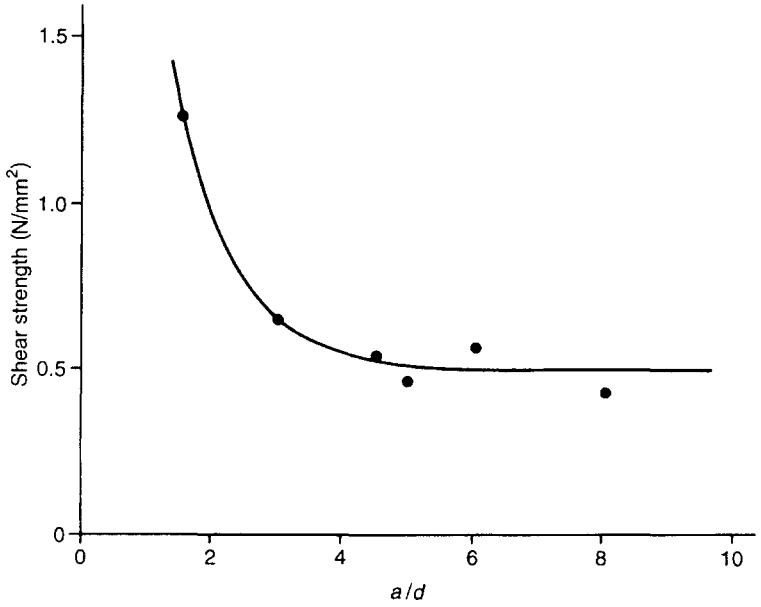

Fig. 10.8 Shear strength versus shear span ratio for grouted cavity brickwork beam.

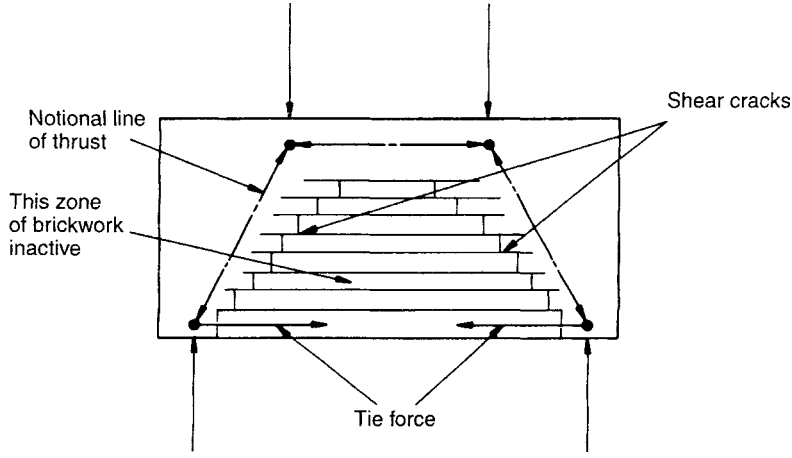

Fig. 10.9 Internal tied arch action in a reinforced brickwork beam having low shear span ratio.

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10.3.2 Shear strength of rectangular section reinforced masonry beams

The method of calculating the flexural strength of reinforced masonry beams is discussed in section 10.2. It is also necessary to ensure that the shear stress in a beam does not exceed the design shear strength of the material, i.e.

$$V/bd > f_v/\gamma_{mv} \tag{10.6}$$

where V is the design shear force at a section, b and d are respectively the breadth and effective depth, f_v the characteristic shear strength and γ_{mv} the Partial safety factor for shear.

As an illustration of the influence of shear strength on the design of rectangular section beams, it is possible to plot a 'cut-off' line on Figs. 10.6 and 10.7 defining the M_d/bd^2 value above which shear will be the limiting factor. This has been derived by assuming that the shear span is $a=M_{max}/V$, so that, referring to equation (10.6):

$$M_{max}/(a/d)\,bd^2 > f_v/\gamma_{mv}$$

or

$$M_{max}/bd^2 > (f_v/\gamma_{mv})\,(a/d)$$

In Figs 10.6 and 10.7, f_v=0.35(1+17.5?), a/d=6 and γ_{mv}=2.0. For these conditions it is apparent that shear strength will be a limiting factor for steel ratios above 0.007–0.009 and 0.003–0.004 for f_y=250 N/mm^2 and 460 N/mm^2, respectively unless shear reinforcement is provided.

The provision of shear reinforcement presents no difficulty in grouted cavity sections. It is possible in brick masonry sections by incorporating pockets in the masonry after the manner of Quetta bond and in some types of hollow concrete blockwork. BS 5628: Part 2 gives the following formula for the spacing of shear reinforcement where it is required:

$$A_{sv}/s_v \geq b[v-(f_v/\gamma_{mv})]\gamma_{ms}/f_y \tag{10.7}$$

where A_{sv} is the cross-sectional area of reinforcing steel resisting shear forces, b is the width of the section, f_v is the characteristic shear strength of masonry, f_y is the characteristic tensile strength of the reinforcing steel, s_v is the spacing of shear reinforcement along the member, but not to exceed 0.75d, v is the shear stress due to design loads but not to exceed $2.0/\gamma_{mv}$ N/mm^2, γ_{ms} is the partial safety factor for the strength of steel and γ_{mv} is the partial safety factor for shear strength of masonry.

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