

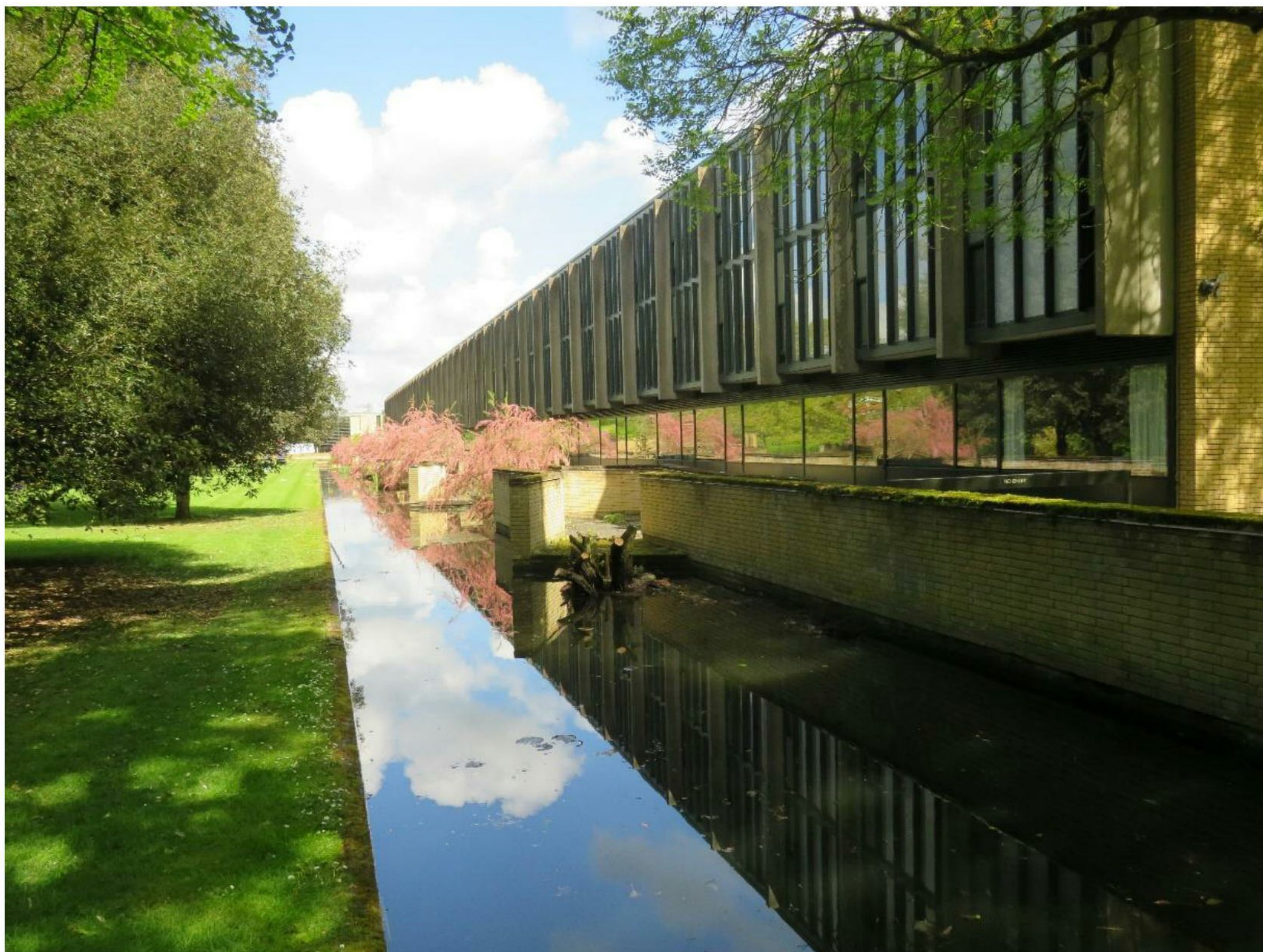
ST CATHERINE'S COLLEGE, OXFORD

REPAIRS TO THE GARDEN WALLS

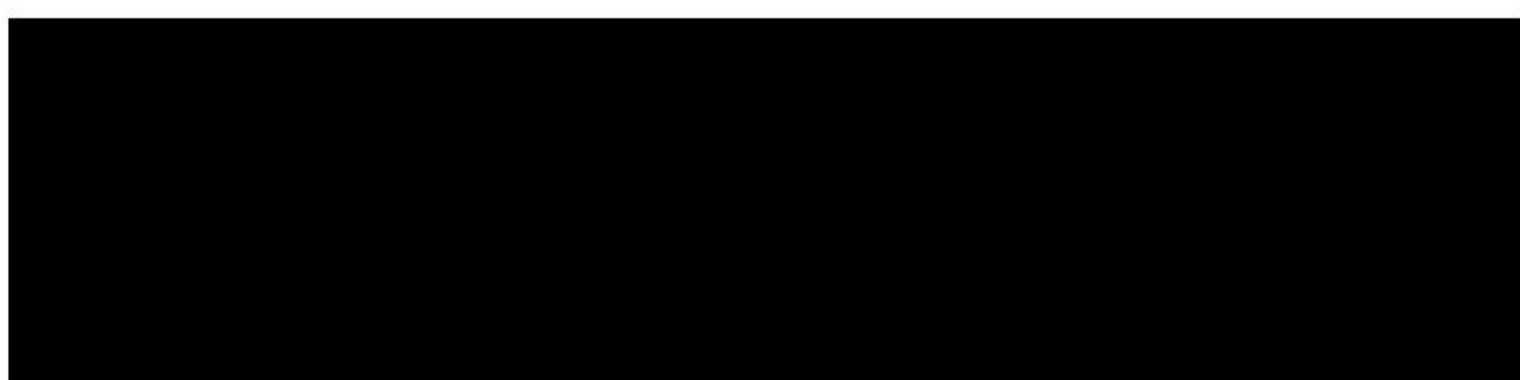
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Cover - The central pond looking north, with a garden wall along east side of the pond.

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1 The Garden Walls

The garden walls are an integral part of the buildings and gardens designed by Arne Jacobsen for St Catherine's College and built in the mid-1960's. The group are all listed at grade I and are covered by a single listing description. The listing describes the group of buildings as those on 'the podium', as they are all raised up by approximately 1 metre from the Merton College sports field to the east and the banks of the Holywell Mill Stream to the west. There are separate listings for the Master's Lodgings and the Music House, both also listed at grade I.

There are various walls throughout the gardens, intended for differing purposes. Along the east and west sides of the College site, there are long walls running north-south, which act as retaining walls to the lower areas adjacent and define the podium. Within the gardens, there is also a long wall running north-south along the length of the central pond, to the east side. There is also a long wall running north-south along the length of the lawn next to the pond and also incorporated into the Master's Lodgings and garden.

All of these four long walls running north-south are not of uniform design and were varied as required to suit their function. The eastern retaining wall is of medium height and has long continuous lengths at the north and south ends but in the centre, there are a series of short lengths, with steps down to the lower level of the sports field from the paved area along the eastern side of the residential block. For the wall along the east side of the central pond, there is a long continuous length of medium height at the northern end but then the central and southern end were designed as a series of short walls with steps down from the paved area along the side of the residential block, to lower paved areas with splayed walls close to the water. The wall to the west side of the lawn adjacent to the pond is a long continuous high wall for its northern half, to provide privacy to the Master's Lodgings garden and to hide the gardener's storage area. The southern half of the wall drops down to lawn level and becomes a retaining wall to the west side of the podium. Finally, there is a long wall of medium height along the western side of the podium towards the north-western end, acting as a retaining wall to the bank of the Holywell Mill Stream.

In addition to these long walls running north-south, there are various groups of walls within the central area of the podium, between the two residential blocks, the main administration building and hall and the southern end of the podium. All of these shorter walls are also orientated north-south but are in groups which have an east-west repetition and used as screens in conjunction with yew hedges of the same height. These groups of shorter walls have a specifically architectural function, whereas the longer north-south walls described above also have a privacy function or a structural function as retaining walls.

