two surveyed clusters indicate that the layout of the houses also compares with that of the old private residences at Chanderi²⁵ in Madhya Pradesh, some 240 miles (386 km.) south of Agra. Chanderi was a fortified town built a generation or so after Tughluqabad, and mansions dating from as early as the sixteenth century are still in use, some as ancestral homes, and some divided into tenements. These multi-storeyed buildings around central courtyards, some with stables, give an impression of the scale of the noble houses of the time. Those at Tughluqabad, being the royal capital, could have been even grander.

The lake and the sluice gate

Creating a lake at the south of Tughluqabad must have been a challenge for Ghiyāth al-dīn's architect and engineer, Aḥmad b. Ayāz, who was in charge of the design and construction of Tughluqabad.²⁶ The site was not close to the River Jumnā and it was apparently impractical to bring the river water to the town by means of a canal. The lake was, therefore, dependent on local streams and monsoon floodwater, the level of which would decrease severely in the dry season, while the whole lake might even dry up in a long drought. This was possibly a reason for Fīrūz Shāh Tughluq choosing a very different site for Fīrūzābād—his own capital of Delhi—far away from Tughluqabad and from Muḥammad b. Tughluq's capital Jahānpanāh. Fīrūzābād was sited so that it was possible to excavate a canal and bring water to the edge of the palaces. It was this canal which was also used for transporting the well-known Ashokan column set up at Kotla Fīrūz Shāh, celebrated in the *Sīrat-i Fīrūz*

²⁴ Shown in G. Yazdani, *Bidar*, Oxford, 1947, archaeological map of Bidar town at the end of the book. See in particular the *khānaqāhs* of 'Alī Ḥusain Quṭb-i Thānī, Shāh Walī'ullāh al-Ḥusainī and Shāh Abu'l-Faid.

²⁵ The houses of Chanderi have not yet been studied. For an early description of Chanderi see Ibn Baṭṭūṭa, *Tuhfat al-nuẓẓar* 557; for an archaeological report on the town see *ASIR*, II, 1862–5 (Report for 1864–5), 400–13.

²⁶ Ibn Baṭṭūṭa, *Tuhfat al-nuẓẓar*, 432.



PLATE XXV. Tughluqabad lake, view of the southern end of the retaining wall of the dam between the Khiṛkī gate and 'Ādilābād seen from the lakeside showing the steps leading to the water and in the background the 'Ādilābād citadel.

Shāhī.²⁷ The canal was later incorporated into the design of Shāhjahānābād, and provided an expanse of water to the east of the Red Fort, where the site of the canal can still be seen, overlooked by the private pavilions in the fort.

In Tughluqabad, available water from the surrounding area was channelled into a depression at the south of the town where the water was regulated by means of several dams and a sluice gate controlling the outlet which flowed into a canal. The dams are constructed as simple earth-banks lined on the lake side with blocks of stone. The main stretch of the earthwork is over 200 m. long and runs between Tughluqabad and 'Ādilābād (pl. XXV). The area to the east of the dam is flattened and, as already noted, the outer fortified walls of 'Ādilābād are set about 100 m. to the east of the dam. In the wall several sets of steps give access to the water at intervals. These steps seem to be part of the original construction, but could also have been added at the time of the construction of 'Ādilābād, when the area to the east of the dam may have been intended to function as an internal urban space between the east gate of the new citadel and the town—a space similar to those in front of the main gate of other sultanate forts as already discussed.

Sluice gate

The construction of Tughluqabad follows well established methods of the time and were it not for a few exceptional buildings which display advanced engineering achievements, Tughluqabad would not have been much different from many other sultanate forts. However, a number of the Tughluqabad buildings are somewhat unique in India. The audience *īwān*, with its unusually wide

²⁷ The full text of the *Sīrat-i Fīrūz Shāhī* is not yet published, but a nineteenth-century manuscript with the space of the illustrations left blank is in the SOAS library, no. MS 283116, in particular ff. 179–207. For the text, illustrations and translation of the part relating to the column of Fīrūz Shāh, see J. A. Page, *A memoir of Kotla Fīrūz Shāh*, Memoirs of the Archaeological Survey of India, LII, 1937.



