

TRE'R CEIRI
CONSERVATION PROJECT
1990
PART 1: TEXT



REPORT ON THE SECOND SEASON OF THE
TRE'R CEIRI CONSERVATION PROJECT
JUNE - NOVEMBER 1990

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FOR

GWYNEDD ARCHAEOLOGICAL TRUST LTD.

PART 1: TEXT

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Introduction.

Tre'r Ceiri, Llanaelhaearn (SH373446), occupies the easternmost of the three peaks of Yr Eifl, which rises to 485m OD. Although the fort is one of the best preserved stone built hillforts in Britain, increasing concern about the deterioration of the remains prompted Cyngor Dosbarth Dwyfor, in conjunction with Cadw: Welsh Historic Monuments and Gwynedd County Council, to embark in 1989 on a conservation programme aimed at the consolidation of the site. The Gwynedd Archaeological Trust was commissioned to supervise archaeological aspects of the project and record works as they progressed.

The second season of the project began on 5 June 1990, with a preliminary phase lasting until 13 July, during which the condition of those areas due to be conserved was recorded in detail. The main works began on 13 August, continuing for twelve weeks until 2 November.

Staff and Supervision.

Conservation works were again conducted by W.H. Evans, W.O. Ellis and D.Ll. Jones, all of E & E Stone Masons, Penrhyndeudraeth, under the supervision of the writer. Monthly site meetings were attended by Mr. A. Davies and Mr. A. Sturkey of Cyngor Dosbarth Dwyfor; Dr. M. Yates, Mr. W. Watkins and Mr. H. Williams of Cadw; Mr. P. Fasham of the Gwynedd Archaeological Trust and Mr. T. Edwards of E & E, at which progress was discussed and work programmes arranged.

Progress in the second season.

During the second season work was concentrated on the north-west side of the main defensive wall (fig.1). Approximately 65 metres of the wall from the west corner of the fort towards the north-west gateway was conserved. Some work was also done on a short stretch of wall behind Huts 77, 78 and 78a. Huts 78 and 2 were also conserved, and the door jamb between huts 53 and 89, repaired in the first season but already ruinous, was rebuilt once more. Photographic recording of the main wall from Collapse H to Collapse I (see fig.2) was completed.

It had been hoped that the lintel from the north postern would be replaced during this season. However, repairs were not completed in time, and this work has been put back to the third season.

Recording methods.

As in the first season, a full written description was made of all works as they progressed, again supplemented with photographs and drawings.

Drawings.

More time was spent than during the first season on accurate

Fig 5/42 ~~28~~
(pp 2, 3)

used for 1991
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stone by stone drawings of exposed masonry, particularly when working on the major collapses. The shift away from rough sketches supplementing a photographic record certainly slowed the masons' progress, but the improved quality of the archive justifies the extra time taken.

A problem emerged when attempting to plot accurately the position of each repaired stretch of wall. The most recent plan of the site, the 1980 photogrammetric survey produced by Plowman Craven & Associates for the Welsh Office, doubtless provides an accurate general plan of the site, but proved insufficient for plotting detail. The lines of wall faces have been smoothed out, resulting in a loss of detail (see for example fig.6), and there seems to have been some mis-interpretation of the aerial photographs on which the plan was based, resulting in the form of many huts being shown incorrectly. The most serious difficulty was that the plan was not related to any permanent fixed points within the fort from which measurements could be checked. Even using the more sharply defined features such as the junction of two walls, it proved impossible to relate any particular point on the survey to the remains on the ground to within closer than 0.5m. When working on the long stretch of rampart from the west corner to the north-west gateway, therefore, the 1980 survey was of little help and it became necessary to replan much of the wall. This was done by taking offset measurements at 1.0m intervals from a series of temporary base lines which were tied in to prominent boulders. In fig.14 those wall faces shown in solid lines have been re-surveyed, while only the stretches shown with longer dashes (Hut 2, the wall behind it and the terminal at the north-west entrance) have been traced from the 1980 plan.

Resurveying the site in this way was time-consuming, but apart from ensuring the accurate plotting of those stretches in need of repair, the method enabled a detailed examination of the wall to be made as a result of which further weak points in need of attention were identified.

The lack of permanent fixed points from which measurements can be taken remains a problem. The boulders used during the second season to tie together the temporary base lines are themselves 'floating'. A priority during the next season must be to establish a network of fixed points, related to the National Grid, around the fort.

Photography.

Some 1100 photographs, mainly monochrome and colour prints but including colour slides of points of particular interest, were taken during the second season. As before, the photographs record the condition of walls before conservation, the clearance of collapsed rubble, wall foundations or other features exposed by stone clearance, the process of rebuilding and the end result. examples noticed of recent visitor damage ('treasure hunter' holes, a 'new' cairn on the summit etc.) were also photographed.

The approach to photographing the condition of the main rampart before conservation has changed considerably. During the first season the wall faces were photographed with a 50mm lens. On the outer face in particular the slope of the ground meant that all photographs were taken with the camera pointing up at an angle, resulting in severely distorted images due to converging vertical lines. A 28mm 'shift' lens was therefore obtained before the start of the second season, and by adopting the techniques of rectified image photography (as far as the irregularities of both wall face and terrain would allow) much improved results have been obtained. However, in this report most of the photographs of the wall before conservation were taken during the first season: the benefits of the new approach will not be fully apparent until the third season.

Visitors.

Since the increasing number of visitors has been identified as one of the main causes for the fort's deterioration, attempts were made to count the number of visitors, and to observe the way in which they toured the monument. The following general comments can be offered.

Numbers.

The table below sets out the number of visitors counted during the first two seasons, and the number of days in each month on which a count was taken. In September and October 1990, when conservation work was concentrated on the outer face of the main wall, out of sight of the fort's interior, attempts to count walkers were abandoned.

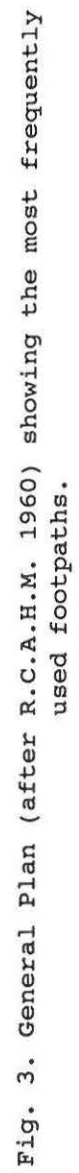
Month	Days counted	No. of visitors	Average per day	Total for month.
January	10	29	3	93
February	4	23	6	168
June	11	168	15	450
July	4	97	24	744
August	6	222	37	1147

The total in the final column was reached by multiplying the daily average by the number of days in the month. These are very rough figures which take no account of days of bad weather (which would bring down the average), or of weekends and the daylight hours of summer evenings (which would push the average up), but are perhaps not far from the actual totals. An annual total can be estimated by averaging out the monthly totals and multiplying by 12, giving a total of 6254 visitors per year.

Visitor behaviour.

The majority of visitors to the fort approached from the south-west. Most of these climbed up from the Llanaelhaearn-Llithfaen road, although a considerable number walked over from the road

Regular steeple indicates areas of steeple
The letter R indicates position
of ramps leading to walk-walk



between Lllithfaen and Nant Gwrtheyrn. Occasionally, walkers were also seen descending to the fort from the north-west, after climbing the summit of Yr Eifl. Most visitors followed the tracks through the gateways, although those approaching from Yr Eifl sometimes climbed directly towards the summit from the gateway in the outer wall, climbing over Collapse I and causing further damage to the wall (see fig.3 and Plates 1 and 2).

Once inside visitors tended to follow the existing footpaths to the summit, usually passing between Huts 36 and 29, then between 9 and 21, 46 and 47 on their way up, returning past the north postern and along the path running just inside the north-west wall down towards the north-west gateway (see fig.3). In two areas the wear on these footpaths causes particular concern. To the south of the summit cairn a number of pathways up through the scree have developed, resulting in considerable erosion, and the path down the north-west side of the fort runs through several huts and over stretches of wall, some of which are now barely traceable. The extent of the erosion along this route as it passes the south corner of Hut 77 can be appreciated by comparing Plate 3, taken in 1956, with Plate 4, taken in 1990. Other routes were occasionally followed, and one which continues to cause concern is the path leading through Hut 89 (see below p.13).

It was noticed, however, that visitors rarely walked along the top of the main wall. There are points where visitors clamber over the wall (for example Collapse I), and there are points where visitors walk onto the wall top for the view, for example at the point marked V on fig.3; but from these points visitors appear to return directly to the footpaths. If large numbers of visitors walked along the wall, many of the loose surface stones would have been kicked over (or kicked off the wall) leaving a trail of unweathered masonry, and as this is not the case it is clear that the wall tops are not generally walked upon. It would be surprising if they were: the wall tops are loose, uneven, uncomfortable to walk on, and dangerous if care is not taken. One cannot admire a view if one has to watch every step. This point will be returned to later (see below, p.33).

Most damage seems to occur at the summit. Visitors amuse themselves by building small cairns and walls, using stones quarried from the prehistoric summit cairn. The cairn illustrated on Plate 5 was constructed during the August Bank Holiday weekend. Stones are also hurled from the remains of the rampart onto the scree below, and the rampart here has now been reduced almost to ground level.

Those visitors who do stray from footpaths and cause damage to the walls and huts probably do so out of ignorance. It was surprising how many visitors, having climbed the hill for the view, were quite unaware of the fort. The provision of noticeboards should go far towards solving this problem, and one notice was erected during the second season below the south-west gate. Unfortunately this did not last longer than a week: during the August Bank Holiday the wooden frame was smashed open and the

display panel was stolen. A more secure frame is to be prepared by Cyngor Dosbarth Dwyfor.

This theft is only one example of the vandalism which continues to plague Tre'r Ceiri. The most serious deliberate damage is caused by the activities of treasure hunters, armed with metal detectors. Sometime in late August or early July two holes were dug into the floor of Hut 78, and others were found in Huts 24, and 12 and outside Hut 84. In September more holes appeared, this time in Huts 92 and 89. Treasure hunting is a problem on many well-known ancient monuments, but it is difficult to see any easy solution, beyond educating the public and increased vigilance on site.

