

Safe Design and Construction of Cantilevered Projecting Structures

Canopies, balconies, bay windows, air-conditioner platforms, windows flower boxes and other similar features are prone to becoming unstable if they are not properly designed, constructed and maintained. These are features on the exteriors of buildings normally of cantilevered construction projecting from the parent building. Their collapse would have serious consequences. This Practice Note gives guidance to Registered Contractors on the design and construction of cantilevered projecting structures in the interest of public safety.

Reinforced Concrete Cantilevered Projecting Structures

2. The most significant aspects relating to the safety of reinforced concrete cantilevered projecting structures are the load carrying capacity of the structural elements and the durability of concrete. Appendix A gives guidelines on structural design, construction, drainage, site supervision and construction reports for achieving the safety standards. Appendix B provides recommended details for the arrangement for reinforcements. Structural submissions not conforming to these recommendations will be considered as not complying fully with the performance requirements set out in Building (Construction) Regulation 4. The requirements on supervision, standards of workmanship and submission of construction report will be the Building Authority's pre-requisites for approval of plans and consent to commence works.



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Building Authority

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Index under : Cantilevered Projecting Structures

**Guidance Notes on Design and Construction of
Reinforced Concrete Cantilevered Projecting Structures**

Structural Design

1. For cantilevered projections of span more than 1000 mm., a beam-and-slab type of arrangement should be used instead of pure slab cantilever where practicable. The overall depth of a beam at support should be at least 300 mm.
2. Where pure cantilever slab projections have to be designed for, the span to overall structural slab thickness ratio should not be greater than 7 and the slab thickness should be adequate to satisfy the structural strength and durability requirements. If the projecting span exceeds 500 mm, the overall structural slab thickness should not be less than 150 mm. If the projecting span does not exceed 500 mm, the slab thickness may be reduced but should not be less than 100 mm. The thickness of the wall supporting the projecting slab should not be less than the thickness of the slab in addition to any other requirement on the design of the wall.
3. Cantilevered concrete slabs should be reinforced with high yield steel bars in both faces and in both directions. Main reinforcement bars should be at least 10mm diameter and spacing should not be greater than 150 mm, and the steel area should not be less than 0.25% of the cross-sectional area of the structural concrete.
4. The main reinforcement of a projecting structure should have adequate anchorage in the supporting member and wherever possible, be rigidly fixed to the reinforcement of the supporting member. Reinforcement details should be drawn to a large scale indicating clearly the connections.
5. If a cantilevered projection is exposed to weathering, the service stress for deformed high yield steel and plain mild steel reinforcement used in the design should not exceed 100 N/mm^2 and 85 N/mm^2 respectively. Anchorage length should not be less than 45 times the diameter of the steel bar. The minimum cover to the main reinforcement should not be less than 40 mm.
6. Consideration should be given to any local reduction in structural strength affected by the surface drainage system or embedded service pipes and ducts.
7. Allowance should be given to the superimposed loads due to the finishes, waterproofing materials, maintenance work and possible ponding resulting from malfunctioning of the drainage system.
8. Projections over street could be removed under Section 31(2) of Buildings Ordinance if public interest so requires. As such removal may affect the structural integrity of the supporting elements of the parent building due to

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contractor where appropriate, is required to submit a construction report upon completion of the works.

18. The construction report should include the following : -

- (a) an as-built plan showing --
 - (i) the location and dimensions of the members of the cantilevered projecting structure;
 - (ii) the direction and gradient of the fall, where applicable;
 - (iii) the location of the drainage outlets/down pipes, where applicable;
 - (iv) the thickness of screeding and finishes;
 - (v) the location and details of any construction joints for the cantilevered projecting structure;
 - (vi) the grade of concrete and steel;
 - (vii) the diameter and spacing of steel reinforcement in the cantilevered projecting structure;
 - (viii) the date on which the concrete was cast; and
 - (ix) the concrete cover of the steel reinforcement at critical positions of cantilevered slabs, as measured by covermeter; and
- (b) record photographs of cantilevered slabs and supporting members showing --
 - (i) the condition and arrangement of the fabricated steel reinforcement prior to concreting; and
 - (ii) the condition after concreting but before laying of the finishes and waterproofing materials; and
- (c) a certificate in the prescribed form (Form BA 14) confirming that the works have been carried out in accordance with the approved plans and are structurally safe.