PLATE XXVI. Sluice gate near the ‘Ādilābād Gate seen in 1992 from the lake looking east towards the water outlets, before a modern retaining wall was built for the main road passing south (right) of the feature.

span discussed in our first report,²⁸ is one example. Although many later audience halls and other buildings followed the structural principles of the *tīwān* of Tughluqabad, none had the grand scale of their prototype. Another example was the escape route discussed in our second report:²⁹ a simple construction with a sophisticated design concept which restricted the movement of an attacking party which would have had to scramble backwards down the steps of a tunnel, while the escaping party—also going down backwards—would be facing any pursuers and in a better position to fend them off. Another example of an ingenious structure is the sluice gate, a relatively small building controlling the level of the lake water, not with complex machinery, but by simple devices which could be operated by a single unskilled person—an uncomplicated structure with a truly sophisticated design.

The sluice gate has been surveyed earlier by Professor Tatsuro Yamamoto and his team.³⁰ Nevertheless, a discussion of this feature seems essential, not only for the fresh information provided in our drawings but also because Yamamoto’s report is entirely in Japanese with no English summary. Also, at the time of the earlier survey the lower parts of the sluice gate were buried under debris. This debris was later removed together with two additional piers, which had been constructed at later dates presumably to reinforce the structure. Although fresh sediment has again obscured the lower sluices most parts of the original structure can now be seen (pl. XXVI) and are presented in our drawings. In addition we have been able to provide a detailed plan of the top level of the sluices as well as a perspective to demonstrate the method of operation.

In 1999 two retaining walls were constructed at the northern side of the sluice gate, to consolidate the nearby modern road, and channel away its flood

²⁸ *BSOAS*, LVII 1994, 533–5.

²⁹ *BSOAS*, 62/3, 1999, 443–9.

³⁰ Yamamoto, *Delhi*, III, 46–54 and pl. 49 at the end of the book.

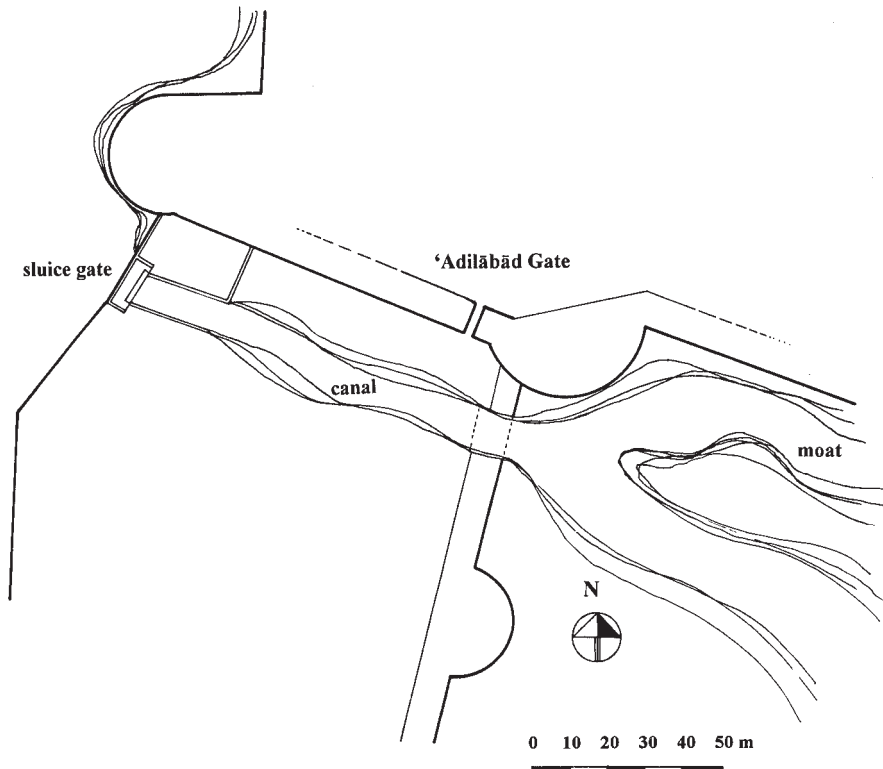


FIG. 14. The sluice gate and dam for the lake south of Tughluqabad. Site plan.

water. These walls now flank the sluice gate at the side of the lake, and although the sluice gate itself has not been damaged the effect of the original setting of the feature against the lake has been lost. Furthermore, the sediment of the floodwater, now channelled to pass through the sluices, will soon fill up the feature again.