Details of Work Completed.

Details follow of all conservation works completed during the second season. The huts are described first, followed by the main wall. Fig.4 shows the location of collapses/spills in the area around Hut 78, while the locations of areas conserved between the fort's west corner and the north-west gateway are shown on fig.14 at the back of this report.

Two aspects of the conservation work, wall capping and the marking of new masonry, are discussed separately at the end of the report.

Hut 2 (fig.14).

A rectangular hut set against the inner face of the fort wall, measuring 7.25m x 2.75m internally with an entrance in the centre of the south-east side (Plate 6). The north-west wall was built against the fort wall, forming a shelf about 1.0m high. Parts of this had collapsed and the uppermost stones were loose (Plates 7 and 8). The north-east end wall was largely grassed over, and presumably for this reason the Plowman Craven survey wrongly identified an entrance here, as indicated on fig.14. Only a short length of standing wall survived, projecting from the north corner, and this had partly collapsed. The other two walls of the hut were reduced to little more than a spread of stones, although there seemed to have been some rough rebuilding of the south-west wall, probably in relatively recent times.

The stretches of hut wall consolidated are indicated on fig.14. In the north-east wall, no more was done than the rearrangement of four large stones, already slipped from their original positions, to secure what remained of the original masonry (Plate 9). On the north-west side there were two points, one 0.5m-1.2m from the north corner, the other 1.4m-2.6m from the corner, where the collapse extended almost to ground level (indicated on Plate 8). The tumble was removed and the wall rebuilt using the original stones. Then, along most of the length of this wall large stones were placed on the edge of the wall top to secure the new work and prevent other parts of the original from collapsing. These stones were picked from the floor of the hut, immediately below the wall (Plates 10 and 11).

Hut 78 (figs.4 & 5).

A sub-rectangular hut, its north-west side built against the inner face of the rampart (Plates 12, 13), and measuring 4.2m x 3.4m within walls generally 1.1m thick. The floor of the hut was about 0.6m lower than the ground level outside it to the east, so that whereas the inner faces of the hut walls stood 1.2-1.6m high, the outer faces (where these still survived) were only about 0.7m high. The entrance, which was in good condition (Plate 14), was 0.45m across at its inner edge widening to 0.8m at the outer edge, where there was a step up, 0.4m high.

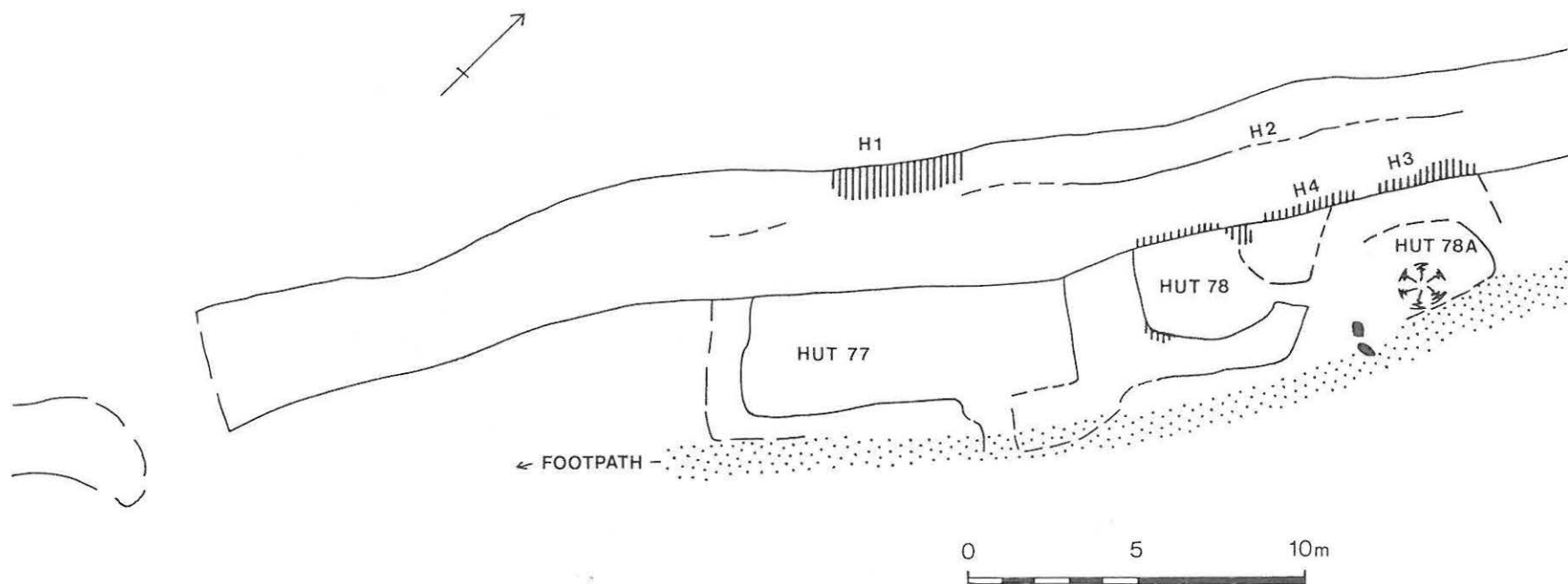


Fig. 4. Huts 78, 78A and adjacent main wall, showing areas conserved.

Conservation work was required at three main points within the hut. The north corner had collapsed totally, and from the unweathered surfaces of the rubble, it would appear that this had happened recently. Dallimore recorded this collapse in 1978, but it was not mentioned in 1946 by Griffiths. Dallimore noted that the south corner had also collapsed, but this had since been rebuilt. The rebuilt masonry, however, was unstable and was dismantled and replaced. The final area requiring major conservation work was the upper part of the north-west wall, which was loose and in need of strengthening. Details of these works are given below. Otherwise the walls appeared to be in good condition. Parts of the outer face on the south-east side had spilled onto the pathway and these were replaced to protect the remaining masonry, although no attempt was made to rebuild a neat face. At the same time occasional large stones lying loose on the top of the hut walls were rearranged to prevent them falling off. Finally, two holes dug in the hut floor, presumably by treasure hunters, were filled in.

a) The north corner.

This corner had collapsed completely, leaving a pile of loose small core material (Plate 15). Removal of the rubble revealed two possible lines for the wall face (see fig.5 and Plate 16). At ground level a line of three stones (X-Y on fig.5) set firmly into the ground suggested a wall 'smoothing out' the corner of the hut, while 0.5m above stone Y one large slab protruding from the core (stone Z) provided slight evidence for a 'squared' corner. The former appeared slightly more convincing, but the line of stones stopped short of the north-west wall of the hut, the face of which bore no evidence that a wall had once abutted it, and moreover there was not enough rubble within the hut to account for a collapsed wall on this line.

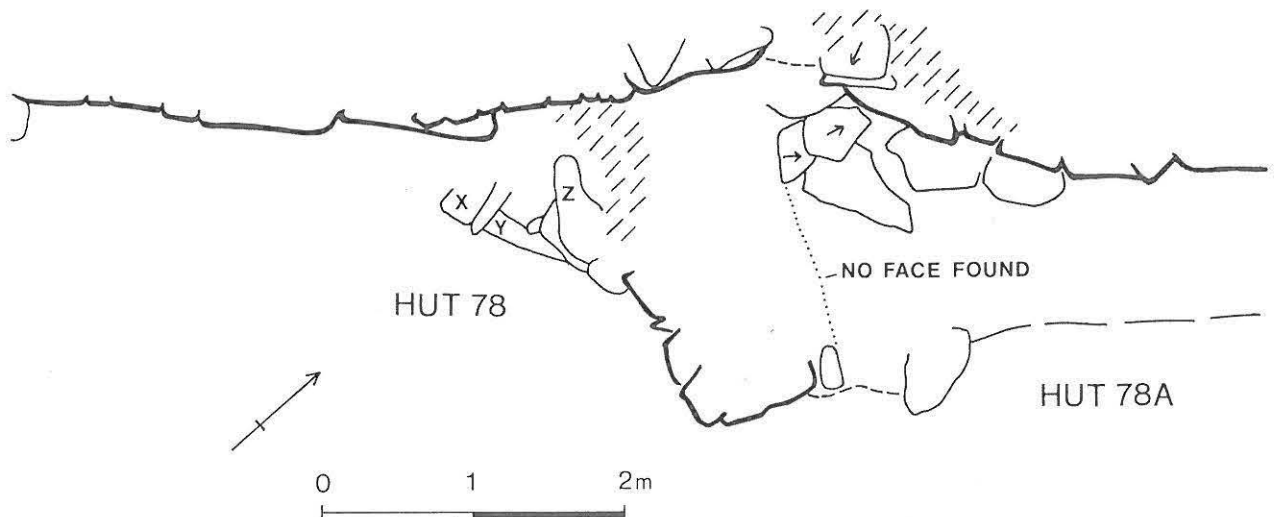


Fig. 5. North corner of Hut 78 and Collapse H4.

As there was insufficient evidence to determine the shape of this corner an attempt was made to adapt the technique of 'rough-racking', used in the conservation of mortared walls where original masonry has been lost. The aim here was to suggest an exposed core without defining the position of the wall face, while at the same time providing support for the original masonry behind and above. A revetment of small stones was built, starting behind the line X-Y and sloping backwards to meet the standing masonry at the top of the wall. To ensure the stability of this structure stones were angled down into the core. The result is shown in Plate 17.

b) The south corner.

