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Padley Mill

A question of interpretation

Keywords: preservation, industrial heritage, water mill, restoration, country house.

The transformation into a house of an old mill from the mid- eighteenth century in Padley Gorge, within the now known as Peak District National Park in the vicinity of Sheffield, UK, has raised a significant number of the problems of conservation and restoration of ancient industrial heritage, focused and concentrated in a single building. To restore and maintain the property as a museum or to make a significant change of use were some of the dilemmas faced by the author. After the final decision, the architectural work revealed as laborious, unexpected in its pre-existing conditions and opposed to any attempt of developing a personal style. The result is a hybrid building which shows its historical layers and, although modified, clearly better preserved than without any intervention at all.

Figure 1. Padley Mill and its pond seen from across the Burbage Brook in winter.



Padley Mill is in North Derbyshire on the east edge of the Pennines, England's hilly backbone. Just ten miles from Sheffield, it lies in Padley Gorge within the Peak District National Park, part of a conservation area and a site of special scientific interest, and also directly adjacent to ancient woodland owned by the National Trust. Nowadays this is 'countryside' heavily used for recreation,

fulfilling the popular idea of beautiful nature, but little more than a century ago it was an industrially exploited landscape, with trees and peat cut for fuel, boulders from the last ice age being continually transformed into grindstones (figure 3), and many other violent incursions.

In 1893 the Sheffield to Manchester railway arrived through the second longest

Left. Figure 2. Top of the gorge, now recreational.

Right. Figure 3. Abandoned grindstones c. 1900

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Left. Figure 4. Path up the gorge.



Right. Figure 5. Base of winding engine in quarry.



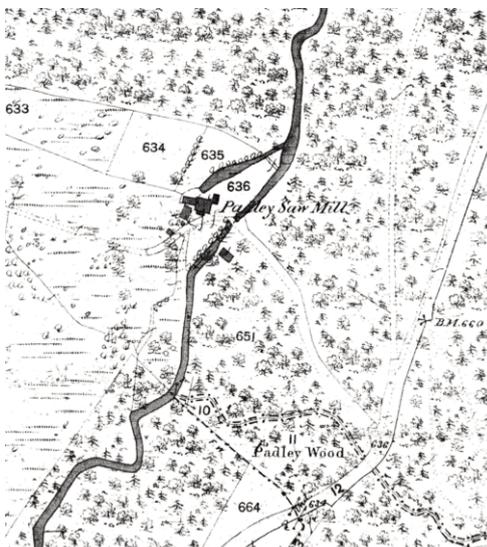
tunnel in England, and new houses sprung up in what had been a remote area. The railway's presence made it a good site to quarry stone for the great dams further up-river, built to supply water to the industrial cities of Sheffield and Nottingham, so more than a million tons of gritstone were excised from the adjacent hillside at the beginning of the 20th century leaving a terrible scar, but it is now attractively recolonised by birch trees. The inclined plane down which stones were taken to the railway, and the mount for its winding engine, are still to be seen (figure 5). The mill itself lies in the bed of the Burbage Brook which is fed by local sources within the surrounding hills but provided adequate flow for a water wheel during most of the year. Water power was essential for early industry, and the main reason for the growth of Sheffield as Britain's premier steel city, for until the arrival of steam it was the sole motive power beyond manpower and horsepower. Water wheels, already long used for milling flour, were adapted also to operate hammers and grinding wheels, to blow bellows, saw logs, and drive many

kinds of industrial machine. Water power sites were therefore highly valued, and Sheffield's five small rivers were crowded with ponds and wheels along their length, taking advantage of every fall in their course. The power obtained depends on the weight of water and the height dropped in the wheel's buckets. Reservoir ponds allow conservation of water and precise regulation of flow, and at times of drought they can at least fill overnight to drive the wheel the following day.

Local setting and history

The mill site at Upper Padley probably dates back to Medieval times. It was built at a point where the narrow gorge widens just enough to allow the formation of a pond against the hill (figures 1 and 6). There may have been a flour mill serving nearby Padley Hall of c.1350, and documentary records confirm a mill at least as early as 1600, used for smelting lead ore from the nearby Eyam mines. But the existing building is a rebuild from the 1760s, a three storey stone structure with 0.5 metre thick walls and a simple double-

Left. Figure 6. Ordnance survey map 1880.



