

### **Water Seepage**

Water seepage has been a cause for concern to a number of Government departments including the Buildings Department (BD). Causes of seepage are many and varied but one of the common sources of seepage relates to water-borne piping embedded in the concrete members of a building.

2. The problems associated with water seepage caused by embedded water-borne piping are complex and difficult to resolve for the following reasons :

- (i) The party affected (lower floor) is normally not the one who created the problem (upper floor), therefore co-operation is usually not forthcoming. If common areas are involved, multiple ownership status of such areas further complicates the problem;
- (ii) It is difficult to locate the defective sections of water-borne piping for repair, as water leaks and finds its path of least resistance through cracks and ducts; and
- (iii) Even if such defective sections are accurately identified, the breaking up of structural elements for repair is costly and disruptive to the occupiers, which would discourage them from co-operating.

3. Regulation 3 of the Building (Construction) Regulations (B(C)Rs) stipulates that all materials used in any building works shall be of a suitable nature and quality for the purposes for which they are used; adequately mixed or prepared; and applied, used or fixed so as to perform adequately the functions for which they are designed. Regulations 34, 38, 41 and 48 of the B(C)Rs also require external walls, roofs, kitchen and bathroom walls and floors to be protected against penetration of moisture or water. Authorized Persons (AP), Registered Structural Engineers (RSE), Registered General Building Contractors (RGBC) and Registered Minor Works Contractors (RMWC) are therefore reminded to ensure that the design and construction of their buildings or building works, as the case may be, meet the above performance requirements and are structurally safe.

4. Water seepage arising from embedded piping causes not only nuisance but also deterioration to the structural member of a building if unattended for a prolonged period. To cure the problem at source, you are strongly advised to design the routing of all water-borne piping off structural elements to facilitate the indispensable need for repair and replacement of such piping during the design life of the building, which would normally outlast the design life of the piping. The huge benefit to the consumers and the public that this will bring about in terms of easy maintenance of the building for its entire design life will certainly outweigh the efforts you, as AP and RSE, have to make at the design stage of a building project.

5. To ensure the long-term integrity of all structural elements and also to avoid sanitary nuisance arising from water seepage, you are required to state explicitly in the drainage plans that no water-borne piping, other than that specified in paragraph 2 of the guidelines at Appendix A, will be embedded in structural elements. If despite my advice you still decide to embed any section of such piping in any structural elements, you will be required to submit for my consideration details showing the routing of all water-borne pipes when you apply for approval of drainage plans and to justify to my entire satisfaction how you would achieve the above objective of ensuring the long-term integrity of such structural elements and preventing water seepage arising from the embedded pipes. Omission of such routing details, or the justification of such omission as the case may be, would result in disapproval of plans under Section 16(1)(i) of the Buildings Ordinance. This is applicable to all new building projects for which building plans are submitted for the first time for approval.

6. To assist designers to route water-borne pipes off structural elements, the Building Authority is prepared to grant modification to permit genuine pipe ducts designed in accordance with Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers APP-93 in new buildings to be excluded from gross floor area calculation.

### **Prevention of Water Seepage in New Buildings**

7. Your attention is also drawn to the importance of preventing water seepage from other sources. To ensure the building quality and compliance with the performance requirements stipulated in the Buildings Ordinance and Regulations, AP and RSE should pay special attention to the choice of material, design and specification, workmanship and supervision.

8. According to the past records, roof, external wall, window, bathroom, kitchen, plumbing and drainage pipes, car park floor and basement are areas which are susceptible to water seepage if not carefully designed and well attended to during the course of construction. AP and RSE are therefore advised to take steps to prevent water seepage in these areas and to specify appropriate waterproofing measures to these areas in their design.

9. You may wish to note that BD has issued Guidelines on Prevention of Water Seepage in New Buildings for general reference.

### **General**

10. A practice note on the same subject has been issued to registered contractors.

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**Guidelines on Embedment of Water-borne Pipes**

1. In general, embedment of water-borne pipes in structural members, other than those specified in paragraph 2, would not be permitted within columns, slabs, structural walls, beams, transfer plates, pile caps and footings.
2. Water-borne pipes piercing through the following structural members may be permitted where it is demonstrated that no adverse effect will be caused to the performance of the structural members and, where the pipes are easily accessible for maintenance :
  - (a) Vertical pipes piercing through structural slabs, transfer plates; and
  - (b) Horizontal pipes piercing through beams, columns or structural walls.

In this regard, for the sake of easy replacement, pipe sleeves should preferably be cast into the structural elements for the pipes to pass through.

3. In the context of para. 2, no adverse effect may be assumed in the following circumstances :
  - (a) Vertical pipes piercing through r.c. floor slabs, transfer plates :-
    - (i) The size of a hole formed is not greater than 150mm in diameter or the minimum bar spacing of the slab in either direction, whichever is the less and no main reinforcement is severed to make way for the hole; and
    - (ii) Trimming bars not less than the size of the main reinforcement of the slab are provided around the hole.
  - (b) Horizontal pipes piercing through r.c. beams :-
    - (i) The size of a hole formed is not greater than 150mm in diameter or 1/3 the depth of the beam, whichever is the less;
    - (ii) The hole is formed at the neutral axis of the beam section;
    - (iii) Vertical and horizontal trimming bars not less than 16mm in diameter are provided around the hole and at each side of the beam; and
    - (iv) No shear reinforcement is severed to make way for the hole.

- (c) Horizontal pipes piercing through structural walls :-
- (i) The size of a hole formed is not greater than 150mm in diameter or the minimum bar spacing of the vertical reinforcement of the wall, whichever is the less; and
  - (ii) Vertical and horizontal trimming bars of size of not less than the vertical reinforcement bars of the wall are provided around the hole and at both side of the wall.

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