The rebuilt section in the south corner (Plate 18, behind the right hand scale) was easily identified by the different weathering of the masonry. As the stones were loose this stretch was dismantled and rebuilt once more.

Before dismantling the wall, the original masonry to either side was marked, in case it collapsed (Plate 19). Removal of the face (Plate 20) revealed several weathered stones within the core: presumably these were exposed when Dallimore recorded the collapse. Rebuilding was a straightforward task (Plate 21).

c) The north-west wall.

The upper three or four courses of this wall were loose and in danger of collapsing (Plate 22). The larger *in situ* stones were marked and 0.4m of wall dismantled. Almost all marked stones were replaced in their correct positions (Plate 23).

Hut 78A (fig.4).

Hughes planned about two-thirds of an oval structure immediately north-east of Hut 78. In 1946 Griffiths described the remains naming it No. 79. However it was not numbered on the R.C.A.H.M. survey, which shows only the north-west wall, with a hint of a north corner (fig.1), and identifies another hut, 50 metres to the south-east, as No. 79. The 1980 Plowman Craven survey also omits this hut. The remains of an oval hut could still be made out, however, during conservation work on adjacent walls, and it has been named No.78A.

No works were carried out on this hut, but the remains have been shown on fig.4. The north-west side wall, abutting the fort wall, hardly rises above ground level, but its inner edge is still sharply defined. An arc of walling 0.4m (two or three courses) high defines the north-east end. A footpath now runs along the top of the south-east wall, but probing suggested that its inner edge survives beneath the edge of the path. The suggestion is of a structure 2.4m wide. At the south-west end was a scattering of large stones, many of which may have come from Hut 78, but two earthfast stones set on edge could be the remains of the outer facing of Hut 78A. Within the hut is a large hole, about 0.75m

deep, which continued to hold water during the dry summer of 1990. See Plate 24.

Hut 89.

This hut was repaired in the first season, but two points within it continued to cause concern.

The jamb on the left hand side of the entrance from Hut 53, rebuilt in 1956 and again in January 1989, had collapsed by late summer 1990 (Plates 25 and 26). The report on the first season (Boyle 1990, 26) had pointed out that the rebuilt jamb would always be a comparatively fragile feature. It was not anticipated, though, that it would collapse quite so quickly.

The jamb was rebuilt during the second season. This time it was built to a height of 0.7m, to discourage climbing, and was capped with three large heavy stones (brought from the stones cleared from the entrance to Hut 73 but not used during the first season) to help stabilise it (Plate 27). It is now a much more boldly expressed structure than before, perhaps too bold, but unless it is bonded to the wall (which would be contrary to the archaeological evidence) it is difficult to see an alternative.

The second point of concern was at the rear of the hut. It had been hoped that the rebuilding of the rear wall would force visitors to retrace their steps after viewing the hut. However this has not happened, and the problem seems to be due to the partition between this hut and Hut 90, which forms a convenient step onto the rear wall. The conservation of this partition had been deferred during the first season in the hope that what might have to be a complete dismantling of the original masonry could be avoided. During the summer of 1990, however, the partition continued to deteriorate, and its collapse now looks increasingly likely (Plate 28). A decision on how to tackle this wall must be made during the third season.

Collapse D (Figs.7 & 14).

At the west corner of the wall the outer face bulged out by some 0.75m, giving the appearance of a corner 'turret'. This bulge is smoothed out on both the RCAHM plan and the Plowman Craven survey, but is clearly shown on Hughes' plan (see fig.6). Griffiths makes no mention of any collapse here, remarking only that 'the wall is thickened to 14 feet (4.27m) at the west corner'. Dallimore makes a brief note of a collapse 3.0m wide.

Before conservation it was clear that the 'turret' appearance was at least partly due to the wall face having slipped forward, opening up a void in the outer face where the 'turret' met the wall to the north-east (Plate 29, left of centre). The wall had not totally collapsed: roughly coursed masonry survived to a height of 0.6m above the scree/tumble at the centre of this stretch, above which was a further 0.6m of displaced and loose stones (Plate 30). At first it was hoped that only this displaced

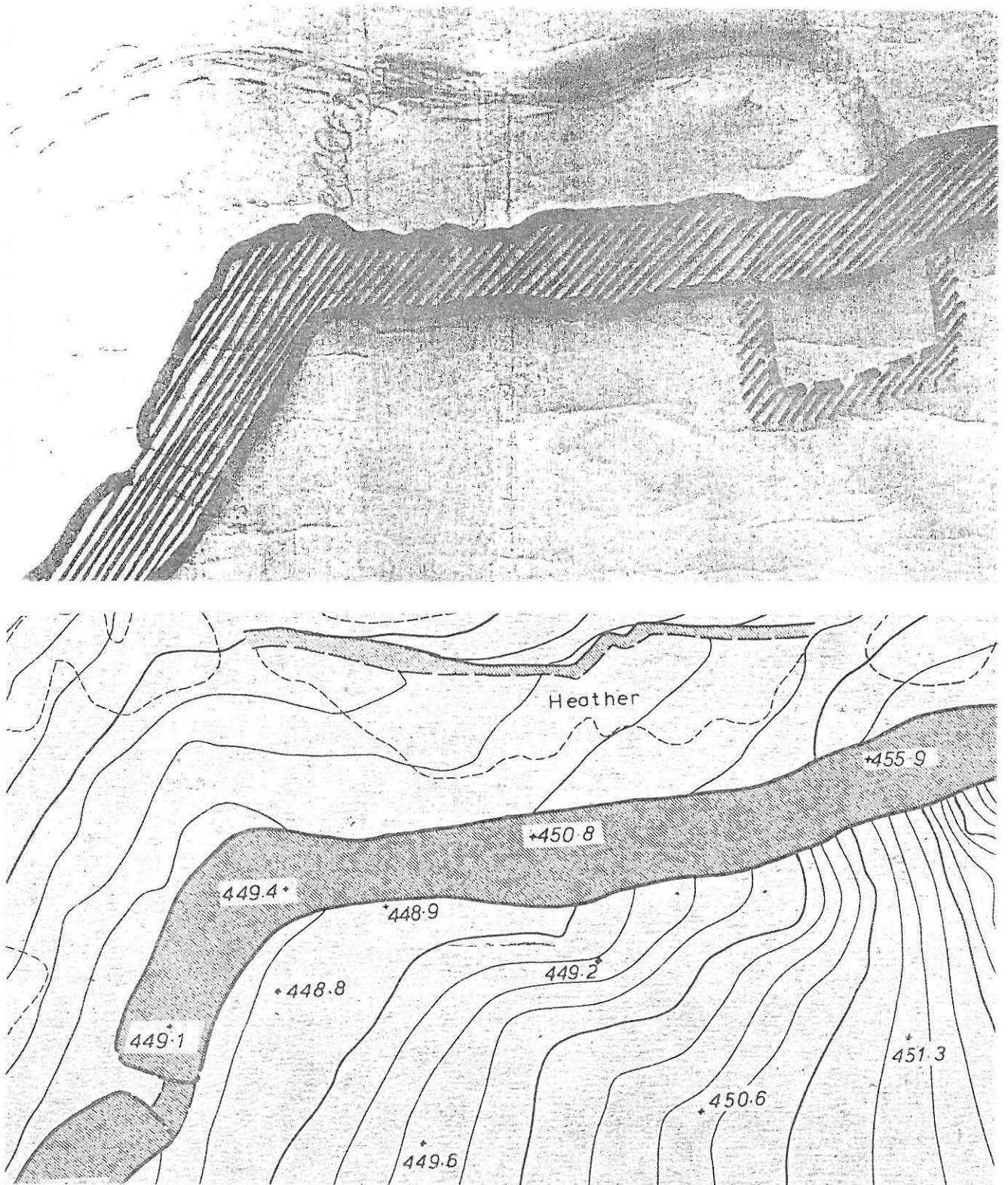


Fig. 6. The west corner of the main wall, surveyed (top) by Hughes ca. 1906, and (bottom) by Plowman Craven in 1980.

material would need to be taken down, but it quickly became clear that much of the *in situ* facing was also unstable, having tilted forward when the wall slipped (Plate 31), and these stones were also removed after they had been marked.

Plates 31 and 32, and fig.7 show the basal courses after clearance of loose material; Plate 31 in particular shows that the boulders on which the wall was built had tilted forward: presumably this was the main cause of the slippage. Voids between the back edges of the facing stones and the wall core (fig.7) show that the core had remained in place when the wall slipped, but rather than attempt to rebuild the wall on the original alignment (which could not be re-established for certain), it was decided to rebuild on the line to which it had slipped. To emphasise that this was not the original line the rebuilt stretch was not bonded to the extant wall to the north-east: stone 24 (see fig.7) and those above it were left protruding up to 0.3m from the wall line to the north-east (Plate 33, centre of frame).