All of the garden walls are built of the same buff coloured narrow calcium-silicate bricks as all of the podium buildings, laid in a raking stretcher bond with recessed mortar joints. The walls all have pre-cast concrete coping stones, with drip detail made of zinc sheet under the copings. There are bitumen-felt damp-proof courses at low level.

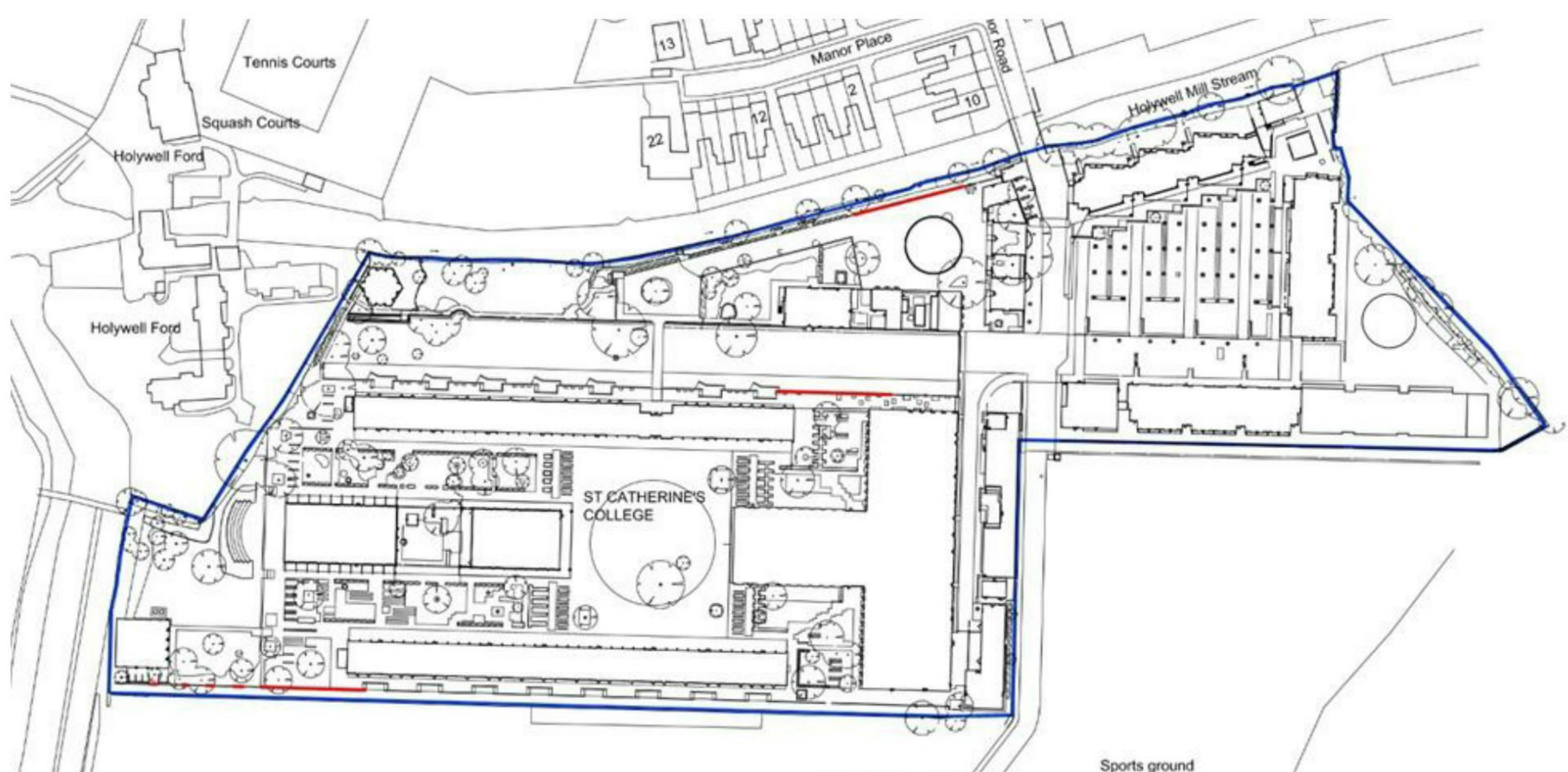
Finally, it should be noted that the reason that the ground under the podium area is raised, is because prior to becoming the site for St Catherine's College, the land was used as a refuse dump. Consequently, it has been established by exploratory excavations that the garden wall foundations are over 1 metre deep, down to the original ground level.