The sluice gate is located to the south of the *Khirkī Gate* and near the north end of the dam between Tughluqabad and 'Adilābād (fig. 14). The structure opens to a canal with stone lined walls which runs between the dam and the outer fortification walls of 'Adilābād. Although the eastern end of the canal is not well preserved, it appears that it was divided into two branches, one taking the water to the irrigated fields and the other leading to the moat around the town wall. It is likely that the excess water of the lake filled this moat and also the lake at the north-east side of the town through the tunnel under the wall (no. 36).

The sluice gate itself (figs. 15–16) consists of three arches, each containing twelve small sluices set at four levels, three sluices at each level. The western side of the arches facing the lake is walled up with massive stones and the inlet of the sluices are small rectangular canals, the profiles of which appear as small apertures on the lake side. Inside the arches, the four levels of sluices are stacked in a step form with eight steps (figs. 17–18). The lower step of each set of sluices is for standing on and the upper one has the slots, each about 35 × 10 cm. wide and 75 cm. deep, to house the wooden shutters which controlled the flow of water. Access to each level of the steps is provided via

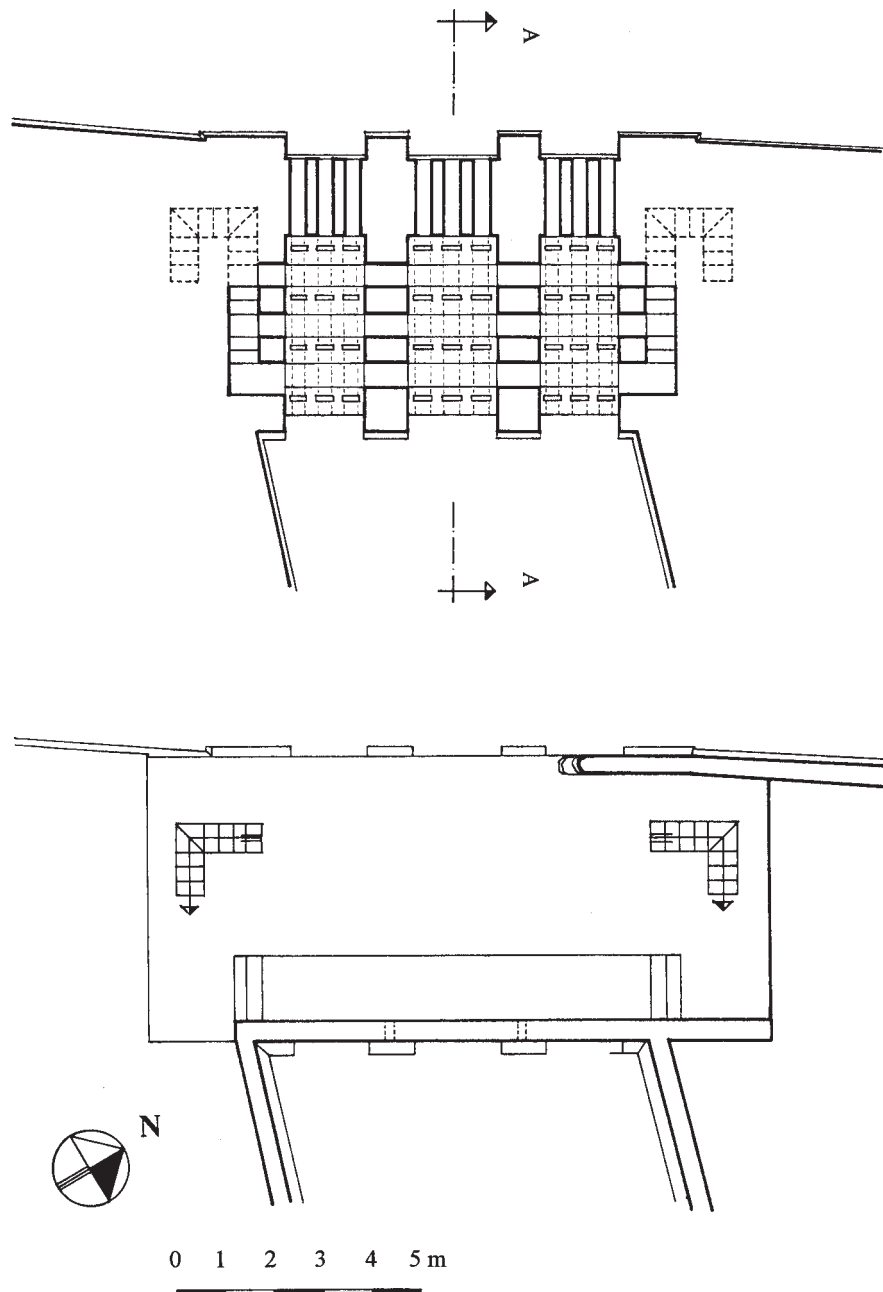


FIG. 15. Sluice gate, plan at roof level below and plan of the sluices (the line of plan level is shown in section A-A).

two sets of stairs built into the piers at either end of the structure, with openings in the inner piers connecting the arches to each other (fig. 15, pl. XXVII).

The operation of the sluice gate was therefore simple and could have been carried out by a single person, who could first go down to the lowest level to insert small shutters into the slots of the lowest nine canals. The water of the