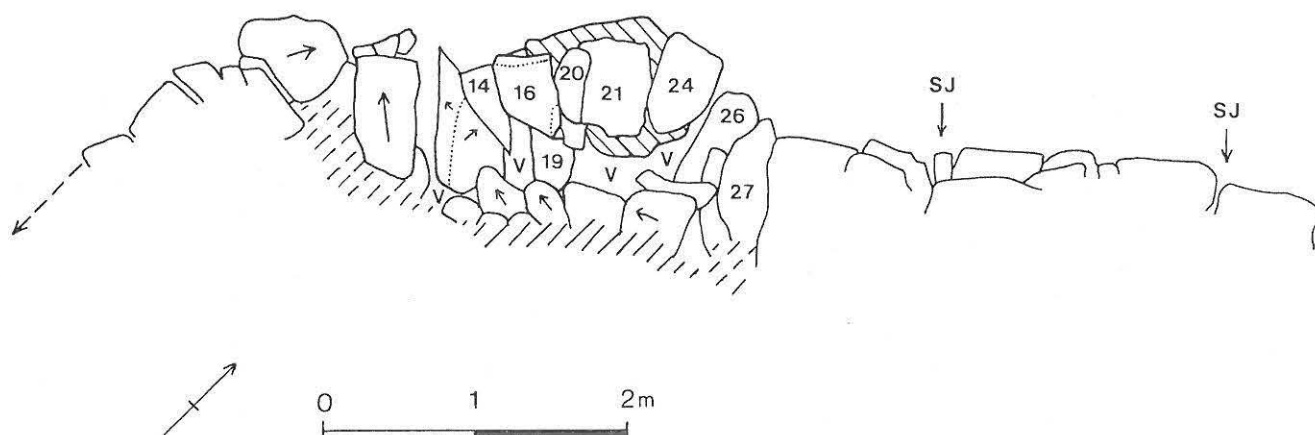


Fig. 7. Collapse D after removal of tumble and unstable masonry. V = void.

The wall was rebuilt to a height of 1.6m above the scree on the north-east and graded evenly down to 1.25m on the south-west, in order to match the height of the extant masonry to either side. The original face here presented more flat-faced stones than are usually found in the wall, and this was reflected in the rebuilding (Plate 34 and compare Plate 30).

Main Wall D-E.

This stretch of wall, some 19 metres long, is one of the best preserved around the fort. Before conservation the outer face stood up to 3.3m high, and much of the parapet survived (fig.14). The inner face was also well preserved although parts of it had collapsed, and unweathered stones suggested that there had been some rebuilding (of poor quality) in recent times. Close examination of the entire stretch revealed eleven points requiring attention: four on the inner face (D3 - D6), five on the outer face (D1, D2, D7 - D9) and two lengths of parapet (D10

& D11). These are dealt with individually below.

During the conservation of this wall two features were recorded in the outer face which deserve particular mention. Roughly midway along this stretch is a rough line of large stones, some 10 metres long and about 1.25m above ground. The masonry below this line appears to be smaller and more regularly laid than that above, suggesting that here there were two stages of building, with a levelling course between them (Plate 35).

The most important discovery along this stretch of wall was a blocked-up entrance, close to the west corner of the fort. Two phases of entrance are visible. The more obvious is the later, marked by two straight joints, 1.8m apart, running from top to bottom of the wall (Plate 36 to the right of the scale). The positions of these straight joints are marked on figs.7 and 14.

Less clear (indeed only noticed towards the end of the season) is the evidence for an earlier, wider entrance. Approximately 1.0m to the north-east of this entrance the lower half of the wall face curves inwards and then turns sharply outwards again (Plate 36 to the left of the scale and Plate 37). When examined closely this inward curve, with a face of large stones, could be traced into the core of the wall for at least a metre. The curve only reaches some 1.5m above the ground: above this there is no visible joint and the 'kink' in the wall line is smoothed out, perhaps suggesting that the upper part of the original entrance had collapsed, or was dismantled, immediately before it was narrowed. Alternatively it might be that the original entrance never stood any higher than it does now, as the top of the original passage is approximately level with the 'levelling course' of large blocks described above (see Plate 35: the earlier entrance passage is to the right of the scale). In that case two phases of wall construction are indicated: the earlier entrance being contemporary with a low wall of comparatively neat build, succeeded by a raising of the wall height with more rough stonework and a narrowing of the gateway.

It should be stressed that the evidence for two phases of construction (both of the gateway and of the wall) is only to be found on one side of the entrance, and only on the outer face. To the south-east of the gate the wall was partly ruined (Collapse D, above), while on the inner face there was no trace of any gateway at all (Plate 44) although again the wall had partly collapsed (D4 & D5, below).

Collapse D1 (fig.14).

At the point indicated on fig.14 the front of the wall dropped sharply by 0.4m (Plate 35, centre of frame). To protect the *in situ* stones immediately to the north-east of this point, large heavy stones were added to grade the wall top gently down towards the south-west. This was achieved usually without moving the existing masonry, although one or two small loose stones occasionally had to be replaced to ensure stability. There was no

south-west edge of this 'collapse': the added masonry tailed off into the general work of securing the edges of the wall tops. Plate 38 is marked to indicate the new masonry.

Collapse D2 (Fig.14).

A minor spill at the front of the rampart, about 1.0m from the south-west edge of Collapse E. The spill was 2.0m in width, and at its centre 0.4m of masonry had been lost (Plate 39, left half of the frame). Filling this gap was a straightforward matter, and only two or three small stones needed to be removed in order to fit large heavy headers. Plate 40 shows this spill after repair.

Collapse D3 (Fig.14).

Here a stretch of the inner face, 2.4m wide at the top, appeared to have been rebuilt, probably in modern times judging by the number of unweathered stones. This rebuilding was loose, and much of it had collapsed (Plate 41). All unstable masonry was therefore stripped away and the wall rebuilt from the base up. Before dismantling, those stones which appeared to be original were numbered, as indicated on Plate 41. Stones F, G, H, I and K were removed, while stone E was moved to a more stable position about 0.1m to the right. Plate 42 shows this stretch after clearance of the collapsed rubble.

The wall was rebuilt to a height of 1.3m, matching the face to either side (Plate 43). The numbered stones which had been removed were replaced as close to their original positions as possible, although stone I was tilted and moved 0.2m to the left, and stones F and G were turned on their sides.

Collapse D4 (Fig.14).

This was a short stretch of inner face close to the west corner of the fort wall. Again it appeared from the lack of weathering on the stones that there had been some recent rebuilding here, and again the rebuilt masonry was loose, some stones having fallen already (Plate 44).

As the stones in this stretch were clearly not *in situ* they were not numbered, although original masonry to either side was marked in case it collapsed during conservation work. A 2.1m length of the upper part of the wall was dismantled, down to 0.7m above ground. The wall was then rebuilt 1.2m high. As with D3, there was a shortage of large stones in the dismantled stretch. One very large block was found half-buried in the turf at the foot of the wall, and was used in rebuilding, but otherwise the temptation to bring in large stones from elsewhere was resisted (Plate 45).

Collapse D5 (Fig.14).

Immediately south of D4 was another stretch, 1.55m long, the upper half of which was loose and again apparently not original

work (Plate 44). Although the wall had not yet collapsed there was a clear danger of this happening. The top 0.4m of the wall (to 0.7m above ground) was therefore taken down and the stones were replaced in a more secure arrangement (Plate 46). The heaviest stones were reserved for the uppermost course to aid stability.

Collapse D6 (Fig.14).

This was a minor patch of loose masonry at the top of the inner face of the wall, 0.5m wide and 0.25m deep (Plate 47). Six or seven stones were removed and replaced more securely, the heaviest stones being placed on top (Plate 48).

Collapse D7 (Fig.14).

Here some stones had been lost from the top of the outer face of the wall, leaving a gap 1.0m wide and up to 0.4m deep (Plate 49). This gap was filled with large heavy headers. No original masonry was disturbed (Plate 50: the scale runs down the centre of the added masonry).

Collapse D8 (Fig.14).

At the top of the straight joint marking the north-east corner of the blocked entrance the top of the outer face dropped by 0.3m, leaving *in situ* headers at risk of being displaced (Plate 36, immediately above the scale). Large stones were added here to smooth out this drop. 0.5m to the south-west of this was a small patch of loose masonry 0.9m wide and 0.4m deep. The stones here were too small to provide a secure edge to the wall top and were therefore removed and replaced with larger stones. Plate 51 shows the line to which this loose masonry was cleared and Plate 52 shows the gap after rebuilding.

Collapse D9 (Fig.14).

This minor spill was directly above the south-west corner of the blocked entrance. Some stones had already fallen and as with D8 the stones left on top were too small to secure properly (Plate 53). These were cleared away leaving a dip 0.6m wide and 0.25m deep into which large headers were placed. The result is shown on Plate 52.

Collapses D10 & D11 (Fig.14).

Much of the parapet along this stretch survived. A 16 metre length could be traced, running south-west from Collapse E, with an average height of 0.5m, but in places standing up to 1.0m high. About half of this was in good condition, although there had apparently been some rebuilding in recent times, judging by the unweathered masonry (see Plate 54). Two long stretches amounting to approximately half of the total length required major conservation works.

The first, Collapse D10, measured 5.8m in length. 2.5m of this, immediately above Collapse D3, had collapsed completely (Plate 54) and a further 1.0m was recent masonry of poor quality. The rest of this stretch was loose and unstable, most stones having slipped out of position. To prevent further deterioration of the better preserved sections to either side, therefore, the whole length was dismantled and rebuilt. As most of the stones were already displaced they were not numbered before work began. As dismantling proceeded, though, a watch was kept for firm *in situ* stones, which were marked to prevent their accidental removal.

Plates 55 and 56 show the parapet after clearance. Four stones (marked 'x' on the photographs), all deeply embedded in the core, with their ends roughly on the line of the parapet face, provided a useful guide for rebuilding. During rebuilding care was taken to copy the style of the original work to either side, although it took two attempts before a satisfactory result had been achieved (see Plates 57, 58 and 59).

Collapse D11, the second stretch conserved, was about 3 metres south-west of D10. A 2.5m length of parapet had collapsed (Plate 60, between the scales). To the north-east of this the parapet face stood 0.6m high and was still in good condition: to the south-west the parapet was no more than two courses high and faded away altogether about 1.0m farther on.

The rubble was cleared away, revealing an 'island' of solid masonry, about 1.0m long and 0.3m-0.4m high, halfway along the gap (Plate 61: these stones are marked 'x'). To either side of this were two narrow gaps which had to be built up from wall walk level.

