Permanent structures for irrigation farms

A H. Bosch
Department of Agriculture

K S. Cole
Department of Agriculture

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WITH the close of the irrigation season many farmers have put away their shovels with sighs of relief. Now no doubt they have forgotten, due to the passage of time, the many battles with unruly water. Perhaps they have even forgotten the arduous hours of shovelling and the attendant backaches.

Rather than forgetting these problems they should be now planning countermeasures. Now is the time to put into operation plans for the coming summer. In a few months the irrigation zones will open and a flurry of last-minute preparations and half-hearted solutions will usher in another season of hard work and bad temper.

A careful study of the accompanying plans should reveal structures to suit every farm. Although basically designed in tim-

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**PERMANENT STRUCTURES FOR IRRIGATION FARMS**

By A. H. BOSCH, Dip. Trop. Agric., Technician, and K. S. COLE, B.Sc., Agri., Irrigation Adviser

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**fig 1.**
ber, most of the designs are capable of being manufactured in concrete, if a few modifications are made to the design.

Generally, farmers will find the timber structures easier to deal with. If concrete is used, it must be poured in situ and this is not always easy in winter. Further, reinforcing must be adequate or the structure will collapse or crack so badly as to be ineffective. There is probably very little difference in price between the two materials, but timber must be purchased to make the forms for concrete. Such materials as sand, metal, reinforcing rod may have to be carted long distances or else be hard to obtain. There is very little difference in working life of the two forms of material. Jarrah should last at least 20 years if the structures receive some form of maintenance such as termite-proofing and the replacement of rusted nails, etc., as necessary.

Some designs have suggested measurements included, but it must be borne in mind that these measurements will vary according to channel and flow size, and are only intended as a rough guide for interested persons. It is essential that certain dimensions should always be in proportion to other dimensions of the design.

For example—the take-offs as in plan 1 must be equal in size to the inlet throat. Wings, which are placed in the bank to prevent movement of the structure and the passing of water round the structure, must be of sufficient length to give good anchorage, and minimum size should be equal in length to the width of the throat opening. The greater the length, within reason, the safer the structure becomes. It must always be remembered that moving water is an insidious enemy and will always find faults, should they exist, in any structure designed to control it. Once a break
occurs, the trouble entailed in recontrolling the water is guaranteed to test the temper of the most placid type. Where concrete or wooden aprons are provided for stops or drops, designs 2, 3, 4, 5 and 6 should be equal to and preferably twice the length of the total drop of water, i.e., if the water is held up 12in. in a stop the apron must be at least 12in. and if possible 24in. long on the downstream side.

The necessary boards for closing off stops can be cut from 2in. x 1in. or 3in. by 1in. timber. Usually it will be found advantageous to have a number of boards of each size for every individual stop. By this means the farmer is able to vary the effective height of the stop to suit changing conditions of water flow. The wall and floor boards can be made of 5in. x 1in. or 6in. x 1in. jarrah. Wider boards are not recommended due to cracking and warping. Generally suitable uprights, struts, etc., can be constructed from 3in. x 2in. jarrah except in design 4, where suitable uprights and base board can be cut from an old railway sleeper.

By studying diagram 11, it will be readily seen where the various designs may be used to advantage.

Plans 1, 2, 3 and 4 are fairly simple and should be relatively cheap to make. Any handyman can cut the components in the workshop and, in most cases, can assemble the structure in the workshop during rainy weather. Plan 5 is also simple in design but care will be necessary if cracking is not to reduce its effectiveness.

Plan 1 gives great ease of water control where a body of water must be split up in two or three directions. By careful regulation of the stop boards it will be found possible to split any supply in any proportion desired.

Plans 2, 3, 4 and 5 are of stops which are required to build up the height of water in the channel so that the water may be applied to the land. Plan 4 is probably the cheapest and simplest to make. Once again the height to which water is held up is readily adjustable by altering the number or size of the drop or retaining boards. With all stops it is essential that a concrete apron be used on the downstream side.
Plan 6 is of a simple, easy to construct drop for taking fall out of a channel. It cannot be recommended that such drops be constructed to take out more than two feet of fall in any one drop. If three or four feet of fall must be taken out then two or more drops should be used. The value of this structure may not be readily discernible to the average farmer on fairly flat ground. To the man farming relatively steep irrigation country with its risk of channel scouring, particularly if the soil is somewhat light, this plan will remove a severe "headache" at small cost. With this structure it is essential that it be very well bedded into the walls and bottom of the channel and a good stilling pool effect to prevent scouring below the drop.

Plan 7 is a very cheap and effective means of taking water from the head ditch into bays or minor head ditches. The troubles caused by continually cutting the bank, to bring water on to the land, is not only removed but more positive control is achieved.

Plan 8 will not be required on many farms as conditions suitable for its use seldom exist. Where conditions are suitable, it is a very useful addition to water control.

Plan 9 is a rather complicated arrangement for positions where drains and channels cross. Wherever possible it is much easier and cheaper to siphon one under the other with a concrete pipe. Should
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such a procedure not be practical, then the farmer will be forced to resort to a structure similar to plan 9.

Plan 10 is included to show the correct way of installing concrete pipes in channels and drains. To avoid the evils of silting up, or stagnant water with its complement of weeds and insect pests, the pipe must be correctly sited. The pipe must be approximately half its diameter below the invert or bottom of the drain. Contrary to popular opinion, this will not cause undue silting, but will tend to clean the pipe by increased flow of water due to the extra volume that can enter the pipe. It is essential to concrete an inlet and outlet throat for such pipes or the rush of water will scour the channel invert. Also the inlet throat must be relatively smooth to minimise swirl and the consequent bank erosion.

Having decided upon the designs to suit his farm, the farmer must now prepare the sites. Stops and drops can often be sited on past experience. To obtain real accuracy the area needs to be surveyed and the sites picked by dumpy level readings. Field officers of the Irrigation Branch are always available to do this job for farm-
ers. Once the sites are picked the channel in the immediate vicinity should be cleared to correct depth and width and the necessary excavations made. The structure is installed and the earth returned and well rammed. The longer the period between installation and use the greater the stability of the soil and structure.

Small leaks in stops and diversions can usually be cured by hanging a bag over the boards in such a way that the pressure of water forces the bag against the stop boards. In the case of plan 7 a handful of earth placed against the plate will be forced into cracks and crevices and will prevent leakage under the stop plate.

The ease of water control obtained will more than repay the capital cost of the structures shown.

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