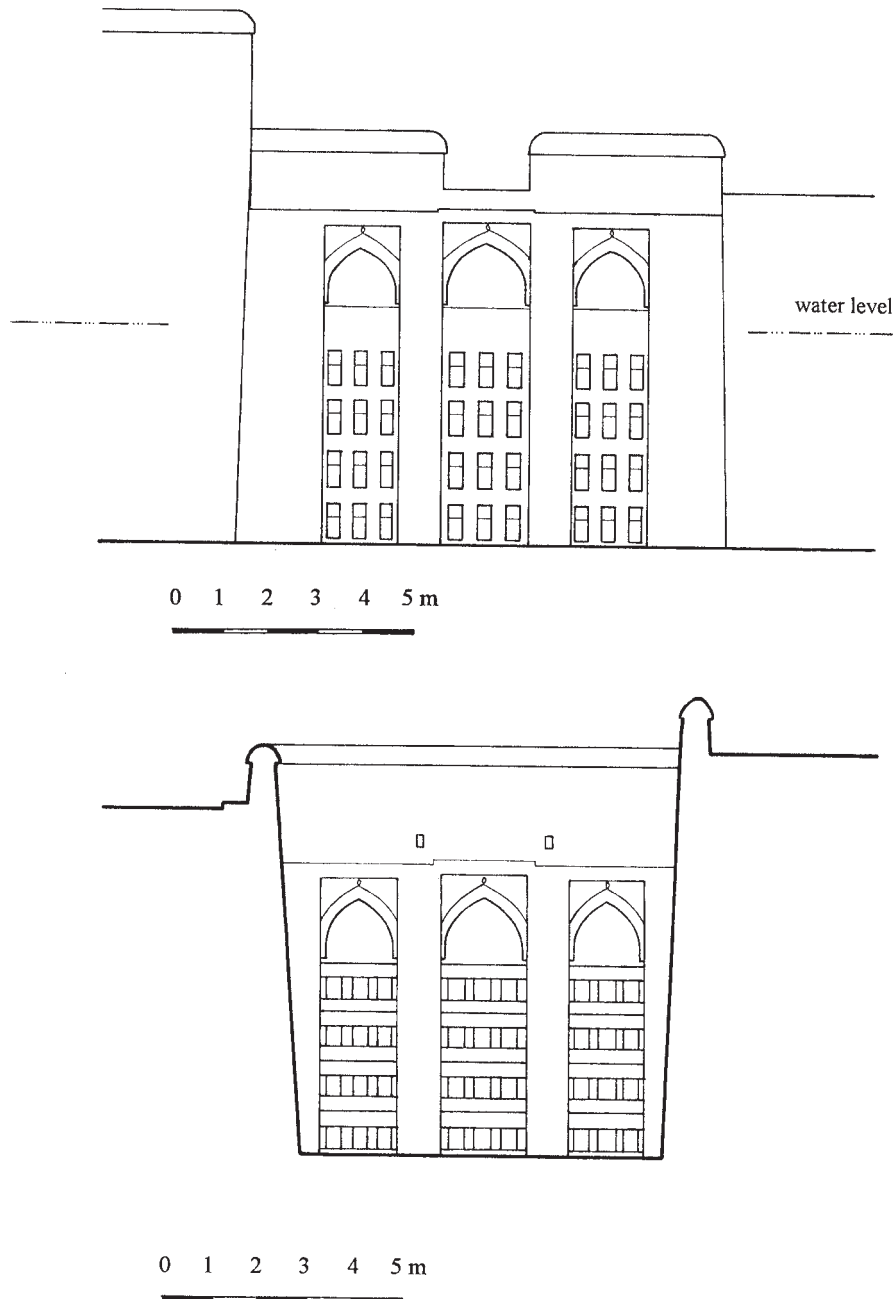


FIG. 16. Sluice gate, above: western elevation, lake side and below: eastern elevation, dam side, also showing the section of the canal encasing the arches.

lake would then rise up to the next level and the same process could be repeated at this level, and later at the upper levels when the water level had risen appropriately (fig. 18). In the case of heavy monsoon rainfall, again a single person could remove the shutters of the upper level and the excess water would gush

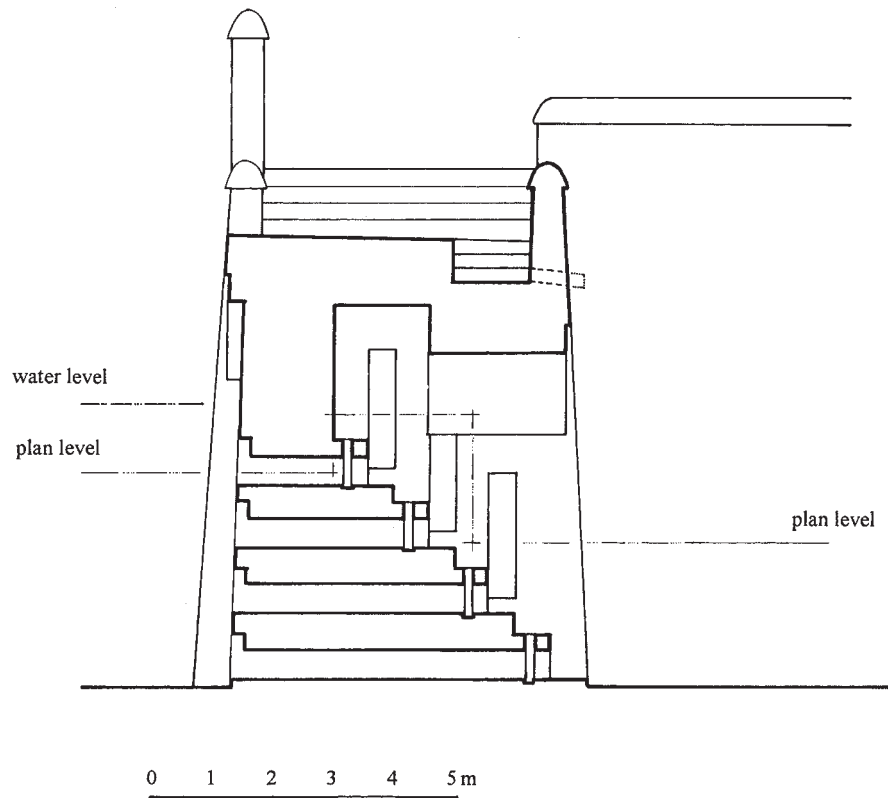


FIG. 17. Sluice gate, section A-A through the central arch showing the four levels of sluices and the highest water level.

through the sluices and flow as a small waterfall through the arches. The shutters would have been taller than the slots, with their upper ends standing above the level of the steps, and could have had holes, handles or metal rings to fit a lever which could be used when the shutters were being pulled out under pressure of the water. Dividing the water canals into a total of 36 small ones—rather than three large ones, one in each arch—eliminated the requirement for large sluice shutters which would have to be operated by chains and pulleys, powered perhaps by buffaloes or elephants when under full pressure of water.