Most of the garden walls are in good condition, with a patina that is reasonable for their age of approaching sixty years. However, the three long walls now require some attention.

When the walls were built in the mid-1960's, there was perhaps less technical knowledge or concern for longer-term maintenance than there is today. Energy was cheap and the war-time shortage of building materials was over. Consequently, construction methods had become more industrialised but were still relatively unsophisticated. Cement-based mortars had all but replaced lime-based mortars for laying bricks, as they were easier to mass produce and use. The original buildings of St Catherine's College are a good example from this era, using the newly-introduced calcium silicate bricks with cement-based mortar, large areas of plate glass in steel frames, exposed structural pre-cast concrete for beams and columns, flat roofs with chipboard decking and bitumen-based roofing felt coverings. Other modern materials included glass-fibre thermal insulation and asbestos-fibre lagging to heating pipework.

The garden walls are typical of the era, built of the same calcium-silicate bricks laid in cement-based mortar as the buildings. Unlike bricks made of clay, the calcium silicate bricks continue to expand and contract as they become wet and dry out, as explained by the accompanying structural engineer's report. The cement-based mortar is also relatively hard, so as the bricks try to expand and contract, the mortar holds them rigidly. This is significantly different to clay bricks which do not continue to expand and contract and lime-based mortars which are softer and allow movement.

For most of the walls, the cyclical movement is not a problem, as the walls are short and unrestrained, so the movements are relatively small and do not result in any damage. However, where the walls are long, their own length and weight becomes restrictive to movement, resulting in damage. For the garden walls, this has occurred in three places. These are all in the longest lengths of garden wall, in the southern half of the podium eastern wall, the northern part of the wall to the east side of the central pond and in the northern part of the wall to the podium western wall. In all three of these areas, the walls are long and continuous and are shown in red on the site plan below.



St Catherine's College site plan- damaged garden walls in red (north to right, not to scale)

It is interesting to note that the longest wall, to the southern half of the podium eastern wall, does have two movement joints which appear to be original. This wall is approximately 80 metres long and has one movement joint at about the mid-point and one movement joint about 8 metres from the southern end. The movement joints were incorporated as the wall was built, by leaving a short length of the bed joints and then all of the perp joints without mortar and then sealing them with mastic, as shown below. It now seems odd to have only one movement joint at the mid-point of the wall and just one other, so relatively close to the south end but both appear to be part of the original construction. There are no movement joints in the northern part of the wall to the east side of the central canal and in the northern part of the wall to the podium western wall.



Podium eastern wall, southern half, northern end

Left- note wall leaning towards sports field and buckle near to middle, at far end of paving

Right- original movement joint of open brickwork joints, sealed with mastic

For the southern half of the podium eastern wall, north of the central movement joint, the wall has been badly affected by movement as shown above and noted in the structural engineer's report, such that the wall is leaning towards sports field side by 125mm. Since this wall is adjacent to a paved and grassed area where students might gather, the garden has been temporarily cordoned off to prevent students leaning against the wall and it collapsing with them or students sitting under it and it collapsing onto them.



Further areas of buckling and cracking to the podium eastern wall, southern half

For the northern part of the wall to the east side of the central pond, the wall has remained nearly upright but has buckled towards the pond. However, since the walls have an unfilled cavity, the movement has not been consistent, with the leaf of brickwork on the paving side exhibiting more damage than the leaf facing the pond. Since this area is not frequently used by students, the problem is less of a safety concern but nevertheless needs to be repaired.



