MASTER CLASS

Over the next few issues of Stonechat I (hopefully with the help of other Master Craftsmen) will be taking readers through various aspects of wall building. Hopefully these articles which will attempt to deal with the vagaries of North Walian stone - if there is such a thing - will be of use to our many new 'novice' members, as well as hopefully including useful tips for amateurs and professionals.

This said it is not possible to learn exactly how to build a dry stone wall from a book. Many aspects of walling cannot be adequately explained through the written word as each stone type varies and no two stones within a stone type are identical, consequently each stone requires a slightly different use.

Foundations - part 1

Many of those who have been on my training courses will know that my primary response to the question 'how can I solve this problem?' is, 'do not to create the problem in the first place'. Hidden in this somewhere is an essential truth. Walling is primarily an exercise in problem solving, and as you solve one problem another is created. The key to building a good piece of wall is to keep the severity of these problems to a minimum, creating types of problem which can be easily solved with the stone available.

"A wall is only as good as its foundation. Poor footings are the source of most serious collapses, and no amount of careful building higher up can correct for problems at the base."[1]
- A.Brooks. "Dry Stone Walling". British Trust for Conservation Volunteers. 1983. p.65.

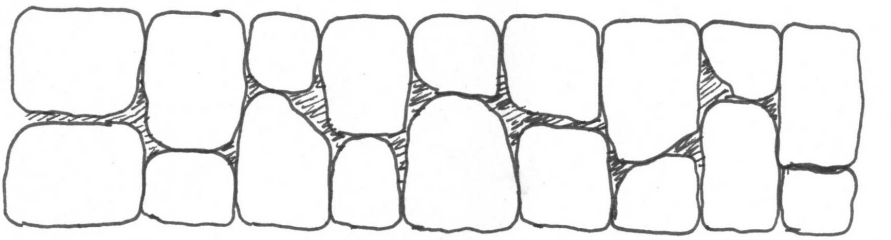
This is undoubtedly true and is especially apt when dealing with irregular sized and shaped stone. These articles will be dealing with foundations in depth, not only because they are the basis of any good piece of wall - no one aspect of walling is necessarily more important than another, as a wall is only as strong as its weakest point - but because the techniques involved are essentially the same as for the building of the rest of the wall, the only major difference being the size of stone involved. The first myth which needs dispelling however, is that in order for a foundation to be good it must be constructed out of big stone.

It is generally agreed that the biggest stones in the wall should be used in the foundation, however there is little comment on how big is big. Many dry stone walls are built on foundation stones which individually sit on little more than 1000 square centimetres. Many walls in Derbyshire, the Pennines Cotswolds (et cetera), have stood for well over 100 years on such footings, supporting between 1 and 2 tonnes of stone per metre of wall, a testament to the fact that well built foundations do not necessarily have to be composed of enormous stone. A number of reasonably large inrterlocking foundation stones will be more secure than larger stones which are not fitted together very well. Large stones are often irregularly shaped, do not sit very well, and cause difficulties in building next to or on top of them.

The first aspect in producing a good foundation - which is often neglected - is a good trench. There is no set rule on how deep this should be, some would argue that at least half the foundation stone should be buried, but generally 3 or 4 inches will suffice, provided all the loose soil has been removed. This soil should be neatly piled out of the way as it might be useful in filling in areas where the foundations have spread and are narrowed during

rebuilding, and in the very least can be placed alongside the foundations at the end of the job, effectively increasing the amount by which they are buried. The trench should have an even base, making the siting of foundation stones much easier as irregularities in the trench will tend to make them unstable. With irregular stone it often pays to dig the trench a little wider than you first think necessary, a point which will be expanded upon in the next issue.

The ideal foundations would be as shown:



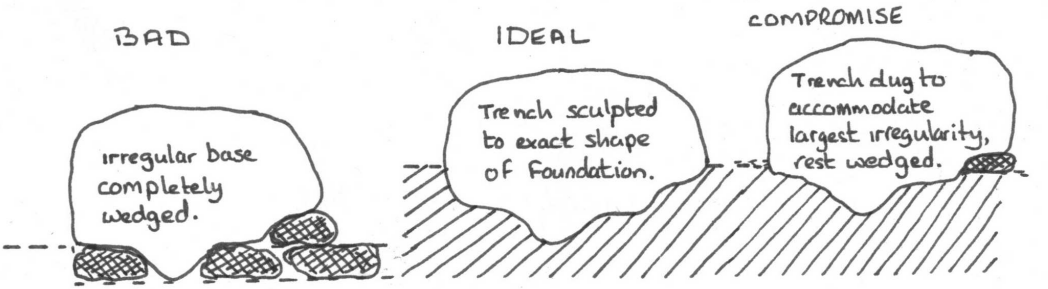
Regular flattish stone would be used to provide an even surface for subsequent building of the wall, stones are of a reasonably uniform size so that there is reasonably even settlement along the length of the wall and stones are laid with their longest axis running into the wall reducing the chance of displacement and tipping. At the same time the inside edges of two adjacent stones would be touching for as much of their length as is possible in order that they are unable to pivot sideways.

As far as basic principles are concerned everything so far is sound advice whatever stone type is being used. Unfortunately the weird shape and variation in sizes we are often faced with can create problems in achieving this.

The key to building a solid foundation with any stone, is to understand the basic, idealised, principles involved. The next step is to be aware of the ways in which the available stone can be used in order to achieve an end result which will most closely approximate the ideal. You must always bear in mind that it doesn't matter how big the stones are and how well you fit them together, if this is not done in such a way that allows sound principles of construction to be used for the subsequent building of the wall you could have wasted your time.