The system seems to have been efficient to the extent that the upper parts of the structure could remain dry, as from the imposts up the arches were plastered, and most of the plaster has remained intact. The system seems to have remained in use long after Tughluqabad itself was abandoned. In the course of time the lake eventually filled with sediment up the maximum level of water—an inevitable fate for all efficient dams. The site of the lake is now used for cultivation. The design concept of this sluice gate, to retain and control the water of a relatively large lake by a very simple method and with minimum use of power, is a great engineering achievement of its time. So far no other earlier example of this type of structure has been seen, and if the design is yet another innovative idea of Aḥmad b. Ayāz, we must regard him as a truly remarkable engineer and architect.

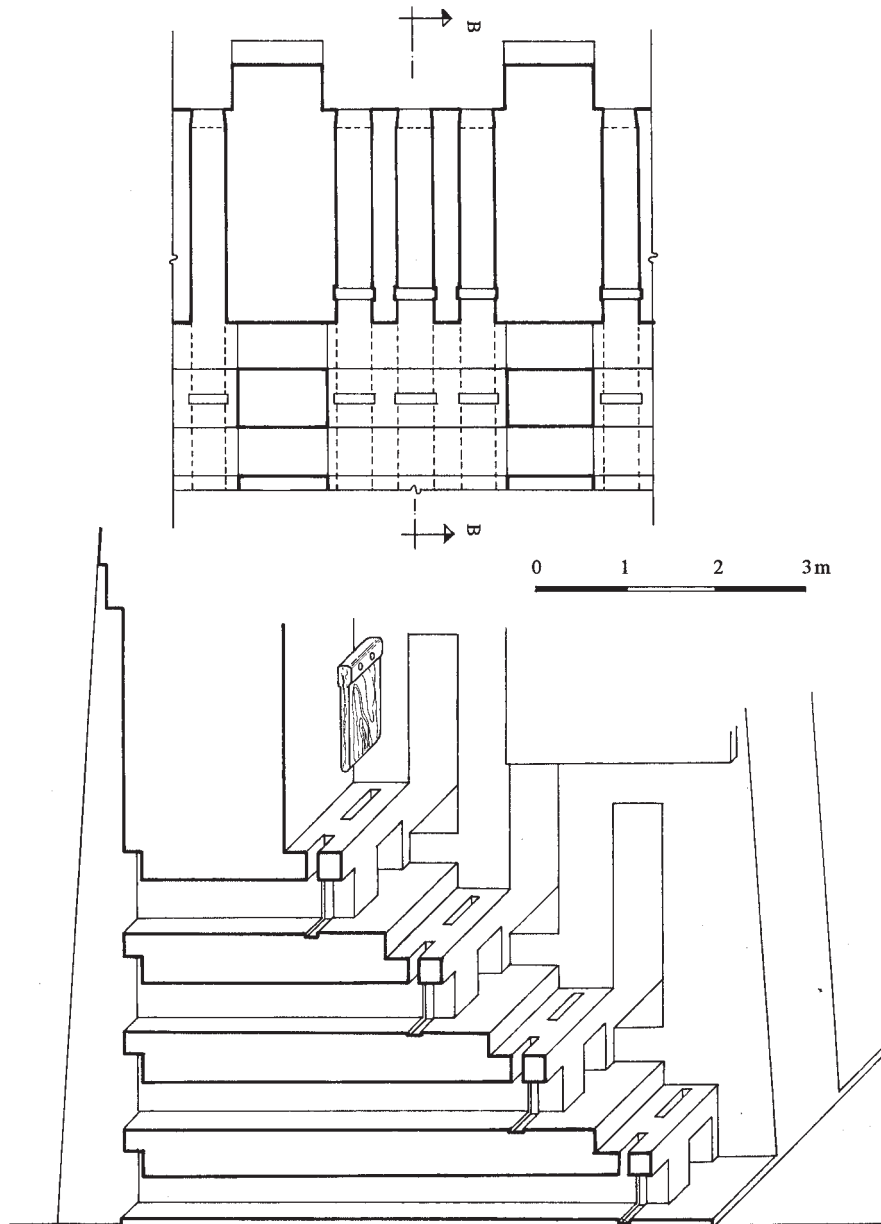


FIG. 18. Sluice gate, detailed plan of central portion showing one row of shutter slots, and section B-B and perspective of central arch, showing the operation of the sluices.

A reinvestigation of other sluice gates of Delhi

In the vicinity of Delhi there are two other major waterworks, Sāt Pul and Band-i Wazīrābād, both generally regarded to be later than that of Tughluqabad, but the dating of Sāt Pul³¹ (seven

³¹ For a detailed survey of the building see Yamamoto, *Delhi*, III, 57–68 and pl. 50 at the end of the book; also see Anthony Welch and Howard Crane, 'The Tughluqs: master builders of the Delhi sultanate', *Muqarnas*, I, 1983, 154–5.



PLATE XXVII. Sluice gate, view from the east showing the water channel and the arches of the outlet housing the sluices. Three levels of openings for controlling the water can be seen.

arches) is a substantial structure situated about 1.5 km. south of Sīrī and in fact consists of eleven arches of which the seven central arches are set at a lower level with sluices to control the water. Above the arches is another level, the arches of which house the mechanism of the sluices. These are designed on a more traditional principle, and each arch would have accommodated a large and heavy shutter about 3.00 m. high by 3.40 m. wide. To dam the water each shutter could be lowered by four ropes or chains into the slot provided within the arch below, with the ropes or chains operated by a wheel, the shaft of which was fitted into the piers of the arch above. The size of the opening and the shutters indicate that the water level of the reservoir could