Wall to east side of the central pond, showing outward movement over damp-proof course



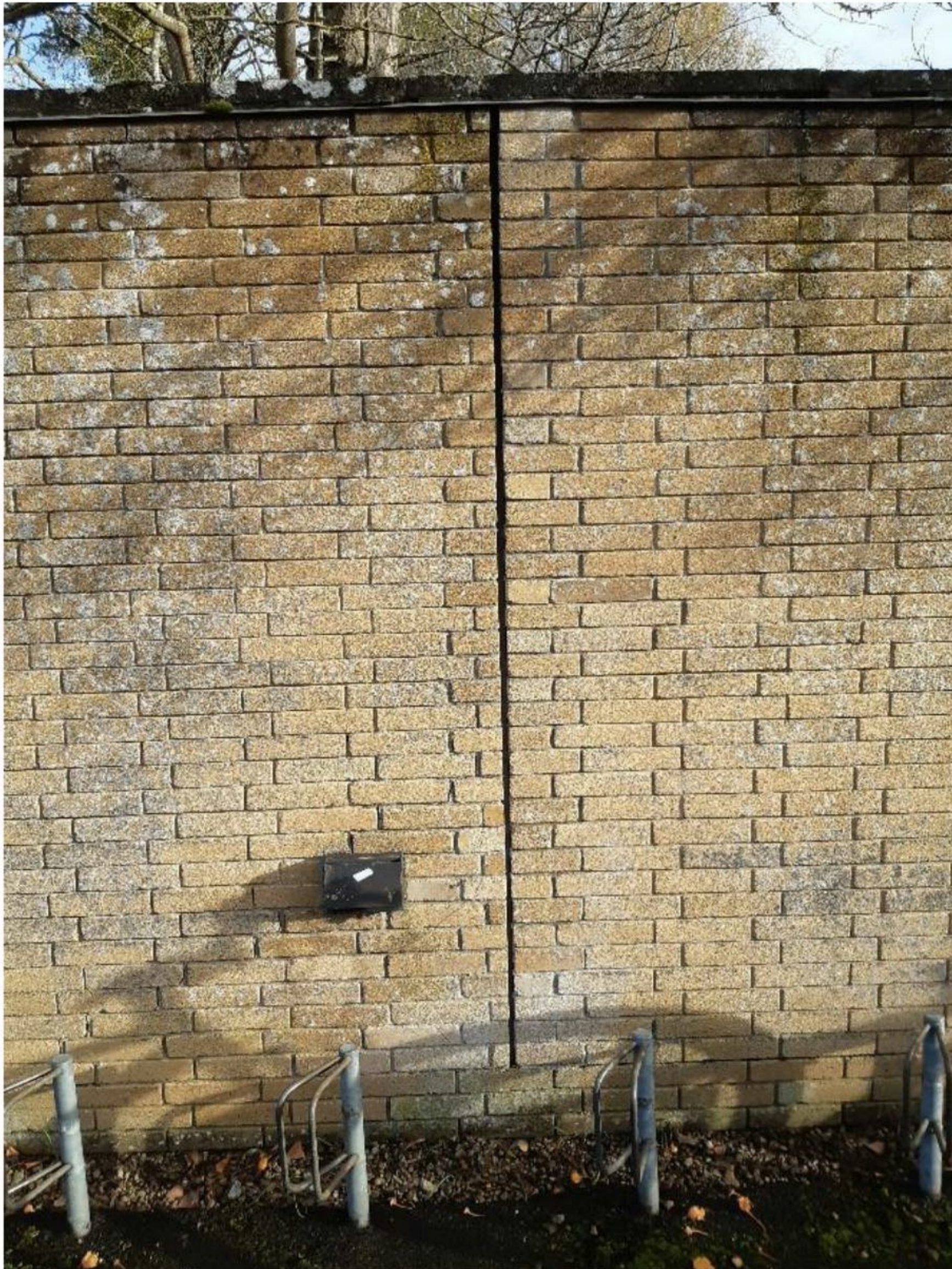
Wall to east side of the central pond, showing inward buckling between damp-proof courses, more pronounced than buckling to outer leaf

For the northern part of the wall to the podium western wall, this has buckled in a similar way to the central wall, with the western wall buckling towards the Holywell Mill Stream. This area is also less of a safety concern, since it is more of a transition area for pedestrians, cyclists and the occasional motorist. Nevertheless, this wall also needs to be repaired.