Right. Figure 7. Restored mill, brook, and pond.





Left. Figure 8. Old postcard as café c. 1950



Right. Figure 9. North side as purchased in 1994.

pitched roof, the wheel house set inboard at the west end. It was built as a flour mill on a plan designed for four sets of grindstones, but only the two on the south side were installed. The hoppers for raw grain were on the top floor, feeding by gravity to the grindstones below, and the drive gearing was in the basement. The building was orientated directly north-south with entry from the east, making an angle of 50° with the pond edge. The tail race was dug deep, with an underground passage returning to the brook to assure maximum head and good outflow. Having operated as a flour mill for a century, it became in the 1860s a saw mill, with a large roof added for the sawing work at the north-east corner. The power from the water wheel was transmitted by gears and belt to a drive wheel on the east front, which survives (figure 10). Cleared of milling equipment, the upper two storeys

could serve as a house, and the chimney on the east side was added along with a crude gargoye, presumably transferred from some earlier building. Old postcards show the sawmill phase, which continued until at least 1908. It was sold in 1930 and the woman owner set it up as a café relying on passing walkers for custom, and it continued through the hands of two more families until the 1960s. A fifth window was added in the upper floor front, perhaps removed from the other side, and modern metal windows were clumsily added to the north (figure 9). A crude bay window was inserted in the south-east corner (figure 8). At some point the leaky stone roof was discarded and replaced with lighter concrete slates. Major beams had rotted in the wet walls and were propped on tree trunks, and as the upper floor subsided, futile attempts were made to level it up by adding more timber. The

Figure 10. East front as restored, with added car port on right.





Figure 11. The building gutted for conversion with the new spine beam in place.

Left top. Figure 12. Importer's mark on truss.

Left bottom. Figure 13. Fragment of water wheel.

Right. Figure 14. New oak window, double outward opening, and deep reveal finished in silver sand render with beech cill.

post-war owner had intended to make repairs but never possessed the funds, and as he also owned the miller's cottage, he decided to live there, letting the mill out to students. In the 1970s the local council became concerned about the building's unsafe condition and condemned it, but did not enforce demolition. By February 1985 they had changed their minds for it was listed grade 2 by English Heritage as an historic building, but it remained in poor condition until put up for auction in the summer of 1994. As the listing discouraged developers, we managed to buy it for a reasonable price.

The building had originally been open plan, with two working floors on oak joists supported on 30cm x 30 cm pine beams

spanning 10 metres. Each of these had circles and strokes inscribed on it which we took to be an importer's code (figure 12), as they were randomly placed on different faces. The roof on rough oak purlins was supported by two king-post trusses also of softwood, dividing the span into three bays between the gable walls, though low ceilings at tie level in the upper floor concealed the entire roof space. The inherited conversion offered little order or convenience, dividing the whole into small dark rooms with few windows at around 75 cm square. To carry out remedial work on the structure it was easier to remove it entirely.

The main beams of 10 metre span had bowed, but could easily be relieved by adding a steel spine beam running longitudinally: this was accomplished on each intermediate floor with 30 cm steels to embrace the timber beams within the section so avoiding loss of height (figure 11). Since a spine beam for the upper floor would arrive in the centre of the front door if centrally placed, it was skewed to the side by 6°, the main reason for the introduction of a new plan angle further exploited in other ways. The rotten beam ends of the lower floor were repaired with bolted-on steel channels and concrete fill. The westernmost beam of the upper floor had been almost burned through in a fire and was perilously propped on single brickwork, so we replaced it with another bought as salvage. All the main beams were halved then tied into the steel spine beams with bolts and brackets. Potential heat loss through the 0.5m stone walls would have been considerable, so insulation was needed. Added outside, it would