not exceed 5 m., of which 2 m. would have been un-drainable and below the level of the sluices, otherwise the water would have flowed over the arches and into the mechanism. This level is about the same as that of the lake of Tughluqabad, most of which could be drained. The wheels and the shutters have not survived, but their fittings have remained, showing that while Sāt Pul was indeed an achievement in engineering, its mechanism was heavy to operate and required high maintenance and a massive structure to support it. As a result Sāt Pul is a grand and impressive feature, and likely to have attracted many visitors from the cities of Delhi. It is also known that the flanking chambers later added at the upper part were used as a *madrassa*.

As far as the date of the structure is concerned, Sayyid Aḥmad Khān³² suggested that the building was constructed by Muḥammad b. Tughluq in 727/1326–27. This dating has been generally accepted and is referred to in most of the later works. The date is not improbable as the area was indeed in the vicinity of Muḥammad b. Tughluq's capital, Jahānpanāh. If this is the case it seems surprising that after the Tughluqabad experience the designers of Sāt Pul reverted to an older and more traditional design, particularly at

³² Sayyid Aḥmad Khān, *Āthār al-sanādīd*, second edition, Delhi, 1854, Chapter 3, 31–2. The feature is also mentioned to have been known as Sāt Pilla (seven steps), but this name is no longer in use.

the time when Aḥmad b. Ayāz was the grand vizier and enjoyed immense influence concerning architectural and engineering projects. We could perhaps presume that the design of the sluice gate in Tughluqabad was not entirely successful and in this later project, in spite of the relatively smaller reservoir, an older but more proven device was preferred. However, there are some indications that Sāt Pul may be older than suggested. The reservoir is known as the water of Sīrī (*āb-i sīrī*) and the location of Sāt Pul south of Sīrī indicates that it may have been associated with this town, and was probably built as part of ‘Alā al-dīn Khaljī’s project to provide water for his capital. In this case the earlier type of installation would be expected as the date of construction of Sāt Pul would be a generation or so earlier than that of Tughluqabad. As Jahānpanāh was adjacent to Sīrī, Muḥammad b. Tughluq could have maintained the structure, and even extended and improved it, a case that certainly applies to the next sultan, Fīrūz Shāh. According to Barnī:³³