The cleared rubble was used to rebuild the face, the height being graded down towards the south-west, from 0.6m to 0.4m. Plate 62 (to the right of the scale) and Plate 63 (to the left of the central scale) show the result.

Collapse E. (figs.8 & 14).

At this point the wall climbs steeply over rising ground, turning a few points to the north and then back towards the east as it skirts a rock outcrop within the fort. Griffiths makes no specific mention of any collapsed stretches on this part of the wall, noting only that from the west corner of the fort to the north-west entrance 'the outer face is well preserved, the inner less so'. Dallimore records the width of Collapse E as 2.0m.

i) The outer face.

Before conservation (Plates 64 & 65) 2.5m of the outer face of the wall had collapsed completely. Much of the upper part of the wall to the north-east of this had also collapsed, the wall top rising only gradually for 1.0m-1.5m (above stones P, O, N on fig.8) before levelling out, and much of what remained here was either loose and unstable, or obviously displaced. Those stones

which appeared to be approximately *in situ* but which had to be relaid were first marked. The standing wall at the south-west edge of the collapse was also marked, but in the event the stones here proved to be stable and it was not necessary to remove any of them.

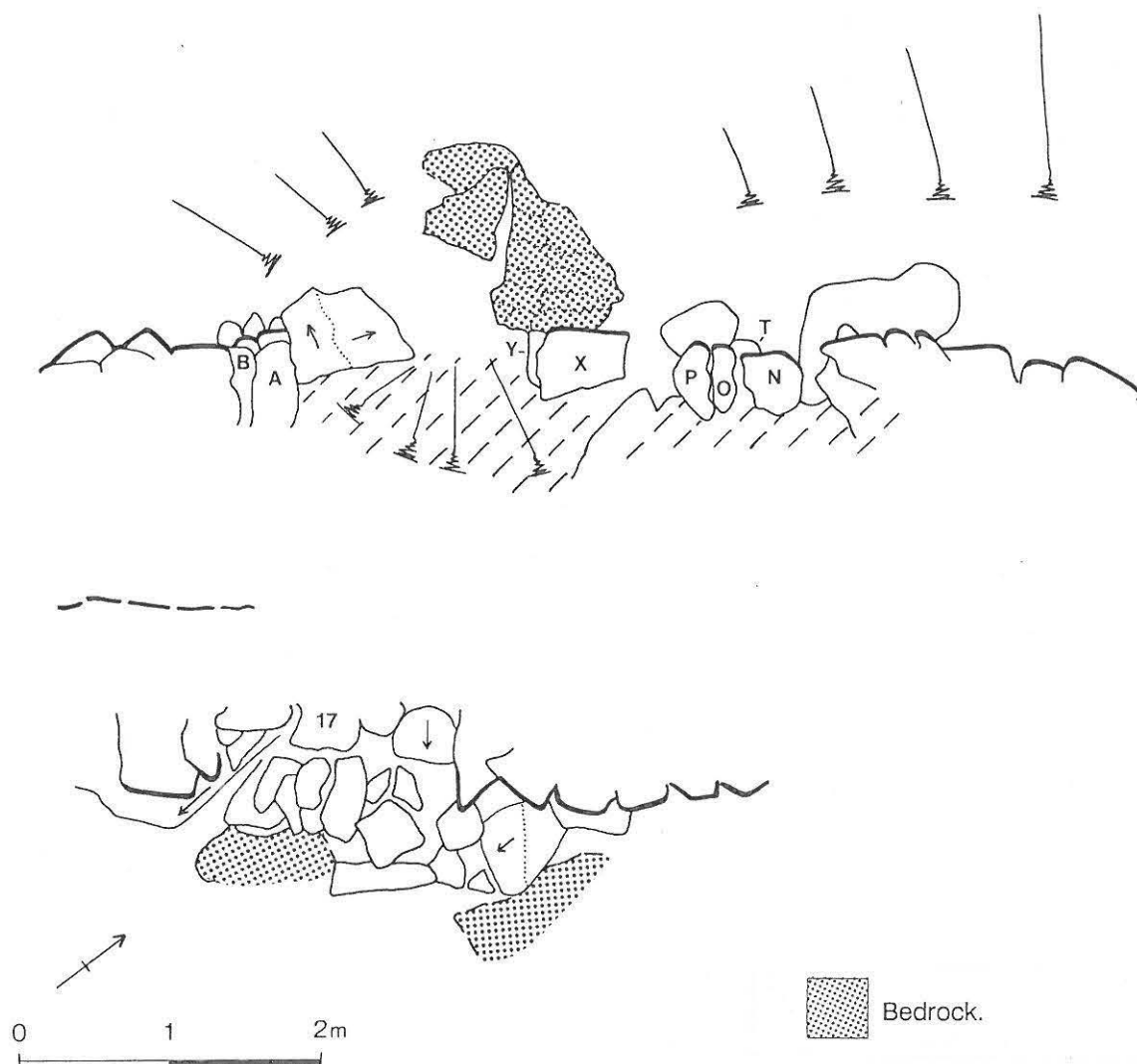


Fig. 8. Collapse E after removal of tumble and unstable masonry.

Plates 66, 67 and 68, and fig.8 show the area of the collapse after removal of the fallen rubble. In the stretch between stones A and P on Fig.8 only two stones remained which appeared to be part of the wall face (marked X and Y on the plan and in the plates). The wall had been built across several large boulders, and it was perhaps the irregular surfaces of these which introduced a weakness into the construction, causing the collapse. On one of these boulders presented a difficulty when rebuilding: at the south-west edge of the gap, below stone A, the upper surface of a tall boulder sloped outwards, making it impossible to build headers directly onto it. The problem was solved by 'bridging' the top of this stone with one long slab (see Plate 69).

Between this boulder and the outcropping bedrock it had not been possible to clear enough core material to allow the building of a vertical face from the base upwards without risking further collapse. The basal course of the rebuilt wall was therefore laid ca. 0.4m forward of the line between stones X and A, and for the first metre above this the new masonry was battered so that the upper part of the wall was aligned correctly with the original. The wall was rebuilt to the height of the extant walling to either side (Plates 69 and 70).

ii) The inner face.

Immediately behind Collapse E about 1.5m of the inner face had collapsed. To either side of this the wall face, though roughly built, was secure (Plate 71). After the collapsed rubble had been cleared away two possible lines for the inner face emerged (fig.8). The first was set about 0.5m back from the wall face to either side, although apart from one large flat faced stone (stone 17: the scale is leaning against it in Plate 72) this line was vague in the extreme. The second possible line was slightly forward of the line of the extant wall, and consisted of a row of flat headers lying on or between points of outcropping bedrock. These headers have been partly uncovered in Plate 72 (marked 'x'). The possibility was considered that if the line through stone 17 was accepted, these headers could have been the base of a step or ramp leading up to the wall top, but this was no more than speculation, and as there did not seem to be anything but randomly arranged core material beneath stone 17 the row of headers was accepted as the most likely indication of the wall line. It may be that these headers had been placed to level off the ground before the construction of the wall.

During rebuilding, the largest stones from the cleared debris were used for the facing, to blend as far as possible with the original work. The result is shown in Plate 73.

Main Wall E-F.

This stretch of wall measured about 15m in length. The outer face was generally about 2.0 -2.5m high from Collapse E to E3, rising to a maximum of 3.2m as the ground level dropped towards Collapse F. The inner face was up to 1.3m high, although where the wall was built against an outcrop the wall did not rise above ground level, and there was no evidence to suggest that it had ever done so. A 7 metre length of parapet could be traced along the wall top.

The wall was generally in good condition, and most stones appeared to be secure. Conservation work was necessary, however, in six places. A major collapse of the inner face had been repaired in the first season (Collapse E1), and one stretch of extant wall (E3) had to be dismantled and rebuilt. Two minor gaps at the top of the outer face were filled in (E2 and E4), two small buttresses were constructed against the outer face (E4 and E5), and a length of parapet was conserved (E6).

One feature in the outer face of this wall should be mentioned here. At Collapse E2 two straight joints, 0.9m apart at the base of the wall, 1.1m apart at the top suggested a blocked up entrance, perhaps another sally port (Plate 75). However the wall here was built against a rock outcrop, with the inner face no higher than ground level, and an entrance passage would have been very steep, perhaps improbably so, climbing by about 2.0m through the thickness of the wall, approximately 2.5m at this point. Nevertheless there is some indirect evidence from outside the wall that there was an entrance here. The track leading up from the outer gateway runs south for about 35 metres before swinging south-east towards the north-west gateway in the main wall (fig. 1). From this bend the line of the lower part of the track is continued by one of the low terrace walls on this side of the fort, which runs towards E2, fading out just short of it amongst the scree and tumble. On the uphill side of this terrace wall is a pronounced dip in the hillside, now overgrown with heather, which appears to be a hollow way continuing the line from the outer gateway. If this was a trackway its line is now obstructed by the wall flanking the path down from the north-west entrance, suggesting that the entrance at E2 may have predated the north-west gateway.

Collapse E1 (fig.14).

The rebuilding of this stretch of the inner face during the first season had left a number of loose stones on the surface of the wall walk. These were replaced with larger, heavier stones which would not be so easily dislodged.

Collapse E2 (fig. 14).

The upper courses of the wall had been dislodged here, leaving a gap in the outer face 0.6m deep and 1.1m wide. There were a number of slabs lying at the foot of the wall, with unweathered upper surfaces, suggesting that this minor collapse had occurred recently (Plate 74).

The obviously fallen stones were used to rebuild the gap to a height of about 2.0m, as shown in Plate 75. The heaviest available stones were used for the uppermost course, to prevent further collapse.