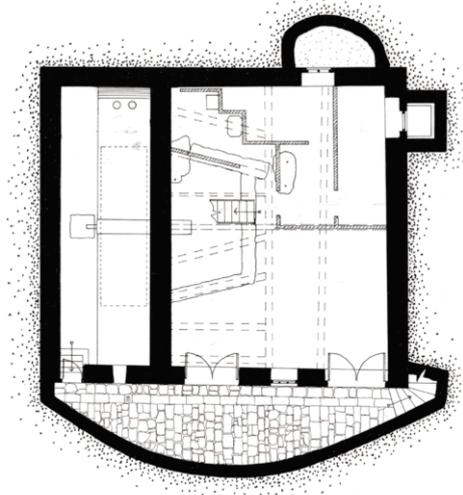
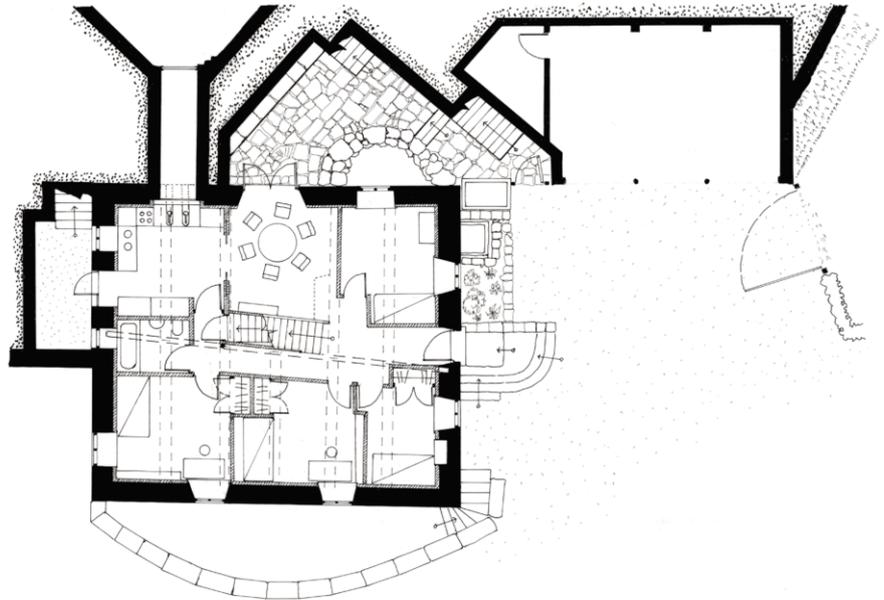
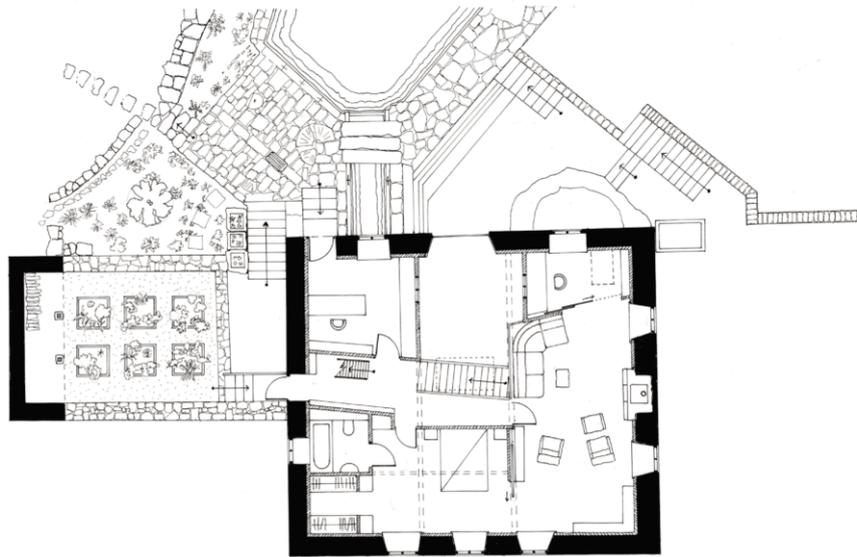
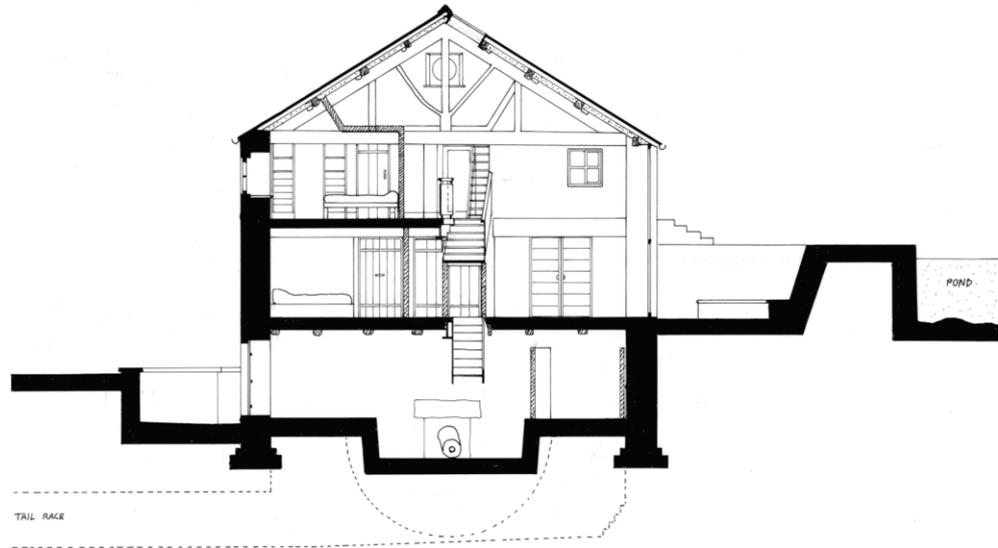


