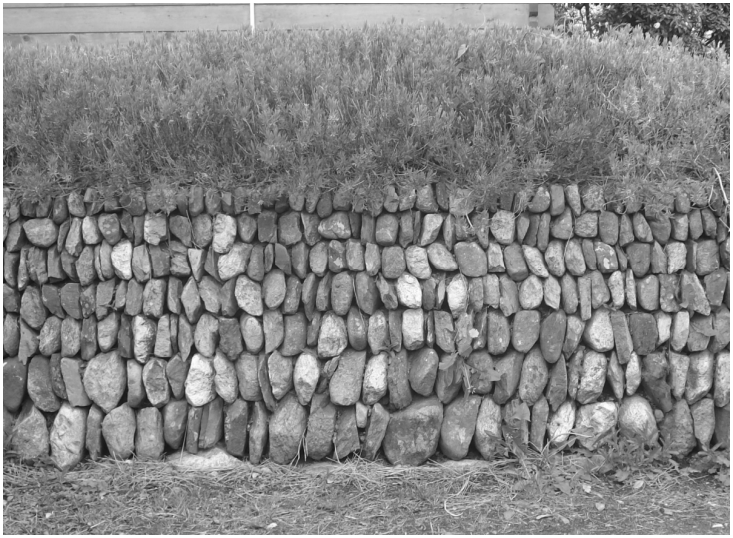
DRY STONE WALLING ASSOCIATION
OF GREAT BRITAIN

TECHNICAL SPECIFICATIONS FOR WELSH CLODDIAU



SPECIFICATIONS FOR WELSH CLODDIAU

The following notes have been prepared to assist professional decision makers (local authorities, architects, civil engineers, landscape designers, etc.) in drawing up specifications for the construction of "cloddiau" (single – "clawdd") - stone-faced earth banks built to traditional Welsh patterns. Before giving guidelines, several points should be understood:

1. With any type of stonework the difference between good and bad work can be particularly marked. It is essential to retain the services of a qualified waller, particularly with prestigious projects. The DSWA operates the only tiered, national, practical skills certification scheme.

2. The DSWA believes from long experience that the tendering process should consider build quality and hence length of life, as well as the price - which alone does not guarantee quality workmanship. The informed monitoring of the quality of workmanship during construction is of paramount importance if a suitable standard is to be achieved.

3. The patterns of cloddiau vary considerably from one locality to another. Wherever possible, the type of stone and the style of building should be matched to the tradition of the immediate area.

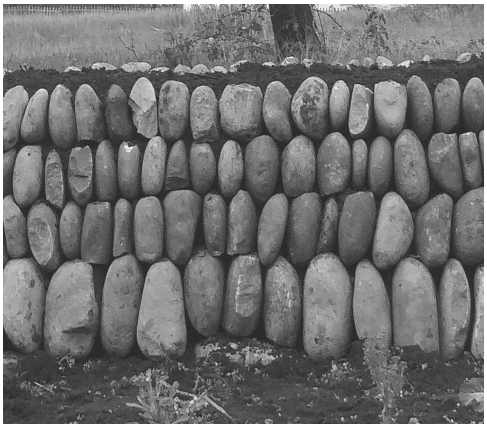
4. The waller can only work with the stone supplied. If a particular style is required, then material suitable for that style must be available.

5. Stone supplied to the waller must be clean. Contractors undertaking the dismantling of existing structures should do so by hand, if at all possible.

GENERAL NOTES

Within construction the single most important factor in determining the pattern of cloddiau is rock type.

The most common form is built with the stones "pitched" or "book-ended" (that is set vertically on edge, with the length of the stone running into the clawdd), in more or less even courses, with the course height gradually diminishing with each additional layer.

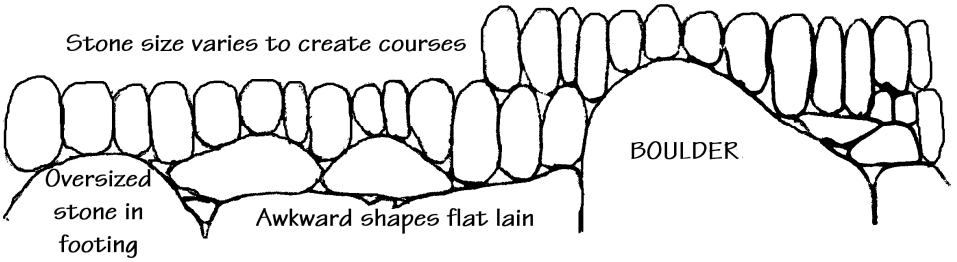


A clawdd is not a wall filled with soil. It is an earth bank with a stone casing which protects the bank from erosion by stock and the weather. The compaction and integrity of the core is crucial to its longevity.

Even when the clawdd is built with "flat-layed" stone, rather than pitched, it is not simply a dry stone wall with an earth infill. Cloddiau are considerably wider than dry stone walls to enable adequate compaction of the core. In addition the

building stones are set more or less exclusively length in, and primarily secured with wedges rather than soil.

Random-built pitched cloddiau can also be found in areas of shale or similar rock.



Where large boulders are used, the clawdd is often built random between the boulders, often to a relatively even height and then finished with two or more courses of pitched stone.