(See above for the possible blocked entrance here).

Collapse E3 (figs.9, 10 & 14).

The wall here had not collapsed, but was in danger of doing so. A section of wall 2.3m wide at the top, narrowing to 0.6m at the base, was therefore dismantled and rebuilt. Fig.9 and Plate 76 show this stretch before conservation.

The source of the problem was close to the base of the wall, where stone B (fig.9) appeared to have tilted forward, causing the wall to bulge. Stones C, D, H and F were all being squeezed



Fig. 9. Elevation of Collapse E3 before dismantling.

out (H and F were on the point of falling), and it appeared that only E and J, both very long headers, held the wall in place.

The lettered stones were removed first, in the hope that those marked with numerals could be left *in situ*, but it soon became clear that these were also unstable. On the north-east edge of the gap stone 2, a large slab set on edge (see fig.10 and Plate 77), was being pushed out by pressure from above, and there were similar problems at the south-west edge. The final extent of the dismantled stretch is indicated by the thick line on fig.9.

The wall was rebuilt to a height of about 2.0m, as shown on Plates 78 and 79. As usual the marked stones were replaced as closely as possible to their original positions, but many of these stones were too short to be replaced securely with their weathered side outermost. It is likely that poor quality work in the original construction, with few long headers being used, was the root cause of the wall's instability.

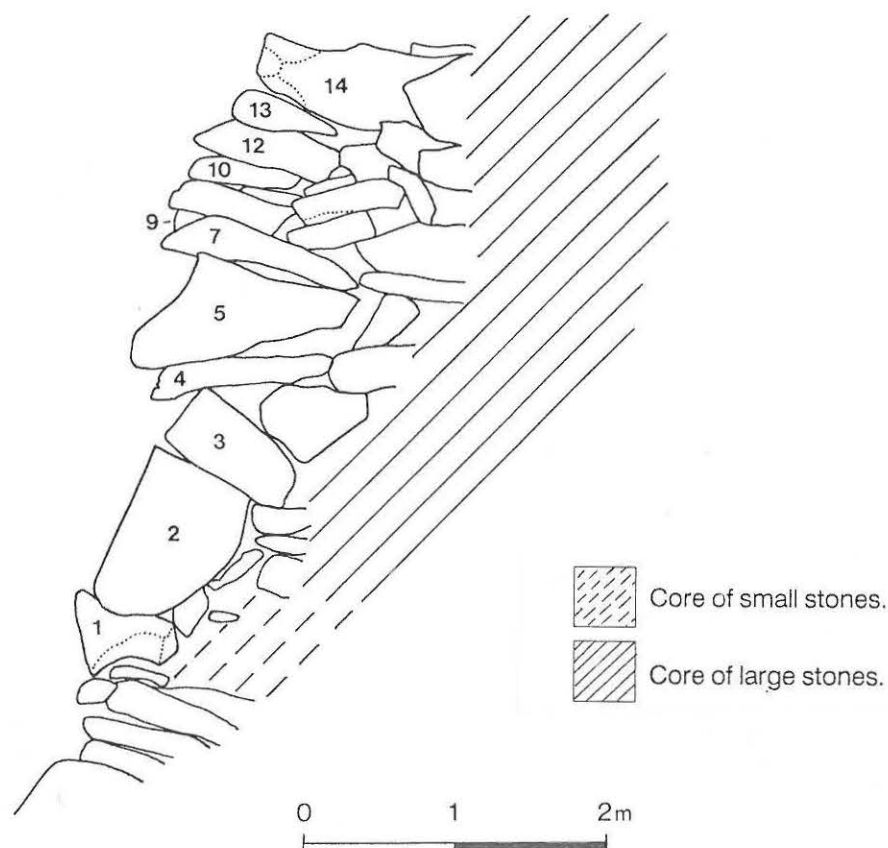


Fig. 10. Collapse E3. SW-facing section.

Collapse E4 (fig.14).

About 2.0m to the south-west of Collapse F stones had been lost from the top of the wall, leaving a dip 1.5m wide and up to 0.5m deep. Immediately below this there was a void at the base of the wall, and above the void a bulge had started to develop (Plate 89, at the right edge of the frame, and Plate 80).

The wall top was levelled up with large headers, and a buttress 0.5m high was constructed to fill the void and support the base of the bulge. Finally, a small gap in the wall face 0.9m above the ground (indicated on Plate 80), from which a facing stone appeared to have fallen, was filled with two stones. Plate 81 shows the result, the scale being in the centre of the repaired gap in the wall top.

Collapse E5 (fig.14).

To the north-west of Collapse E3 was another void at the base of the wall. Immediately above this a long slab had snapped in the middle, and there was concern that the wall might eventually collapse (Plate 82). One large stone was therefore pushed into the void to support the cracked slab, and this was disguised by placing weathered stones over it (Plate 83).

Collapse E6 (figs.11 & 14).

Above the repaired stretch of inner face E1 a length of the inner face of the parapet survived, but in poor condition. Before conservation it could be traced for about 7.0m, standing 0.5m high at most, although for most of its length it appeared as little more than a loose pile of stones with no clearly defined facing (fig.11a, Plate 84 - the nearer end of the parapet is behind the left end of the scale - and Plate 85).

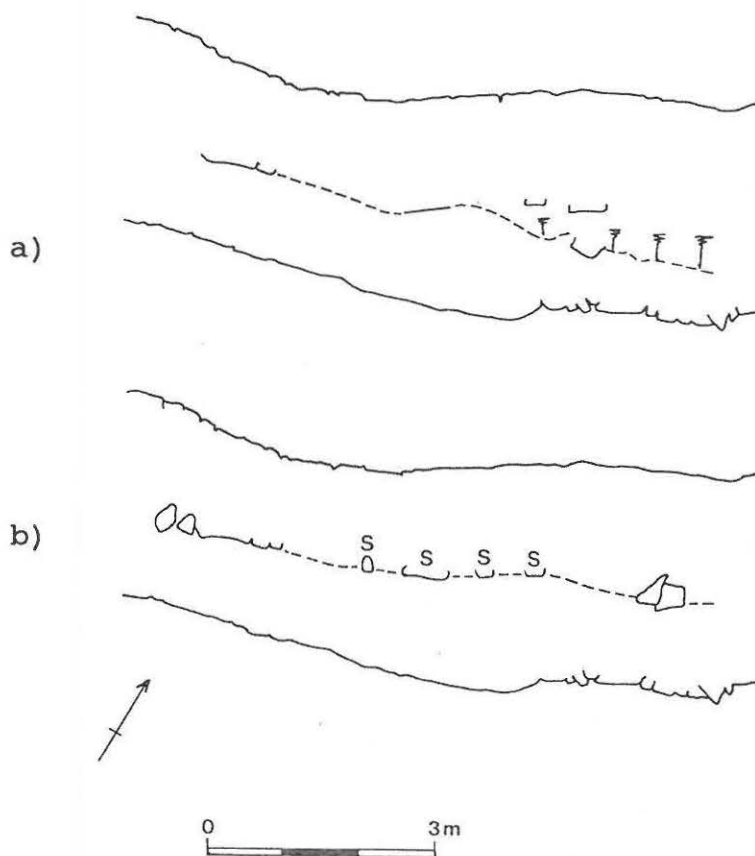


Fig. 11. Collapse E6: a) before conservation;
b) after conservation, S = *in situ* stone used to re-establish parapet line.

A decision was made to peel off the rubble in the hope that at least the lowest course of the facing survived *in situ*. Before this was done, stones at the south-west end which were clearly *in situ*, and other stones at the north-east end which looked to be displaced but were nevertheless secure, were marked to prevent their accidental removal. Between these no unquestionable evidence for the precise line of the parapet emerged. Four large solidly set stones, however, did seem to define a line in the expected position, three of them at the level of the wall walk, the fourth higher up, protruding from the core of the parapet. These are indicated on fig.11b (marked 's') and are also marked on Plate 86. As these stones were the best guides available, the cleared rubble was used to rebuild a parapet face on the line they described, copying the style of surviving stretches of

parapet elsewhere (fig.11b and Plates 87 & 88). This was an exercise in reconstruction rather than consolidation, but once the rubble had been removed there was no sensible alternative. It was certain that there had been an inner face to the parapet, and the line of the rebuilt masonry can vary by no more than a few centimetres from the line of the original.

Collapse F (figs. 12, 13 & 14).

i) The Outer Face.

Before conservation the outer face here had collapsed completely for about 3 metres, as noted by Dallimore (Plates 89 and 90). To either side of this the standing wall had slumped towards the gap, and was supported only by fallen rubble. It was clear that a considerable amount of this extant masonry would have to be dismantled as the rubble was stripped away, and these stones were therefore numbered before clearance began (Plates 91 and 92).

During clearance long stones, especially those with weathered surfaces, were stacked separately for use when rebuilding the wall face. Numbered stones were also kept separately.