Figure 15, 16 and 17. Upper, middle and lower floor plans as converted.

Figure 18. Cross section as converted with outline of water system.



have concealed the stone and contradicted the listing, so we decided to add a new skin of woodwool inside, fronting a cavity filled with recycled paper insulation. The woodwool panels were coated with an exposed lime-based and silver sand render to leave a continuous inside surface with good daylight reflection especially on the deepened window reveals, which we floored in light-coloured naked beech (figure 14).

The design of a new house within the old shell required first of all an acknowledgement of the givens and the limitations. Working with a water power site necessitated retention of the water system as the soul of the place, let alone memory of its industrial history. At purchase the mill-pond had nearly disappeared through backfill and silting, but the original stone outer pentrough survived, and a trickle of water still ran through it into the basement wheelhouse. We decided to contain this in pipes to prevent soaking the building, and we fitted a 25mm thick glass

panel on the end of the pentrough to preserve its opening and the view into it, and also to accept the full pressure of the dam if necessary. Later, when we had dug out the mill pond, we put a timber sluice between pond and pentrough which is now a waterfall visible from within the building (figure 19). We also fitted an old industrial valve to the pond's original inlet sluice to guard against flooding.

The historic listing applied particularly to the publicly visible south and east facades which had ended up somehow composed despite many changes, the east one with its four symmetrical windows, chimney, and central door looking like a classic child's drawing of a house (figure 10), the south one well balanced with its three upper windows, two lower ones, and basement double doors. Removing the added bay on the east and putting back wooden doors in the basement arches were not difficult decisions, and the more or less square windows, each slightly different in size and not quite in line, needed repla-

Left. Figure 19. Pentrough glazed.

Right. Figure 20. Fragments of millstone set in paving.



Figure 21. The north side after conversion, with big central window.



cing. The stonework showed that these were of at least three kinds suggesting layers of historic alteration (figure 10): the two on the lower east had true voussoirs, the five on the south and two on the north lintels cut as arches, the two upper ones on the east lintels with cut arches and fake voussoirs. On some jambs there were hinge pins to suggest a wooden shutter to cover only the upper half, but I have yet to see a surviving example of this type. The surviving softwood windows were single glazed and in poor condition, mostly sideways sliding sashes. We replaced all, but kept the two best originals for internal reuse. The new windows, made by a local joiner at the end of his career, were of oak with double-opening hinged casements,

