

TR14-213-214

**R.585. Effect of sand and moisture content on shrinkage
in extruded pipes**

Clay and sand in current use at Humes Pipe Works were supplied by J. Gilbert for evaluation, with particular reference to shrinkage over a range of sand and water contents.

The general level of water content used by Humes Ltd for pipe extrusion is about 20%, and the sand concentration is about the 25% level. Total shrinkage is governed by water and sand level in the fabricated article and the temperature of firing, which for this series was kept constant at the plant firing temperature of 1200° C.

PROCEDURE

Clay sand mixtures, ranging in steps of 5% from zero sand to 30% sand were made with three different water contents: 18, 20 and 22%. The resulting 21 mixtures were pressed into experimental bricks, marked for shrinkage measurements, and then dried to remove mechanical water. Dry shrinkage was then measured, and the bricks subsequently fired to 1200° C on a cycle which paralleled as near as possible plant conditions. When the cooling cycle was complete, total shrinkage measurements were made and the results evaluated.

RESULTS

% Sand	18% Water		20% Water		22% Water	
	% Dry Shrinkage	% Fired Shrinkage	% Dry Shrinkage	% Fired Shrinkage	% Dry Shrinkage	% Fired Shrinkage
0	6	4	7	6	8	6
5	6	4	7	5	8	6
10	6	3	7	5	8	6
15	6	3	7	4	8	4
20	6	3	7	3	8	4
25	8*	3	7	3	8	4
30	6	2	7	2	8	3

* There was no apparent reason for this anomalous result which was ignored in evaluation.

CONCLUSIONS

The total shrinkage is markedly governed by the water content of the fabricated article, but this can be significantly affected by increasing the sand content. From these results by postulating a particular water content (20%) and sand content (30%), the extrusion die can be adjusted to give the required size in the final product. Then, variations in water and sand content on either side of these figures will give predictable size variations.

Subsequent translation to plant production has confirmed the linear relationship shown in these figures, and the feasibility of quality control based on sand and water determinations.