



Technical Paper

No. 1

UNWANTED HOLES IN BREAD

**WHY THEY FORM
AND HOW TO LIMIT THEM**

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Unwanted Holes in Bread: Why They Form and How to Limit Them

The presence of large and unwanted holes in the crumb of bread and fermented products can be quite common. The holes discussed in this review are ones which would not be considered part of the normal cell structure (texture) of the product crumb because they are so much larger in size. The size of the cells which constitute the crumb cell structure varies according to the product type; typically, in sandwich style bread they are 1-2 mm in size while in baguette and ciabatta they may be 5-10 mm or larger. The presence of unwanted holes is most commonly of concern in the manufacture of fine (small average cell size) structured breads, rolls and buns and in broad terms holes may be classified as being larger than 1 sq cm and/or deeper than 1cm.

It is very difficult, whatever the breadmaking method, to make bread without the presence of some holes which are larger than the background cell structure. This is because there are many recipe and process factors which contribute to their formation, size and location in the product. This review identifies the main types of holes and considers many of the factors which contribute to their occurrence. A practical guide for troubleshooting unwanted holes is included along with information on how to limit their formation.

In some cases, holes in the crumb may occur in products which also have blisters on the crust surface and there may be common factors contributing to the formation of both quality defects. However, the holes discussed in this review are characterised as being mainly part of the crumb component of baked products and as such are not always associated with the crust formation.

The Types of Unwanted Holes in Bread and Other Fermented Products

When it comes to dealing with the formation of unwanted holes in bread crumb it is important to recognise that their physical appearance and other characteristics provide significant clues as to their origins and development.

Holes may be broadly classified as having a smooth surface on the inside or having a stranded/rough/torn/ragged appearance reminiscent of the stalactite and stalagmite formations that one sees in limestone caves. Figures 1 and 2 illustrate examples of smooth and stranded/ragged holes in bread crumb respectively.



Figure 1: Smooth hole



Figure 2: Stranded hole

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A category of shape of hole which may combine elements of both smooth and stranded holes is illustrated in Figure 3. We refer to these as 'unzipped holes' as they have the appearance of a series of relatively small, smooth-sided which have joined together leaving strands of crumb separating one hole from the next. The different forms that holes may take in fermented products and their origins are discussed in detail below.

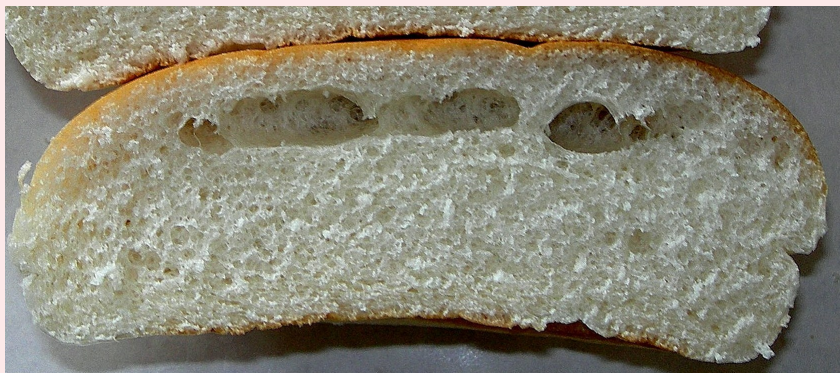


Figure 3: 'Unzipped' holes

From time to time bread crumb may exhibit areas of coarse texture in which the average size of the cells is larger than usual but not large enough to be considered as holes. As well as the cell sizes being larger, the cell walls of such areas are often thicker, and the colour of the area is darker than the surrounding finer crumb. It is not uncommon for such areas of coarse structure to be associated with bread crumb exhibiting holes and on occasions the two features may be adjacent to one another as illustrated in Figure 4. In the illustration an area of coarse cell structure can be seen to the lower left of the large hole in the crumb. The juxtaposition of areas of coarse cell structure and the formation of unwanted holes is an important one and is discussed in detail below.



Figure 4: Coarse cell structure (left centre) and hole