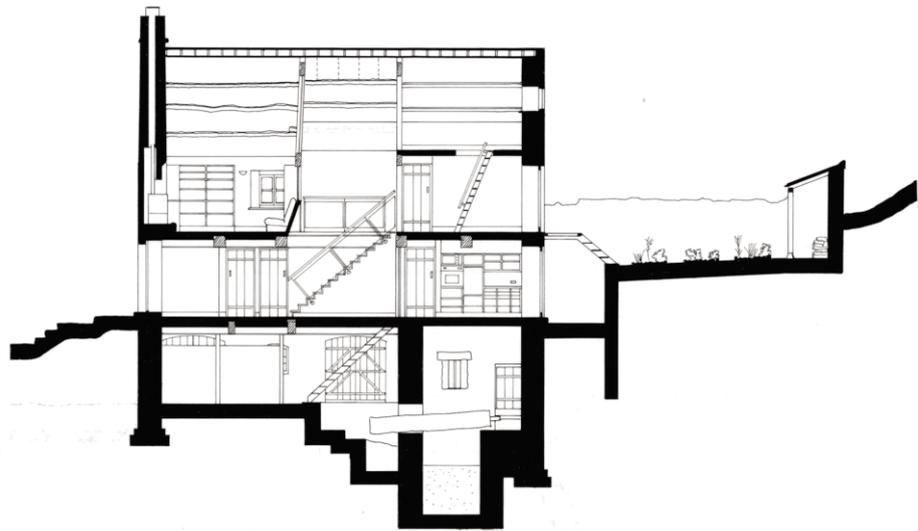
and needed to be so to meet fire escape regulations (figure 14). We retained single glazing to keep glazing bars small and weight down, despite applying double-glazed units to newly introduced windows and doors. The other two facades were less valuable and less documented. The west face into the hill had been backed onto by the gable of an extension, and was blank apart from a couple of windows on yet another pattern, while the north façade had been damaged by ill-considered addition of metal windows, presumably in the 1950s (figure 9). Both had been private facing into the site, with no old postcards to show what had been. Being neither attractive nor authentic, they allowed more scope for reinterpretation.

Left. Figure 22. Dining space and stairs.

Right. Figure 23. View out with doors open.



Figure 24. Long section, showing the double-height space and the wheelhouse.

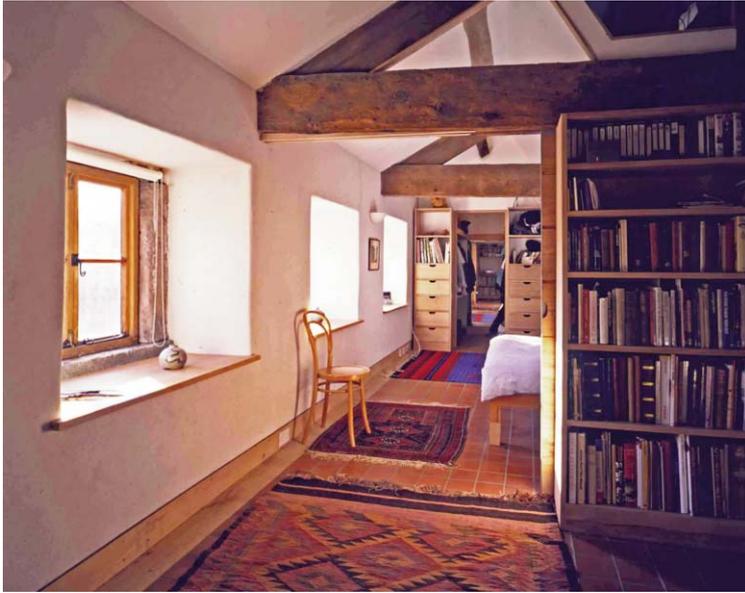


Replanning the interior

The interior volume when cleared was impressive (figure 11) and suggested the possibility of leaving the roof space and trusses exposed. It was desirable to conserve some sense of height as opposed to the low-ceilinged rooms as found, and with more than enough volume for a family house, retaining part as double height was plausible. The repaired floor structures rested independently on the outer walls giving the advantage of plan libre: no need for partitions on the two floors to coincide. The available windows had to be exploited carefully, especially on the inviolable south and east sides, and it was an obvious move to exploit the existing chimney and interior fireplace which had a substantial stone lintel. The central entrance along with its steps remained the obvious approach, east-facing towards the outside world, and it also made sense to keep the rear one. The roof trusses divided the inner space into three bays, more or less meshing with the six bays between the beams of the lower floor and suggesting a tripartite structure. With the larger number of windows in the upper floor and the low lying site, it seemed best to locate the living rooms above, and to do justice to the fireplace by turning the eastern bay into a full width living room (figure 15, plan). Opposed to fire in the east was water in the west – both the through-flowing millstream and the existing service connections – so bathrooms and kitchen could settle in the western bay, using windows of short outlook. The central bay remained the obvious place for a double-height volume as communal dining room and stair-well, linking levels. A two-storey window on the north side (figure 21) could express the volume externally and exploit

