

TalkaboutTalkaboutTalkaboutTalkaboutTalkaboutTalkab



"Earth dams"



"modest"



"risk of failure"

In this issue we depart from our normal Talkabout series and become a little more technical as we discuss the controversial subject of geotextiles with visiting French Professor, J.P. Giroud. Professor Giroud is Professor of Geotechnics at the University of Grenoble and is a consultant for the World Bank in the use of waterproof membranes.

While in South Africa to present a series of lectures to the S.A. Institute of Civil Engineers, sponsored by Noel Hunt Fabrics, Professor Giroud gave this exclusive interview to Contractor.

Leading world expert discusses geotextiles

Editor: Professor Giroud, in South Africa we have been using the term "filter fabrics", I believe that in Europe you call this material geotextiles. Would you describe why you use a different term?

GIROUD: Well, this is almost a personal question, for as you know I have proposed the word geotextile. I don't like the word filter fabric because it seems to convey that the fabric in the field of civil engineering could be used only as a filter. In fact, the fabrics can be used also as reinforcement or as separators between two soils which have a tendency to mix. So altogether there are three main functions of the geotextiles, namely filtration, reinforcement and separation and even some thick geotextiles are able to convey some water and so act as drains. Filter does not convey the full application correctly.

Editor: That's an interesting explanation. I believe that while you are in South Africa you are to address the Highway Materials' sub-committee on what we call filter fabrics. I assume you will make this point to them.

GIROUD: Well I think we must consider the range of use of geotextiles as being large and we should not therefore limit them just to filters. It should even be possible in the coming years to develop new functions. For example, in Europe geotextiles

are widely used for the base for waterproof membranes either by waterproofing the geotextile or by using the geotextiles for reinforcement of plastic sheets. So as you can see in this case there is no connection with filtration.

Editor: I think that in South Africa use of geotextiles has been confined to limited application types. Filter, reinforcement and anti-contamination in road construction and filters in earth dam construction. I believe that in Europe and the United States geotextiles have been used in many other types of construction work. For example rail construction as a separation between embankment material and rail ballast. Could you tell us more of this?

GIROUD: Yes, but you appear to be modest in your description of utilisation of geotextiles here in South Africa. This is not so, for I know, for example, you have used a large amount of geotextiles in interesting applications and you are advanced in use of geotextiles in earth dams and few countries have done this. In fact, geotextiles have not been used in earth dams in the United States, so you should not be so modest.

With regards to railroads, I will give you two examples. First in the United States, the railroad tracks are in a poor state and engineers have to face many difficult situations. So they use

geotextiles in the simplest way by placing them directly under the ballast in order to protect the ballast from contamination by fine particles of foundation soil. Conversely in Western Europe the railroad tracks are usually in a good state and only simple maintenance is needed. So, the European engineers have a tendency to be more conservative and they place a layer of sand between ballast and geotextile in order to increase the life of the geotextile. So, one can say that in Europe and the United States the technique is different due to different situations. Therefore I think that this varying situation between America and Europe shows the versatility of geotextiles. Moreover in France, on the new 300 kilometre an hour railroad from Paris to Lyon, geotextiles are included in the specifications, so they are not only used in railroad maintenance, but also in the construction of new high standard rail tracks.

Editor: Professor, I'd like to go back on a statement you made earlier on the use of geotextiles in earth dams. My understanding is that there are two distinct types of geotextiles. One is a woven material, the other is known as a non-woven. I believe that in the past the United States Army Corps of Engineers have researched woven textiles and until recently had little experience of non-woven textiles. Their earlier reports have stated that non-wovens should not be used in critical situations in earth water-retaining structures. In recent documents they have adopted a more favourable approach to non-wovens. What is your view?

GIROUD: This is connected with the whole development of geotextiles. The woven geotextiles have been in use since the sixties, mostly in slope protection of, for example, waterways. At this time they could have been called filter fabrics because they were mainly used for filtration. It is commonly acknowledged that the real success of geotextiles really started in 1968 when the first non-wovens were used in France in access roads and thereafter the first embankment and then the first dam. So the main success of geotextiles started with non-woven textiles. Now it can be said that most geotextiles used are non-woven, but some organisations, like the U.S. Army Corps of Engineers, were involved in research

into woven geotextiles at the end of the sixties, just when the non-wovens were launched in France. At that time the U.S. Army had only very limited knowledge of non-woven textiles, so there was a time lag of several years before they researched and specified non-wovens. I should state that in most cases non-wovens are more suitable for filtration than are wovens.

Editor: In South Africa there are six or seven non-woven fabrics commercially available and they are made from three or four raw materials namely nylon, polypropylene, polyester or polyethylene. Are there any differences between these various raw materials?

GIROUD: There is a difference between the raw materials. For example specifiers should know that there is a difference in their strength and their resistance to different external actions for example to sunlight, heat and contact with hot bitumen.

Engineers should know the differences in the polymers from a technical point of view, but they also have to consider the cost. If they want higher properties they may have to pay a higher cost.

Editor: As you have mentioned the association of hot bitumen with geotextiles would you care to elaborate on the use of geotextiles in the prevention of reflective cracking in asphalt overlays?

GIROUD: This is a very interesting application. In the United States non-woven geotextiles are used in pavements to prevent reflective cracks. If you have an old pavement which is cracked it is usual to place an overlay of asphaltic concrete. What often happens is that cracks from the old pavement will quickly propagate in the new overlay. Therefore the idea is to separate the two layers, the old and the new, by a sheet of geotextile. Test sections in the United States have also shown that this use of geotextiles as a separator works well and largely reduces the speed of propagation of cracks. The geotextile must be thick enough to withstand large distortion but it must not be too thick because if it is it will cause excessive bending of the overlay.

Therefore careful selection of geotextile is necessary. Second, placement of the geotextile is not

easy as the road is never flat or straight and care has to be taken to ensure that the overlay/geotextile system is well cemented to the old pavement to prevent slipping.

Editor: When you leave South Africa, you have been invited to address the European Disposables and Non Woven Association in Amsterdam. Are there any particular points you will raise?

GIROUD: Yes, this important session will coincide with the tenth anniversary of the launching of the first non-woven geotextile. I have been asked to chair this session and I am going to draw the attention of engineers to the importance of research in geotextiles, not only simple specifications but also the need for specialised design. I believe that we can improve our ability to carry out specialised design by monitoring behaviour of earth structures which have incorporated geotextiles and eventually by carefully analysing any failures, should they occur, in these structures.

Editor: We have very few recorded failures. Do you feel we can expect more frequent failures possibly due to a lowering of design requirements relative to the geotextiles because of attempts on the part of the specifier to save costs or economise?

GIROUD: True there are few failures with geotextiles, but this means that the engineers have a tendency to build with excessive safety factors. They do this because they have insufficient knowledge of design methods with geotextiles. So what will probably occur is, due to competition in geotextile prices, the engineer will have a tendency to build earthworks with decreasing factors of safety so the risk of failure will increase. This has occurred with all new techniques. If failures are carefully recorded by researchers we will learn a great deal and will be able to improve the methods of design in the future. However, this conclusion involving failures should not be regarded as pessimistic as the need for bi-dimensional material like geotextiles is so great that we researchers can predict their use for a great many years to come.

(Editor's foot-note) Woven fabrics are made from directionally oriented fibres. Non-woven geotextiles are made from directly extruded, randomly oriented, continuous filament.