The third beneficial construction³⁴ of Sultan Fīrūz Shāh in the capital city of Delhi is the upper building of the sluice gate of Sīrī (*‘imārat-i bālā band-i Sīrī*) which equals the firmament in height and in splendour of construction, and for purity of air is the envy of the buildings of the occupied quarter of the earth. None of the other sacred places look like it. What a building, which deserves to be called a palace, but would be better called a *khānaqāh*, and even more appropriately a *madrasa*. If in the capital city of Delhi any building could claim to be equal to the Madrasa of Fīrūz Shāh it would be this upper building of the sluice gate of the water of Sīrī, the pleasant breezes of which tell the tale of the air of the garden of Eden. From that wonderful building observers can see heavenly gardens and pastures in all directions. The splendours of that building are to the extent that the pen of all admirers would fail to describe its delights. By the benevolence of the king of Islam a great *madrasa* has been established there and the noblest of the *imāms* and learned men (*sayyid al-‘amma wa al-‘ulamā’*), Maulāna Najm al-milla wa al-dīn Samarqandī, who is of the rarest of the masters is now teaching in that blessed college.

Unless the historian is speaking of a much grander building which has not survived, his account appears somewhat high flown, as the additional upper structures are no more than two large rooms which appear as flanking towers of the sluice gate, with terraces at the northern side, connected to each other via a number of steps and the causeway over the lower arches of the sluice gate.

The other sluice gate, known as Band-i Wazīrābād,³⁵ is located to the north of Delhi, about 9 km. north of Kotla Fīrūz Shāh, the site of the palaces of Fīrūzābād. The sluice gate is part of a substantial waterworks which included a dam, bridge and canal all constructed by Fīrūz Shāh Tughluq and recorded by Shams Sirāj³⁶ to be only one of many dams and waterworks built by this sultan. Wazīrābād is a village associated with Makhdūm Shāh ‘Ālam whose mosque and tomb³⁷ are adjacent to the south-east of the waterworks. The sluice gate there is similar to that in Tughluqabad which was clearly a prototype for the design. However, the Wazīrābād sluice gate is slightly smaller and the three arches housing the sluices together measure 6.40 m. wide. As with

³³ Barnī, *Tārīkh-i Fīrūz Shāhī*, Calcutta, Bibliotheca Indica, Asiatic Society of Bengal, 1862, 565–6.

³⁴ The other two were the Jāmi‘ of Fīrūzābād and the *madrasa* of Fīrūz Shāh at Hauḍ-i Khāṣṣ.

³⁵ Survey in Yamamoto, *Delhi*, III, 68–76 and pl. 51 at the end of the book.

³⁶ Shams Sirāj ‘Afif, *Tārīkh-i Fīrūz Shāhī*, Calcutta, Bibliotheca Indica, Asiatic Society of Bengal, 1891, 330.

³⁷ Yamamoto, *Delhi*, I, 55–6, M. 18, 83, T. 89; III, 69.

Tughluqabad the central arch contains stacks of three small sluices in each register, which would again have been controlled by small shutters about 40 cm. wide and 85 cm. high. The side arches, however, are narrower and house stacks of two sluices. A main difference in the design is that there are only two registers of sluices—rather than four as provided at Tughluqabad—and above these registers are three registers of openings in the retaining wall for the free flow of excess water. As the water would never have reached above 2 m. there was no need to reinforce the retaining wall with solid piers between the arches, and the outlet space is made into a chamber which is accessible by steps from the side piers.

So far this sluice gate is the only surviving example of its kind dating from the time of Fīrūz Shāh, and we cannot be certain how far the innovations at Tughluqabad were taken further and perhaps improved on by Fīrūz Shāh, who was particularly keen on engineering schemes. The Wazīrābād sluice gate, on the other hand, does not represent any particular advancement in design. On the contrary, it seems to be a mere imitation, perhaps without the designer contemplating the full potential of Tughluqabad sluice gate—its original prototype.