views of the millpond. This radical move was the most controversial, vehemently opposed by one of the Peak Park's planning officers, though supported by their presiding architect. Compositionally it worked well following the decision to replace the modern window on the right end with an oak and stone replica, but the big sheet of glass and the glass doors beneath would declare modernity even if unseen by the public. The planning officer suggested the compromise of making it only one metre wide, so that it would be 'more like a loading door in an old mill', but this was false history, as any such loading door had surely been in the east gable predating the fireplace. At only one metre it would have seemed mean. Finally it was permitted at slightly narrower than originally intended, but the officers insisted it line up with the rooflight above also added to light the interior. Only the elevation drawing shows the relationship, for in real life perspective makes it impossible to judge whether they are of the same width or not.

The interior was planned around domestic routines, with priority to the living room and dining space as the prime centres of family life, and separate bedrooms for family members. Entering the front door you pass between two bedrooms, the staircase presented towards you but swung 6° to the right (along with the spine beam as mentioned earlier), swinging you around towards the central void and northward view. Looking into the double height space are the stairs, upper landing, and upper windows from two sides, like houses in a street (figure 22). Beyond the dining space at ground level is the kitchen with waterworks and views into the pen-trough. At the end is a bathroom, and on



Left. Figure 25.
Living room looking
through to bedroom.

Right. Figure 26.
Built in sofa.



Left. Figure 27.
Internal door beech.

Right. Figure 28.
Sliding door beech.



the south two more bedrooms (figure 16 plan). As you mount the stair, the view of the pond unfolds through the big window. At the top a glazed door to the west adds a view out and invites exploring the garden. You turn back to approach the living room, already visible through the internal bay window. Despite the smallness of the original windows the open plan living room allows views through seven of them from a single position, as well as the more generous view of the pond through the big one. Main bedroom and living room are linked by a sliding screen, which when open brings the three south-facing upper windows together, a pleasure with low winter sun. The big window on the north was the centrepiece of the project, providing a change of scale. Set on the cross axis, it aligns dining table, focus of family life, with the stair, and on the upper floor the main bed. The long axis links front door, main stair and garden door, but also

the stove in the old fireplace and the wood store outside to west. The two axes cross on the stair.

Nothing in the inherited building was quite straight or square, requiring constant surveys to make things fit, a reminder of building practice before the machine age and standardisation. We tend to assume that exactitude is visually essential, but it does not seem to matter that windows in the east front are not quite aligned, or that the middle window in the south side added in the early 20th century was set about 80mm lower than its partners. An unexpected irrationality was the lack of alignment between the second intermediate floor beam and the roof truss above, a difference of more than 60 cm (figure 24), but this was exploited as the rationale for cantilevering the back of the built-in sofa beyond the wall of the corner study. The 82° skew in plan of the study partition wall and sliding door which embraces the sofa resulted from existing window relationships, and the experience that a 90° turn in a sofa is excessive.

Resetting the floors allowed them to be accurately horizontal with modern floor joists and chipboard flooring, and under floor heating was added in a concrete screed surfaced with terracotta tiles. This formed a large heat store within the insulated walls, eliminated the clutter of radiators, and has proved comfortable, smoothing out fluctuations in temperature and allowing a thermostat setting of 19°.

Internal joinery of naked beech wood has proved surprisingly durable, tough enough even for stair treads. Doors of 25mm beech planks are of two types: hori-

zontal boards between vertical steel hangers for sliding ones, and triple vertical boards bolted to horizontal hinge straps for pivoted ones (figures 27, 28). Straps to either side of the beech planks linked by a welded dowel and bolt were made by a local steelworker, then galvanised. The same technique was used for replacement external doors to south and east, but with planks of oak (figure 29). By making the construction and material qualities visible, we sought to counterpoint the rough undecorated construction of the original building in a contemporary technology. New openings had galvanised outer steel frames but oak opening lights with double-glass. The glass of the round window in the west gable was set with glazing compound into a rebate in the stone, and has not cracked. We decided to leave exterior timber naked to weather, and after twenty years there is no problem of rot, but contrasts of colour have developed according with degree of exposure.