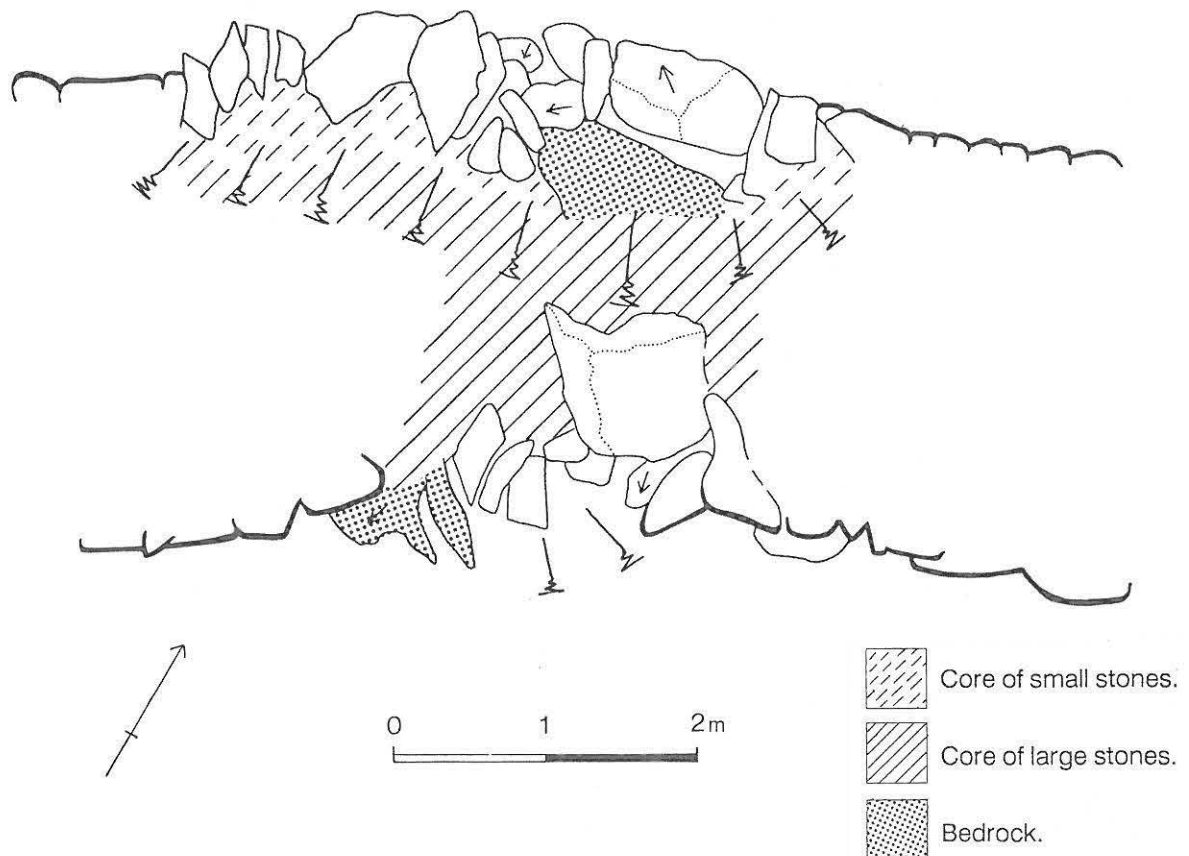


Fig. 12. Collapse F after removal of tumble and unstable masonry.

At the north-east edge of the gap it emerged that the face of the wall had slipped forward, leaving a void between the rear of the facing and the core (fig.13 and Plates 93 and 94). One very large stone at the base of the wall here slanted forward (see Plate 94, immediately to the right of the bottom of the scale), and it seemed likely that it had slipped from its original position, taking with it all the masonry above.

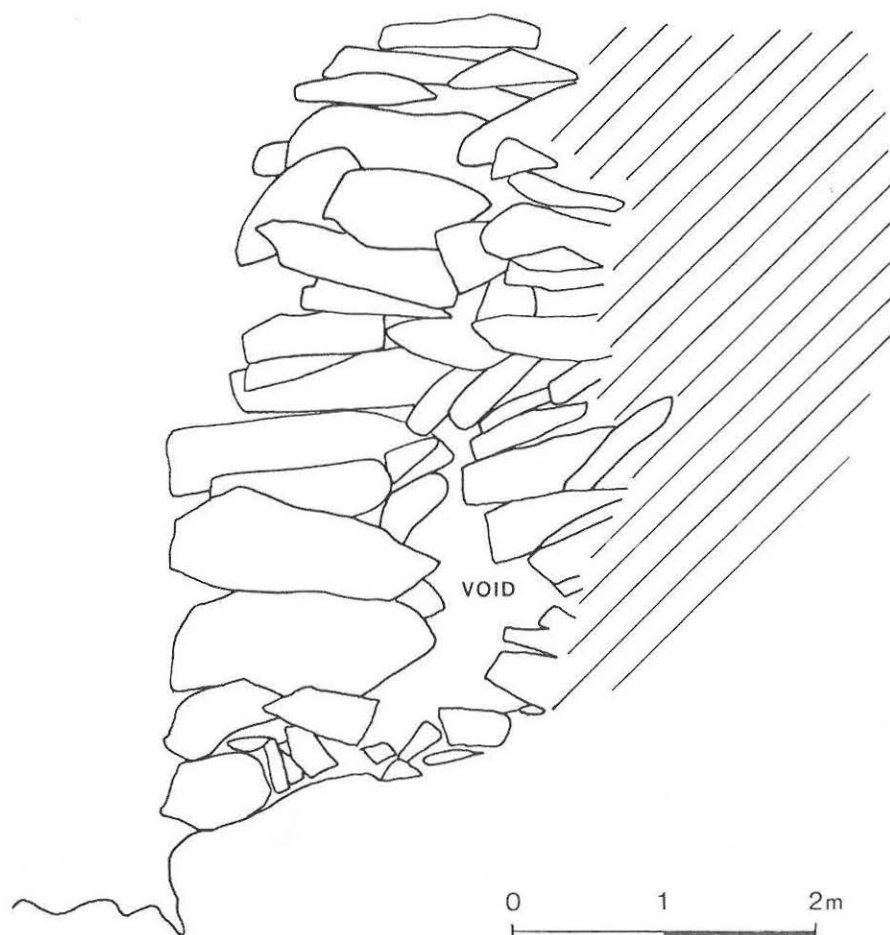


Fig. 13. Collapse F: SW-facing section.

In all a 4.2m length was cleared at the base of the wall, widening to 6.2m at the top. The core was removed to about 1.0m from the line of the facing. Only the basal course of the facing remained (fig.12 and Plate 95). Immediately behind this the surface of the bedrock was visible at about the same level. It was noticeable that the core towards the base of the wall was composed of much smaller material than higher up, where large stones (including one massive boulder) were piled loosely on one another leaving large voids in between (Plate 96). Presumably the small core material had filtered down through the voids.

Rebuilding was a straightforward task. Stones were relaid as headers (Plate 97) and regular coursing was avoided. Efforts were made to ensure that the numbered stones were replaced correctly,

but as with the other gaps repaired, large heavy stones were laid along the top edge of the wall. Plates 98 and 99 show the result.

ii) The Inner Face.

There had also been some collapse at the inner face (Plate 100). Originally it had been hoped that the fallen stones could simply be replaced, but as there was no adequate surface on which to rebuild it was decided to rebuild from ground level. Stones to either side were, as usual, marked before work began, and in the event it was necessary to remove only four of these (G, H, I & J in Plate 100). In all a 1.8m stretch of wall was repaired.

Bedrock again appeared at the base of the wall (see fig.12 and Plate 101, at the farther end of the scale). Next to this, in the centre of the gap, three headers with weathered front edges were assumed to indicate the original line of the wall, and were used as a guide for rebuilding. The wall was rebuilt to a height of 0.9m. Plate 102 shows the result.

Main Wall F-G.

From Collapse F to the north-west entrance (Dallimore's Collapse G) measured about 29 metres. Again, this was a well preserved stretch (Plate 103). In 1946 Griffiths noted that 'just before the NW gate is reached, the outer face stands 10 to 12 feet high (3.0-3.6m) and the inner face 6 feet high (1.8m). The outer face is well preserved, the inner less so'. Dallimore measured the average height at 3.0m. Measured in 1989 and 1990 the wall rose from a height of 2.25m immediately north-west of Collapse F to a maximum of 2.8m between F1 and F2 (see fig.14), before tailing off to about 1.8m high towards the entrance. The inner face nowhere stood more than 1.5m high, and was generally less than 1.0m. There was nothing to suggest that much of the wall had been lost since Griffiths' survey: in fact as the parapet survived intermittently (fig.14) it would appear that the wall still stands close to its original height. The thickness of the wall was about 2.5-3.0m.

In two places the wall showed signs of rebuilding. On the inner face, between collapse F7 and Hut 2, a 1.9m long stretch of the wall top had been patched with small coursed masonry (Plate 116). The character of this work is so unlike the original wall that it is probably of recent date. The other apparently rebuilt stretch was on the outer face at Collapse F2, where a U-shaped line could be traced, starting at the top of the wall at each side of the collapse and extending almost to the base of the wall (Plate 104). The masonry within this line was more ragged than to either side, and the poorer quality of its construction was reflected in the need for conservation work at both top and bottom of the wall face. This stretch, though, did not appear to be modern work, and probably dates from the occupation of the fort. These were the two most noticeable examples of rebuilding. It was possible, with the eye of faith, to identify other vague features within the wall face: for example beneath Collapse F3 (Plate 106, left of

frame) there may be a rather ragged straight joint, perhaps where two gangs of builders met, but within the current project there is not the time to examine and record all these in detail.

So far about 18 metres of this wall have been conserved, as far as F1. Work on the north-west entrance has been left until a detailed survey of the remains has been undertaken.

Collapse F1 (fig.14).

This collapse was repaired during the first season. In the second season additional large heavy stones were placed on the front edge of the rampart to protect the new work.

Collapse F2 (fig.14).

The evidence that the wall here had been repaired before, probably in antiquity, is outlined above. Before conservation there was a dip in the top edge of the wall, 2.4m wide and up to 0.5m deep (Plate 104). Below this, 0.5m above the ground, the wall face had started to bulge outwards.

The gap at the top was filled with large headers. In order to place these securely some small stones lying within the gap had to be removed. Many of these stones, outlined on Plate 104, were probably not *in situ*, but had slipped into the gap from the wall top.

