Digi Design Co Architecture Ltd
Cherwell Business Village F161
Banbury
Oxon
OX16 2SP

Tel: 01295 267617
Email: info@digidesignco.com
Web: www.digidesignco.com

Details of Flood Proofing.
18/00775/F - Temple Mill, Woodway Road, Sibford Ferris.

Foundations
Foundations are designed to suit site conditions, namely the local geotechnical characteristics and the building design. Strip and trench-fill foundations are generally used where no special problems are identified, whereas raft, pile, pier and beam foundations may be necessary in other cases. In general, the choice of foundation type will be dictated by ground conditions, rather than resilience considerations. However, improvements can be made to increase the resilience.
For typical single-storey dwellings shallow footings are likely to be appropriate in most cases. It is common practice to use concrete blocks as substructure elements in typical cavity wall buildings but laboratory work has shown that groundwater can penetrate through the blocks into the wall cavity (and from there into the building) if care is not taken to minimise the passage of water. There is a general recommendation in the NHBC Standards, 2006) to allow a clear cavity of at least 225mm below damp proof course (d.p.c.) to prevent the build up of any mortar dropped during construction from having a detrimental effect on the performance of the wall. However, this unsealed void may be an entry point for rising ground water into the property via the blockwork.

Water exclusion strategy
A general principle for flood resilient design where predicted flood water depths are relatively small (no greater than 0.3m above floor level) is to minimise the entry of water through permeable elements of the foundation. Any concrete blocks placed below ground-bearing concrete floor slabs provide a potential path for water to ingress into wall cavities, as these blocks are considerably more permeable than concrete slabs. Figures 6.2 and 6.3, illustrating a ground bearing slab and a concrete suspended floor slab, show a potential flow path from the ground adjacent and under a dwelling, through porous substructure and into the wall cavity. The use of concrete or another impermeable material to seal the blocks may resolve this problem. The figures highlight the fact that measures taken above ground level may not fully prevent the ingress of water.

Resilient design
Where concrete ground floor slabs are used, the blockwork substructure is often the weakest point in terms of water penetration from the ground into a dwelling. Whereas there is a general perception that water can ingress through the blockwork structure of the external face of a wall into the property, it is less apparent, but equally possible, that water will penetrate from the ground on the inside of the property.
Concrete blocks used in foundations should be sealed with an impermeable material or encased in concrete to prevent water movement from the ground to the wall construction.

Water entry strategy
A general principle for flood resilient design where predicted flood water depths are high is to
provide durable materials that will not be affected by water and use construction methods and materials that promote easy draining and drying.
Standard methods and good quality building materials will generally comply with these requirements but good workmanship is essential.

Floors
The behaviour of ground floors in floods can be influenced by two different conditions:
- water ingress from the ground (potentially resulting in uplift pressures), and
- exposure to standing water.

Of the above two situations (which can occur simultaneously), water ingress from the ground is potentially more severe as it is more likely to affect the structural integrity of the floor. Structural calculations may need to be carried out to ensure that the floor (including any lateral support provided at the perimeter) has the necessary strength to resist uplift forces without excessive deformation or cracking.

Water exclusion strategy
When applying a "water exclusion strategy" (i.e. minimising water ingress through ground floor slabs), for predicted water depths above the floor of greater than 0.3m, it is important to carry out structural checks assuming a flood depth of 1m minimum above the slab, even in areas where the design flood water depth is lower. Usual safety factors must be applied in all such calculations (floors and walls). Laboratory evidence on small slabs (0.5m by 0.5m) indicated that 150mm thick concrete slabs on supporting soil can withstand such forces without allowing water ingress. However, for larger slabs, uplift forces may cause deformation and induce cracking and lead to preferential paths for water ingress.

Resilient design
Ground supported floors are the preferred option and concrete slabs of at least 150mm thickness should be specified for non-reinforced construction. Hollow slabs are not suitable if the elements are not effectively sealed.

Reinforced concrete floors are acceptable but may be prone to corrosion of any exposed steel in areas of prolonged flooding.

Hardcore and blinding: good compaction is necessary to reduce the risk of settlement and consequential cracking.

Damp Proof Membranes should be included in any design to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane sections are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum). Care should be taken not to stretch the membrane in order to retain a waterproof layer. Experience in Scotland has indicated that welted joints in the d.p.m. are an effective jointing solution.
Insulation materials: Water will lower the insulation properties of some insulation materials.

Floor finishes: suitable floor finishes include ceramic or concrete-based floor tiles, stone, and sand/cement screeds. All tiles should be bedded on a cement-based adhesive/bedding compound and water resistant grout should be used. Concrete screeds above polystyrene or polyurethane insulation should be avoided as they hinder drying of the insulation material. Suitable materials for skirting boards include ceramic tiles and PVC. Ceramic tiles are likely to be more economically viable and environmentally acceptable.