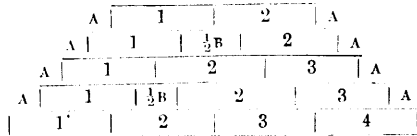


Supposing then that the trenches are properly sunk to the depth required — that is, to the solid subsoil — and that all loose, damp earth is removed from the surface, then a layer of concrete should be placed in each trench sufficiently wide to take the "footings" of the walls to be built thereon. The width of the concrete must obviously depend upon the thickness of the proposed walls; but it should not be less than six inches wider than the first course of "footings," so as to allow of a set-off on either side three inches wide at least. If the superincumbent weight of the structure itself is intended to be great or if it has to carry a great weight, then the depth, and even width, of the concrete foundation must be proportionate; if, on the contrary, the house is not to be of so heavy a character, and is to be simply a dwelling-house, then the concrete need not be very thick, but it ought, nevertheless, to be very good. Indeed, the quality of concrete is of more real importance than its quantity in all cases, but especially for dwelling-houses. Its object in this case is not so much solidity and strength as it is to prevent dampness; in order to effect this it must be good. The use of cement is necessary where great strength is required, and also where the foundation is subjected to the action of water. Blue lias lime, stone lime ground, if fresh and good, is very suitable for foundations, for it solidifies into a kind of natural rock. If Dorking stone lime ground be used care should be taken that it be supplied and used while it is quite fresh. If either the lime or cement used for concrete is at all deadened, its value, for the purposes mentioned, is gone; and it should be mixed and used quickly, so that its strength shall not have vanished ere it is deposited in its place. Sufficient water must be used to "slack" it thoroughly, but not enough to destroy its "binding" properties and power of fusion.

The "gravel" used for concrete should be as free from "dirt" as possible; if it be at all loamy or clayey it helps to destroy the properties of the lime or cement. Ballast is often used, but care must be taken that the ballast so used shall not be of such quality as to "give" when touched by damp. Some kinds of ballast seem to have no damp-resisting properties at all; these must be avoided. Coarse clean gravel is by far the safest, and is preferable to any other ingredient for concrete purposes, if it is at all easily obtainable, and at reasonable cost. If the ingredients of which the concrete is composed are bad in themselves, or are subject to chemical changes when mixed together which tend to destroy their essential character, or to neutralize their natural effect, then it is better to dispense with the farce of concreting altogether. If badly done, with bad materials, it is worse than useless; for you imagine that there is security, when in reality there is nothing of the kind. With good tone ground lime, and clean coarse gravel, or shingle and sand, or good dry ballast, the proportions may be one of lime to five, six, or even seven, eight, or nine of gravel, according to the "strength" of the lime. Under ordinary circumstances one to seven may be taken as the fair proportions of lime and gravel, or other ingredient. The depth of the concrete should never be less than twelve inches, and some contend that it should not be less than eighteen inches, and its thickness should allow for a good set-off beyond the face of the first and widest course of footings. And it is most important that the whole extent of the foundations, or as much of it as is possible, should be put in at one and the same time. If the concrete is put in the trenches in sections, there is no binding whatever between the parts; it is simply like putting in so many blocks—large or small, as the case may be. Its solidity and strength will then only equal the weakest part, and in proportion as the strain tells upon that weak point, so does it increase in intensity, until it takes the full bearing of all that converges thereto, or yields by reason of its inherent weakness, or gives way utterly to the lateral or superincumbent pressure. The pressure and strain should be as nearly as possible equal at all places and at all parts throughout the whole building.

The concrete being in and settled, the next thing to be done is to put in the "footings." The footings, if of brickwork, ought never to be less—indeed cannot well be less—than nine inches wider than the wall proposed to be built, for in this case there is only room for two set-offs of 2½ inches each on either side. This very slender foundation, if upon concrete, may do for cottages and the like, but not for buildings of a higher class, or of greater pretensions, or those requiring strength. For all houses above the commoner sort of workmen's dwellings the footings should not have less than four set-offs, or nine inches on either side, or a total of eighteen inches extra to the full thickness of the wall. Even the com-

monest villa or suburban dwelling ought to have this width of footings, upon a solid concrete foundation, which, in the case of brick walls of eighteen inches in thickness—that is, two bricks wide lengthways—would be double the width of the wall, and would have footings thus:—



In the above example the brick wall is supposed to be two full-length bricks in thickness—that is, eighteen inches wide—the first course of the footings would consequently be thirty-six inches, or four bricks lengthways wide; the second course would be twenty-seven inches wide, or three and a half bricks wide—that is three stretchers and one header; the third course would be three stretchers wide; and the fourth, or top course of the footings, would be two stretchers and one header in thickness; and then would be started the face of the wall, two brick lengths wide. The set-offs on either side (marked *a*) are supposed to be 2½ inches wide in each case. Should extra strength be required, or should the superincumbent weight or pressure to be borne necessitate a more solid foundation, the width of the footings and the number of set-offs must be increased in proportion to the needed requirements of such building, otherwise the proportions above given will suffice for all practical purposes.

There is one hint which should be borne in mind, namely, that the bricks in footings should be laid lengthwise in the wall, as far as practicable. Where half a brick is required, the half brick should be as near the middle of the wall as possible, as, for example, in the illustration they are where the headers are shown (marked *b*), courses two and four from bottom, on first course. The reasons for thus laying the bricks in footings lengthwise are because of the necessity of giving to the wall the widest bearing possible in a lateral direction. The strain longitudinally will be met by other precautions when the building is more advanced.

Now, having got the footings in, one more step should be taken to ensure perfect freedom from damp: either pour a layer of asphalt over the top bed of the brickwork about three courses from the top of the last-footings course, or lay down a course of slates in cement, or cover with a sheet of lead the whole of the inner and outer walls of the building. Upon this layer, whichever may have been selected, proceed to build your house or construct an edifice of greater pretensions and dimensions.

There is yet another matter of great practical utility in building operations, and especially in the construction of dwelling-houses, namely, the building of dry areas, and the insertion of proper air-bricks at convenient points for ventilating purposes. A current of air should pass right through the building underneath the lowest door; if it does not dry rot will be sure to make its appearance, and with disastrous results. If the pressure of earth against the wall be great, headers should be thrown out here and there from the dry area wall to the main wall of the building, but these must be only at such intervals as will not interfere with the free circulation of air.

If the hints and suggestions here given are properly attended to there will be little fear of any damp arising to rot the floors, discolour and destroy the paperhangings or other decorations, and to injure the health of the inmates by foulness—either from defective drainage or damp. Let it not be thought that the directions here given will entail much extra expenditure. In point of fact the extra cost will be comparatively nothing as an item in the entire cost of the building. It looks a good deal upon paper, but an expenditure of £20 extra while the work is being done will make all the difference in the world between a thing well done and badly done. Besides which, if more care were taken at the first with the drainage, the foundations, the footings, the ventilation, and the selection of the site, the edifice itself might be built with far less expensive materials, without much detriment to its rental value as a dwelling-house, or to its intrinsic value as a building. Even in the smaller class of house property it would pay in the long run to do all that is here recommended to be done. But as a rule houses are built to be sold—this makes all the difference.—*The Building and Engineering Times.*