At the base of the wall a buttress 0.8m wide and 0.7m high was constructed using four very large stones, and at the same time occasional gaps in the wall face were plugged with single stones. Plate 105 shows this wall after conservation. The buttress is to the right of the scale.

Collapse F3 (fig.14).

Again work was needed both at the top and at the foot of the wall. At the top stones had fallen leaving a gap 1.4m wide and 0.25m deep. There was a void at the base of the wall and about 1.0m up was a bulge in the wall face (Plate 106).

Repairing the top of the wall did not require the removal of any stones, and six large headers were enough to fill the gap. At the base of the wall long stones were pushed into the void (Plate 107) and above these a buttress 0.9m high was constructed against the base of the bulge. Plate 108 shows F3 after conservation.

Between F3 and Collapse F further buttressing was occasionally necessary, and the need to disguise these buttresses by tailing them off gradually resulted in different buttresses merging to form a single structure 5 metres long and (apart from below F3) 0.5m high. Loose stones were used to disguise this buttress and blend it in with the scree lying at the base of the wall (Plates 109 and 110).

Collapse F4 (fig.14).

On the inner face, close to the west corner of Hut 2, a 1.3m stretch of wall had collapsed (Plate 111). Only the lower 0.25m was firm enough to be left in place: above this all stones were already displaced and were therefore removed without being marked. The wall was then rebuilt (using the cleared rubble) to a height of 0.8m (Plate 112).

Collapse F5 (fig.14).

About 2.5m north-west of buttress F2 was another void at the base of the wall (Plate 113). This was filled with large stones and the original masonry above it was supported by constructing a small buttress 0.5m high (Plate 105, to the left of the scale).

Collapse F6 (fig.14).

Another minor spill from the inner face of the wall, immediately behind Hut 2. A gap 1.2m wide and up to 0.5m deep had developed. Tumbled and displaced rubble was removed down to 0.2m above the top of the hut wall, as indicated on Plate 114, and these stones were used to rebuild the face to the height of the wall on either side (Plate 115).

Collapse F7 (fig.14).

North of Hut 2 and immediately behind Collapse F1, a stretch of the inner face was in danger of collapsing. Plate 116 shows this stretch before conservation. Stone P, at the base of the wall, had slipped outwards, taking with it all the stones above. This had created a gap, leaving the wall core exposed and destabilising the stones on the other side of the gap (stones D down to V). Supporting the original masonry by inserting pinning stones was discussed, but was ruled out as impracticable, and the decision was taken to dismantle the wall and rebuild it.

The stones to be removed were marked as in Plate 116, and the wall was taken down to ground level (Plate 117). When rebuilding care was taken to replace numbered stones as close as possible to their original position, although this was not always possible, and some stones had to be replaced upside down to ensure stability (Plate 118). the repaired stretch measured 2.0m across at the top of the wall, narrowing to 1.7m at the base.

Main Wall H-I.

Conservation works were conducted at four points on this length of wall, all in the vicinity of Hut 78, as marked on fig.4. The wall here stood to 3.0m high, and immediately behind Hut 77 was some 4 metres thick. Behind Huts 78 and 78A was a well preserved stretch of parapet, up to 1.2m high and about 12 metres long, fading out gradually to the south-west. Part of this had collapsed (Collapse H2). Two stretches of the inner face were dismantled and rebuilt: H3, where the face had slumped forward

and appeared likely to collapse, and H4, where the wall had already collapsed. Further work on this stretch of wall is planned for the third season.

Collapse H1 (fig.4).

Along the front edge of the wall here, for about 4.0m, there were signs of rebuilding, which to judge from the unweathered uppermost surfaces of the stones (see Plate 119), was of recent date. Long stones had been laid as stretchers, that is along the wall line, creating a length of 'parapet' only one stone deep. This work was dismantled and the stones replaced as headers.

Collapse H2 (fig.4).

Above the north corner of Hut 78, a section of parapet had partly collapsed (Plate 120, behind the left hand scale). To either side of this the parapet stood over 1.0m high, and to protect these surviving sections the collapsed parapet was consolidated. It was hoped that part of the original parapet face would survive beneath the rubble and that this would provide a foundation for rebuilding. However as the collapsed stones were cleared it became apparent that nothing remained of the facing (Plate 121: the scale lies along the probable line of the parapet face). Rather than rebuild from scratch the rubble was simply replaced as securely as possible, large stones being placed over it to hold it in place (see Plate 124, to the left of the left hand scale).

Collapse H3. (fig.4).

At the north corner of Hut 78A the inner face of the main wall had slipped and partly collapsed. In Plate 122 stone L threatened to slip further, bringing with it the wall above. It was clear that consolidating the wall as it stood was impracticable, and after the masonry had been marked, as in Plate 122, the wall was dismantled. The stretch cleared was 3.0m wide at the top, narrowing to 2.0m at the base (Plate 123). Most of the numbered stones were replaced in their correct positions, but the two largest blocks, stones M and L, could not be replaced correctly if the rebuilt wall was to be secure, and were instead relaid upside down (Plates 124 and 125).

Collapse H4 (figs.4 & 5).

At the junction of the north-east wall of Hut 78 and the main fort wall, the inner face of the latter had completely collapsed. The outer face of the hut wall was also collapsed and spread (Plate 120, between the left hand and central scales).

The rubble was cleared away (Plates 126 and 127) and large solidly set stones were uncovered which provided a convincing, if irregular, line for the main wall (shown bold on fig.5). In front of this line was a confused mass of stones, but no trace was found of the facing to the hut wall. The quantity of core

material to the south of the dotted line on fig.5 might have indicated a possible position for the face, but it was hardly convincing. It was not even certain that the hut wall had ever had an outer face: in many of the other huts the wall on the uphill side is no more than an inner face revetting the scree behind. Rather than invent a face, therefore, the exposed core material was simply protected by covering it with large heavy stones, wedged together to keep them in place.

Before the face of the main wall was rebuilt, attention had to be given to the standing wall to the north-east of the gap, the stones of which were loose and unstable. Some dismantling was necessary, before which stones were marked as shown on Plate 128. The face was then rebuilt on the line shown on fig.5, the top of the wall being graded down to the south-west to meet the top of the north-west wall of Hut 78. Numbered stones were replaced as close as possible to their original positions (Plate 129).

Wall Capping.

There has been much discussion throughout the project about the most appropriate method for securing the wall tops. Experiments on the hut walls at the end of the first season suggested that the best approach would be to lock upright stones together on top of the wall core, thus producing a rough surface which would discourage visitors from walking on the walls. The uneven surface produced would also leave open the question of the original height of the walls.

At the beginning of the second season it was envisaged that the centre of the wall tops would be secured in this way, and that large heavy stones, too heavy to be kicked off accidentally, would be laid along the edges of the walls.

The first attempts at this were not encouraging. There was no difficulty in ensuring that the edges of the walls were capped with large heavy slabs: usually the original stones were sufficient, and where these were not, suitable stones were brought up from the scree and tumble below the wall. When it came to locking the top of the core, however, it was quickly realised that whereas within the huts conserved during the first season there was an abundance of small stones left over from the work on the wall faces, the stones on the surface of the main wall were generally much larger, and of irregular shape, which made it impossible to lock them tightly together. The masons found that in order to lock one small patch of wall top, it was necessary to rob suitable stones from a much wider area. Inevitably it would have become necessary to bring in small stones from elsewhere. A different technique was therefore tried. This involved burying long stones vertically in the wall top so that their tips protruded slightly above the surface. If placed every one or two metres these would trap the stones between them, making it unnecessary to lock each single stone in place.

Initial experiments in this method were tried behind Hut 77, and also between collapses F1 and F7. The technique did not, however, meet with unqualified approval, and further attempts were made at the original locking technique. By the end of the second season those areas hatched on fig.14 had been completed (see Plates 130 and 131). In order to do this large quantities of small stones were collected from the scree within and without the fort. Most of the stones were secured, but the masons warned that they might not remain in place for long.

It may be that further consideration needs to be given to this aspect of the project. In particular it is questionable whether locking the stones together is desirable.

In the first place, it has been noted above (see p.7) that visitors rarely walk along the wall tops, partly because of the uneven surface, covered with loose masonry. If this surface is consolidated the result will be to encourage visitors onto the walls, leading to maintenance problems as settlement of the locked masonry allows stones to come loose and be kicked out of position. Secondly, assuming an average wall thickness of 3 metres, and a total length of 650m for the main rampart, there are some 2000 m² of wall surface to be consolidated. Obtaining enough small stones for this job will lead to large scars being created on the scree within and without the fort. Finally, the appearance of the fort will be greatly changed by consolidating the walls in this way, and there is a risk that much of the 'wildness' which in other respects the Conservation Project has taken such pains to preserve will be lost.

This is clearly an aspect of the project which will only be resolved after further discussion and experimentation.

Marking the new work.

In order to distinguish new stretches from the original walls, stonework replaced or added during the second season was discretely marked. A 1300 R.P.M. hammer drill was used, with a 10mm bit. Holes were not drilled in every new stone, only in stones down the edges and along the base of each new stretch: this should be sufficient to enable anyone not involved in the project to identify the line from which each new stretch was built.

Holes were drilled approximately 10mm deep. The drill cut easily into the stones to this depth, but the core of each slab seemed to be considerably harder than its outer skin, and attempts to force the drill deeper were abandoned because vibrations threatened to shake the wall loose.

It is unlikely that rebuilt sections will collapse, or that archaeologists in the future would wish to excavate these stretches of the wall, but to make clear the extent to which the core of the wall was cleared during conservation works, lengths of coloured plastic tape were laid down before rebuilding began.

These tapes were completely hidden from view when rebuilding was completed.

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