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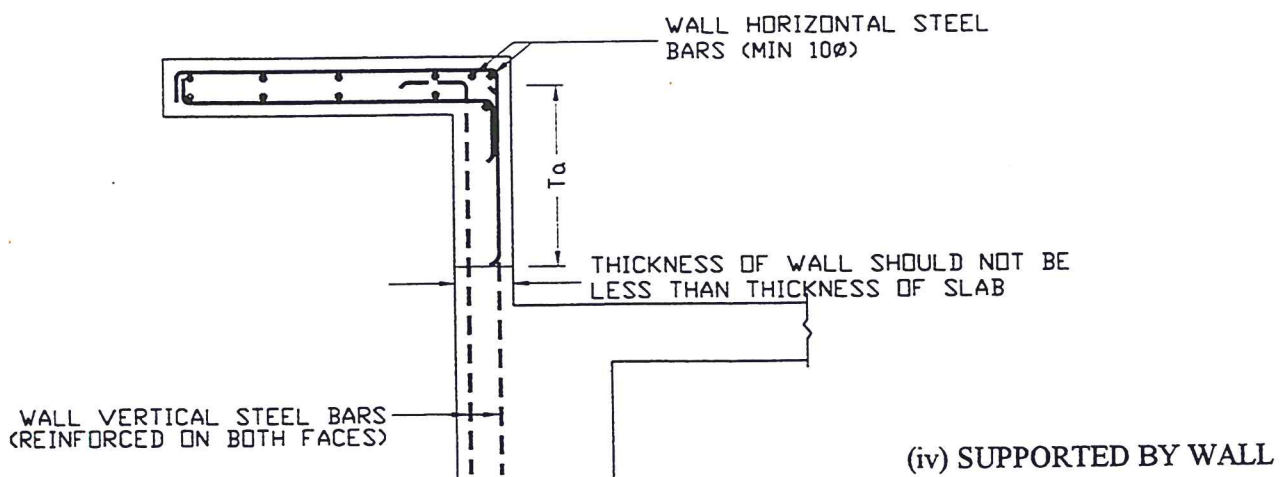
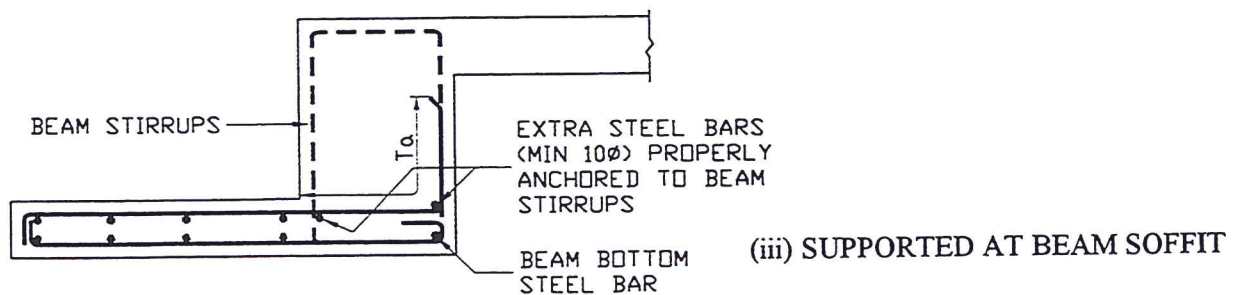
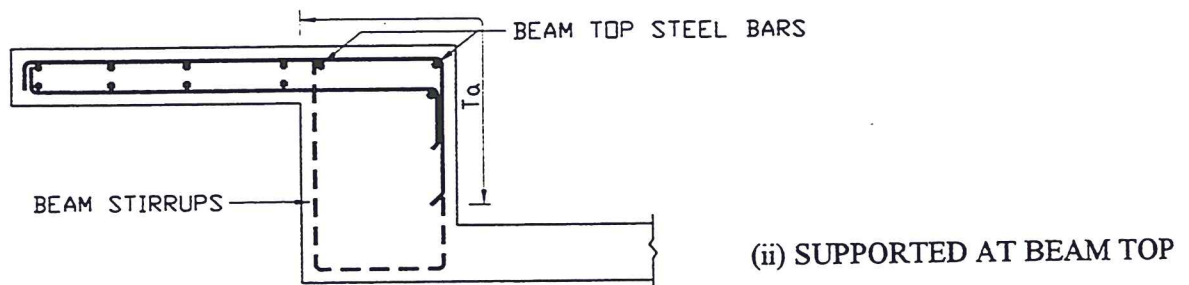
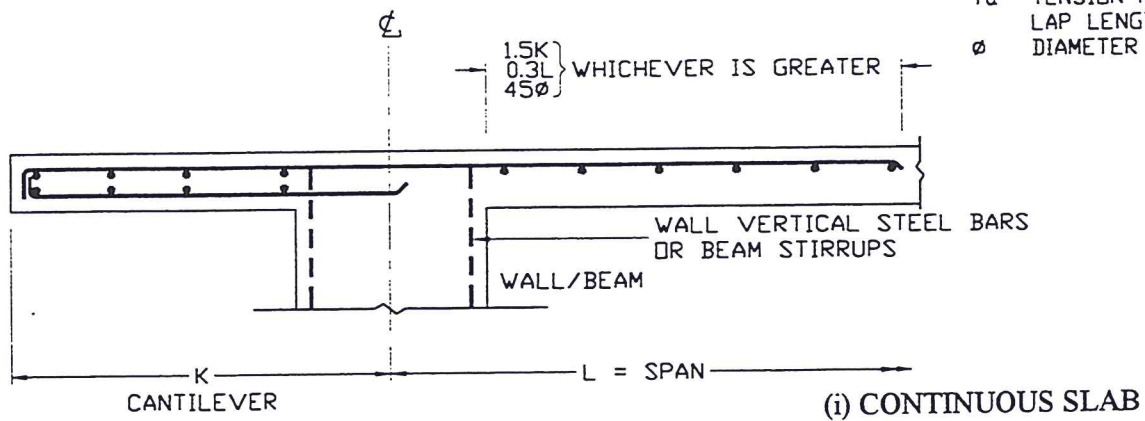
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This revision January 2001 (AD/NB2) – Paragraph 8 added

NOTATION:

T_a TENSION ANCHORAGE AND LAP LENGTH
 ϕ DIAMETER OF STEEL BAR



TYPICAL DETAILS SHOWING THE ARRANGEMENT OF REINFORCEMENT
IN CANTILEVERED SLABS PROJECTED FROM DIFFERENT TYPES OF SUPPORT