The larger the surface area of the stone in contact with the ground the better the weight dispersal, and consequently there is a reduced likelihood of settling. However a large stone which requires wedging is just as likely to push the wedge into the soil as a smaller stone, since this is dependant solely on the weight of the wall above the foundations, than the size of the foundation stone itself. Consequently a large, wedged foundation stone is not necessarily more solid than a small one, and is of less use than a smaller stone which is flat on the soil. This problem can be at least partially alleviated by ensuring that every space under the stone is filled with tight fitting, flat based wedges. This is however very difficult to achieve satisfactorily, and if it is really necessary means that the foundations are in effect the smaller stones. If this happens then you might as well have constructed the foundations solely out of the small wedges and thrown the large stones away. Occasional wedging is generally unavoidable, but it should be no more than occasional and never at the front of the stone where the wedge could relatively easily be forced out by the weight of the wall during

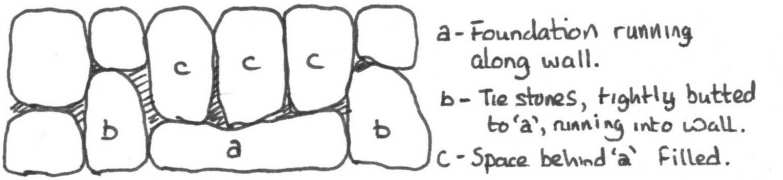
settlement.



Wherever possible irregularities in the base of a stone should be dug into the foundation trench thus reducing the need for wedging. Ideally the trench would be shaped for all the stone's irregularities. In practice such accurate sculpting is rarely possible, and attempting it likely to lead to undesirable voids hidden beneath the stone. The compromise is to dig out the trench to take the larger irregularities and to wedge the rest.

Occasionally it will be necessary to run a foundation stone with its largest axis running lengthwise along the line of the wall. Generally this should be avoided as such a stone is more likely to become displaced. However if it is the only way the stone can be satisfactorily built on, or if placing it long axis into the wall would create too narrow a gap on the opposite side (making the placing of a suitable foundation there difficult) there might be little choice. If such stones are left out altogether there is unlikely to be sufficient stone to finish the job and if it is placed in any other way it will potentially create greater weaknesses. Particularly narrow and/or thin stones should not be used in the foundations as they could be saved and utilised as throughstones further up the wall. This is often a difficult choice to make, especially with irregular shaped stone which might actually cause problems when used as a through. More on this in a later issue.

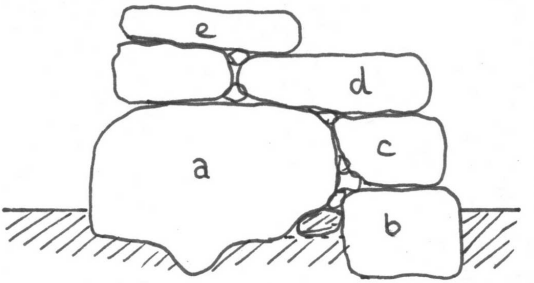
When there is no choice other than to place a stone in this way then it is important that the stones adjacent to it run into the wall and tightly butting up to it, thus reducing the chance of displacement.



It is also very important that two long stones are not run along the wall next to each other as here the potential for displacement would be great. One advantage however, in running a stone along the wall is that it presents an opportunity to place very good stones on the opposite side of the trench, although this should not be done until the more important stones adjacent to the long stone have been placed.

Where there is no alternative to using small stone to get around a big one, longer stones

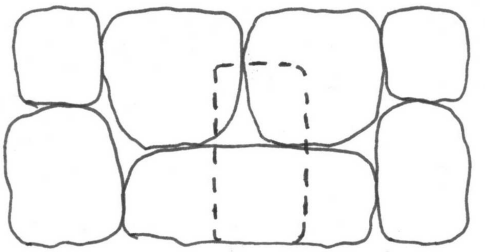
should be used to tie back into the wall either side of the small one. When building on top of these stones be sure to use longer stones tying back into the wall.



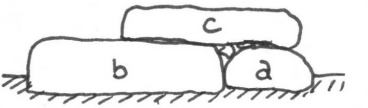
a- oversized foundation
b- small foundation to get around 'a'
c- building stone level with 'a'
d- stone tie, sitting firmly on 'a' & 'c'
e- tie stone lapped onto 'd'

This same principle should be applied to building on top of longer stones run along the wall, making sure that the foundations on the opposite side of the trench are not laid proud of the longer stone.

Dotted lines indicate tie stone



a - foundation stone run along wall.
b - foundation filling space and top level with 'a'.
c - tie stone.



The relative heights of foundation stones is also important. An even surfaced foundation can be built upon securely with good sized stone, which cannot be seated securely on an irregular base. Where the foundation is not even the irregularities will frequently have to be levelled with smaller stones which do not necessarily provide a secure base for the next course, and can be relatively easily displaced by the weight of wall above them.
It is important therefore that when it is not possible to place stones of identical height next to each other they should be arranged in such a way as to create as large steps as possible which can be levelled off using one other large stone when it comes to building.

Large step between a+b, allowing decent sized building stone 'c' to be used.

Small step necessitating use of insubstantial levelling stone 'e'.

A large step between two big foundations can cause problems.

Next issue - what to do with those awkward shapes.
Sean Adcock.