Northern part of the wall to the podium western wall, showing inward and outward buckling with cracking, above damp-proof course

It is also interesting to note the condition of the freestanding walls elsewhere in the original College buildings. The circular cycle store walls were also built without any movement joints, as two semicircles with gaps in the walls for the gates. The two semi-circular walls have both moved outwards towards the top and there are some vertical cracks. Nearby, the Master's Lodgings garden walls were built towards the end of the original construction period. Those walls do incorporate some original vertical movement joints, at approximately 6 metre intervals and there has been no cracking of the brickwork.



Original movement joint in west garden wall to Master's Lodgings

2 The Proposed Works

The three long garden walls are in need of some repairs.

For the east podium wall, the northern half of the southern length has such a lean and several areas of dislodged and cracked bricks, that it needs to be rebuilt from its northern end, to the existing movement joint at the midpoint of the wall. It is proposed that the concrete coping stones and zinc flashings are set aside on the adjacent lawn in the same order as their current locations on the wall. The brickwork would then be carefully taken down to foundation level, with the mortar being cleaned off the bricks as the work progresses. On the podium side, there would be a new leaf of two courses of standard dense concrete blocks, which would then match the existing coursing of the wall up to the level of the existing paving slabs. The concrete blockwork will provide improved retaining strength against the higher ground level adjacent and should release sufficient bricks to replace the worst of the damaged bricks on the visible side. The original bricks would then be reused in rebuilding the wall, following which the zinc flashings and concrete coping stone would then be re-laid in the same order as originally. When the brickwork is rebuilt, movement joints would be incorporated at approximately every 6 metres, to the same detail as the existing movement joint at the midpoint of the wall and pointed with a mid-grey mastic.

There is also some cracking to the southern half of the southern length of the east podium wall. To reduce the likelihood of future buckling and cracking, it is proposed to insert new movement joints into the existing brickwork at approximately 6 metre intervals. These movement joints would be formed by using a 5mm drill to drill a series of holes in the 8mm wide mortar of perp joints and adjacent bed joints to both leaves. Once holes have been drilled, the remaining mortar will be carefully cut with a chisel and then a file used to link the holes and remove the remaining mortar. The mortar joint in the coping stones closest to the new brickwork movement joint would also have the mortar removed, to allow for movement. Once the joints have been cleared of mortar, they would be repointed with a mid-grey mastic.

For the damaged areas of the central wall adjacent to the pond and the northern part of the podium western wall, these would be carefully taken down only in the affected areas and rebuilt, as described for the east podium wall, with movement joints incorporated as described. It is also proposed to create several other movement joints in the long lengths of the central wall adjacent to the pond and the podium west wall, to allow for movement and prevent any buckling and cracking in the future.

For all three long garden walls, the intention is to reuse all of the original bricks for the rebuilding. If it is found that some additional bricks are required, the College do have a small stock of calcium silicate bricks from previous works on site and these would be used if necessary. Finally, if any new bricks are required, these are available, from the same source as those used for the recent construction of the Graduate Centre. For all of the repairs, the mortar mix will be a cement:lime:sand mix of a colour to match the original, laid to the same 8mm bed depth, recessed by the same 8mm, to match the existing.

3 The Impact of the Proposals

The three long garden walls have been damaged due to the original construction not allowing for the need for the calcium silicate bricks to expand and contract and the cement-based mortar holding the bricks rigidly, which have resulted in the leaning, buckling and cracking and now evident.

The impact of the proposals to repair the three long walls, with some localised rebuilding and creation of new movement joints, will be that the walls will be made safe and their long-term future will be secured. If the walls are not repaired, the northern end of the southern half of the podium eastern wall will continue to be a danger and all three long garden walls will continue to deteriorate.

4 Accessibility

Repairing the garden walls will not change the existing accessibility of the College gardens.

5 Conclusion

The proposed repairs are sympathetic to the original design and construction. It is proposed to reuse all of the original bricks, coping stones and zinc flashings and the new movement joints will match the original movement joint.

In conclusion, there will be no perceived harm to the historic fabric and the repairs will be beneficial for the long-term durability of the three walls. Consequently, the repairs and new movement joints ought to be granted listed building consent.