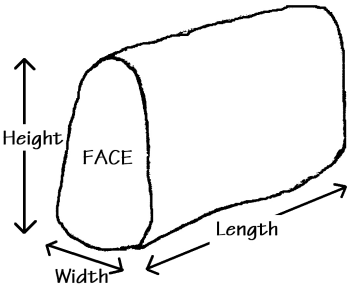
GUIDELINES

1. Dimensions: There are no set dimensions for a clawdd, although the majority are less than 1 metre in height. Generally, cloddiau have a batter of 1 in 4, which can be decreased to 1 in 6 where the majority of stones have a length three times their face height. Cloddiau above 1 metre in height should have a batter of not less than 1 in 5, or be built with a concave face.

The width of cloddiau vary. The top width is wider than that of a dry stone wall to enable hedge planting, the stacking of additional courses of turf or dead wood, and to facilitate moisture capture. A rule of thumb for a one-metre high clawdd would be a top width of between 600mm and 1m with the base width approximate 500mm greater. Top widths below 600mm are ill advised as sufficient core compaction can be compromised. Widths below 700mm are likely to prove problematic if a hedge is to be established (moisture capture).

2. Foundation: A stone foundation course is required for all work not built on rock. The foundation stones are usually 'flat-layed' and length in, even for pitched cloddiau. The foundation is usually set below finished ground level (except for particularly oversized stone). Whatever the case foundations should be laid in a trench dug to a minimum depth of 250mm.

3. Stone Size: Stone size should generally diminish with height.



The size of the face of the building stones is variable. Cloddiau constructed from stones with small (50-150mm) high faces are not uncommon. The most important factor determining strength, other than the skill of the waller, is the length of stone running into the clawdd. Stones should be set length in, with a minimum of one and a half times length into the wall, compared to face

height. Pitched stones under 100mm high should have a length of at least twice face height.

4. Stonework: The face of the clawdd should be built maintaining stone-to-stone contact. It is a common misconception that turf or soil should be incorporated between the stones. Established cloddiau can be found with "grassy faces" which can be due to lack of grazing pressure coupled with colonisation over a period of years.

Randomly built cloddiau should have all joints between stones bridged as in dry stone walls. However this can be virtually impossible to achieve with pitched cloddiau, but a competent waller should prevent a joint running for more than two courses, with two stone joints the exception rather than the rule.

5. Infill: The centre should be filled with firmly compacted granular soil, or a soil/small rubble mix. The most important factor is the level of compaction which should be done at least every 150mm.

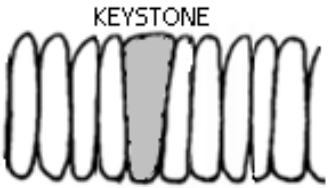
With coursed work, the soil should be compacted on the completion of each course. Where rubble is incorporated, this should be placed in alternate layers with soil minimising stone to stone contact. Care needs to be taken to ensure even compaction. When repairing old cloddiau, the earth core of the original clawdd should be disturbed as little as possible.

6. Capping: Some cloddiau have a course of vertical or even flat cope stones, but generally the stonework just peters out, although ideally the top course should not be less than 75mm deep. Small pieces of turf should be rammed into the tops of the joints of the final course to give increased bonding.

If a hedge is to be established then the top should be flat or even dished (to gather moisture), left un-turfed (except for the stone joints), with at least 300mm topsoil. It is usually necessary to incorporate a weed suppressing membrane. If there is no hedge the top should be domed (50-300mm) and capped with turf.

7. Fencing: The turf top should be fenced against stock for a period of establishment.

8. Pitched Coursed Stonework: Courses should be built in short sections, with a space left between sections. Locking stones, slightly wider than the space, are then jammed downwards into the gap to provide a tightly locked course. The size of each section is variable, the important factor being that all stones become tight once the locking stones are in place.



Ideally, the building stones maintain stone-to-stone contact with the stones in the course below and their immediate neighbours in the same course. In practice, irregularities in the shape of stones can preclude this. Any large gaps between stones on the inside of the clawdd should be firmly wedged with stones. Wedges or props below a stone prevent movement during settlement, and wedges between stones provide a tight, secure course. These (and smaller gaps) can be supplemented with compacted soil.

9. Standards: It is important to bear in mind that the waller can only work with the material provided. Where an exact reproduction is not essential, allowances must be made according to materials and conditions. It should be noted that the ability to reproduce the required work is usually dependent on the skill of the waller. In the case of disputes involving dry stone work, the DSWA has list of recommended assessors who can undertake inspection. Details of this service can be obtained from the Association, without obligation.

The DSWA extends thanks to members of the North Wales Branch for preparing the above information.

Further information: The bilingual booklet Codi Cloddiau/Clawdd Construction which explains these principles in greater detail is available from the DSWA. Electronic versions can be found online at www.dswales.org.uk. The Association endeavours to respond to all requests for specific information regarding dry stone walling. The DSWA offers a mail order service on books which includes a number of technical manuals which would make useful reading, and produces a register of working wallers which is free of charge (available on line at http://www.dswa.org.uk/Professional-Services-g.asp.). Full details available on request (please include a stamped, self-addressed envelope).

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Dry Stone Walling Association
Westmorland County Showground
Lane Farm, Crooklands,
Milnthorpe, Cumbria, LA7 7NH
Tel: 015395 67953 www.dswa.org.uk information@dswa.org.uk
Registered Charity No: 289678.

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