External Works

It was clear from the start that in addition to reworking the mill interior, extensive external works would be required. Not only was there a need to restore the almost lost pond, but the whole building had become increasingly buried in the ground due to build up of spoil. Sand and gravel had washed into the lane to its south, and even more on the north side where basement windows had been blocked and buried. The pond was the essence of the place, and has become a nature reserve, hosting brown trout, frogs, a changing crown of mallard ducks, dragonflies, occasional water voles, and the unwanted heron. The flatness of the water, sometimes still as a mirror, defined

a horizontal datum against the contour, its dam wall a straight line in the landscape, strengthened by repairing the edge and adding a paved path using stone found on the site. An early decision was made to deposit the spoil excavated from the pond on the adjacent land to east, forming a flat lawn that accentuates the line of the pond. As it was also desirable to hide our cars, the possibility arose of an underground car port with lawn on top, adding privacy for the garden. The opening for the cars was made with two steel columns, echoing the tripartite organisation of the house, supporting a full length steel lintel, all parts galvanised. Garage doors suggested a style problem that was deliberately avoided. On the garage's east side grass steps were made between the levels, surrounded by an earth ramp spiralling up for access of garden machines. In digging out the north side the bottom of a flight of steps was discovered, running perpendicular to the dam, and we rebuilt it as a double flight to contain the area outside the big window. All walls and paving were made with local stone found in excavations, including broken grindstones which were incorporated at significant points. The paving at the south end of the pond became a favourite area for sitting out in the sun with views in all directions and water lapping nearby. On the west side were the remains of an old extension which was tidied up, levelled and made into a herb garden, a roof being added to its rebuilt west end to serve as a wood store: set on two intermediate oak columns, it was again a tripartite structure. The area immediately to the south of the mill had to be dug down to the original depth of the road in order to make the double doors of the basement accessible, and a retaining wall was built against the

Left. Figure 29. Front door oak.

Right. Figure 30. Restored pond and new lawn above car port.



Figure 31. Mill from the adjacent bridge showing car port and garden steps.



lane. All these works amounted to a complete revision of the building's relationship with the ground, but were accomplished without removing spoil from the site.

Conclusion

In excavating the mill interior the original layout of machinery gradually became apparent through sockets in walls and floor for the gear cage, and radused recesses in the oak beams for the bottom grindstones. The water wheel had gone but the wheel shaft was still present, along with scratches on the wheelhouse wall to reveal its former size and position. In the flooded base we found bucket timbers and pieces of cast-iron, making it possible to deduce the design, dimensions and composition of the wheel. It would theoretically have been possible for some mill enthusiast to reconstruct the whole thing as a museum, but that would have been very expensive and precluded additional use as a house. Few such buildings can be supported as full-time museums, and even when they are, modern building standards and safety regulations force numerous changes, quite apart from those that occur in the building's use and perception of its use caused by tourism. When used for a different purpose, like becoming a house, there is bound to be radical reinterpretation, and some people will have doubts about the result, or claim it would have been better done another way. Reconstructing the wheel to generate electricity would also have been possible, but it is far easier these days to put in a turbine. This we considered until discovering that the through flow would only generate about 750 watts, less than self-sufficiency. Bureaucratic hurdles prevent

taking the full flow of the river, which during the mill's working life would have been totally unrestricted. Conversion to a house had already taken place nearly a century ago, but in an improvised and unimaginative way and without essential care of the structure causing the condemnation in the 1960s which nearly led to the building's demise before listing raised its historical value. Reconversion as a house has made the building a hybrid, but it is better so preserved for the sake of spirit of place, landmark value, and as a reminder of the history of water power. The conversion involved long and painstaking work and a process of continuous discovery and interpretation, often without sure answers about when and why changes had been made. But the dialogue with the old building and its former uses made for a spatially richer and much more interesting house than would have been made starting from scratch. When all places are becoming the same and few designers bother to research local history, preservation of local buildings helps preserve a sense of place quite apart from any touristic advantages. For the architect this kind of work is piecemeal, troublesome, laborious, and untidy. It tends to oppose the imposition of a personal style, and for the puritanical it may seem a compromised, irrational, and even dirty job. But for the architect who seeks the essence of a project in the givens of the place it allows a fascinating opportunity for dialogue. The hybrid building with historical layers can be of great interest architecturally, and certainly the mill is better preserved in modified form than not preserved at all.