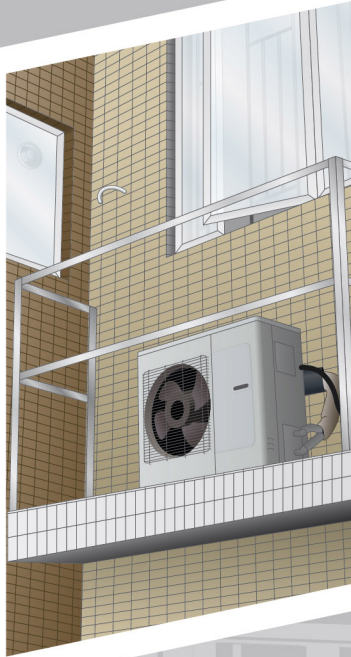




CONSTRUCTION
INDUSTRY COUNCIL
建造業議會



GUIDELINES ON THE DESIGN, INSTALLATION AND MAINTENANCE OF CAST-IN ANCHORS AT EXTERNAL WALLS OF NEW BUILDINGS

Disclaimer

Whilst reasonable efforts have been made to ensure the accuracy of the information contained in this publication, the CIC nevertheless would encourage readers to seek appropriate independent advice from their professional advisers where possible and readers should not treat or rely on this publication as a substitute for such professional advice for taking any relevant actions.

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Preface

The Construction Industry Council (CIC) is committed to seeking continuous improvement in all aspects of the construction industry in Hong Kong. To achieve this aim, the CIC forms Committees, Task Forces and other forums to review specific areas of work with the intention of producing Alerts, Reference Materials, Guidelines and Codes of Conduct to assist participants in the industry to strive for excellence.

The CIC appreciates that some improvements and practices can be implemented immediately whilst others may take more time to adjust. It is for this reason that four separate categories of publication have been adopted, the purposes of which are as follows:

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| Alerts | Reminders in the form of brief leaflets produced quickly to draw the immediate attention of relevant stakeholders the need to follow some good practices or to implement some preventative measures in relation to the construction industry. |
| Reference Materials | Reference Materials for adopting standards or methodologies in such ways that are generally regarded by the industry as good practices. The CIC recommends the adoption of these Reference Materials by industry stakeholders where appropriate. |
| Guidelines | The CIC expects all industry participants to adopt the recommendations set out in such Guidelines and to adhere to such standards or procedures therein at all times. Industry participants are expected to be able to justify any course of action that deviates from those recommendations. |
| Codes of Conduct | Under the Construction Industry Council Ordinance (Cap 587), the CIC is tasked to formulate codes of conduct and enforce such codes. The Codes of Conduct issued by the CIC set out the principles that all relevant industry participants should follow. The CIC may take necessary actions to ensure the compliance with the Codes. |

If you have attempted to follow this publication, we do encourage you to share your feedback with us. Please take a moment to fill out the Feedback Form attached to this publication in order that we can further enhance it for the benefit of all concerned. With our joint efforts, we believe our construction industry will develop further and will continue to prosper for years to come.

1. Background

In view of the frequent accidents associated with repair, maintenance, alterations and additions (RMAA) works in existing buildings, the Committee on Construction Safety (Com-CSY) of the Construction Industry Council (CIC) considers that permanent safety features¹ including gondola system, service platform and anchor devices should be recommended for installation at the external wall of all new buildings when they are constructed. These safety measures will enhance the safety of workers when carrying out future RMAA works at the external walls of the buildings, and minimise the occurrence of falling down of workers from a height.

According to the “Code of Practice for Safe Use and Operation of Suspended Working Platforms” issued by the Labour Department (LD), gondolas should be of sufficient working capacity. To safeguard persons carrying out maintenance and repair works on building external walls with gondolas, the gondolas and the mechanical booms or anchorages should be properly designed and constructed so that they are suitable and safe for the purposes with regard to the nature of works to be conducted therefrom; and the gondolas (either permanent or to be installed to the mechanical booms or anchorages) should be capable of reaching all intended work areas. Besides, Authorized Persons (AP) and Registered Structural Engineers (RSE) should also consider the provision of cast-in anchor devices in the design and construction of new buildings for the direct attachment of personal fall protection systems and equipment for use of workers to prevent and/or arrest falls from height when working on the external walls of buildings during repair and maintenance works.

This document presents the details of the technical guidelines for the location, design, installation and maintenance of cast-in anchors for the direct attachment of personal fall protection systems and equipment. In considering the provision of such anchors, however, AP and RSE should be well aware that provision of safe means of support and access/egress for any works at the external wall should be considered in the first place. Personal fall protection with the use of cast-in anchors should only be treated as a supplementary safety measure or the last resort for protection of workers from falling from height. When air-conditioners (A/C) platforms are provided as a safe means of support for A/C repair and maintenance works at the external walls of buildings, AP and RSE should take note of the safety requirements stipulated under the Occupational Safety and Health Ordinance, Cap 509 and Occupational Safety and Health Regulation, Cap 509A with regard to the provision and maintenance of means of access to and egress from such platforms that are, so far as reasonably practicable, safe and without risks to health and secure fencing of their fall edges respectively.

While British European Standards or British Standards are quoted in this Guidelines, other equivalent international standards or provisions would also be acceptable. When making reference to any standards or provisions, their latest versions should be referred to.

¹ The Buildings Department (BD) issued Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, ADV-14 providing guidelines on the facilities for external inspection and maintenance of buildings such as gondolas, mechanical booms, anchorages and cast-in anchor devices.

2. Location

Cast-in anchors² should be provided for safe access to and egress from A/C platforms constructed at external walls as well as the regular maintenance and minor repair of A/C thereon without the need to engage gondolas. Designers should make reference to items (b) and (c) in Section 6.

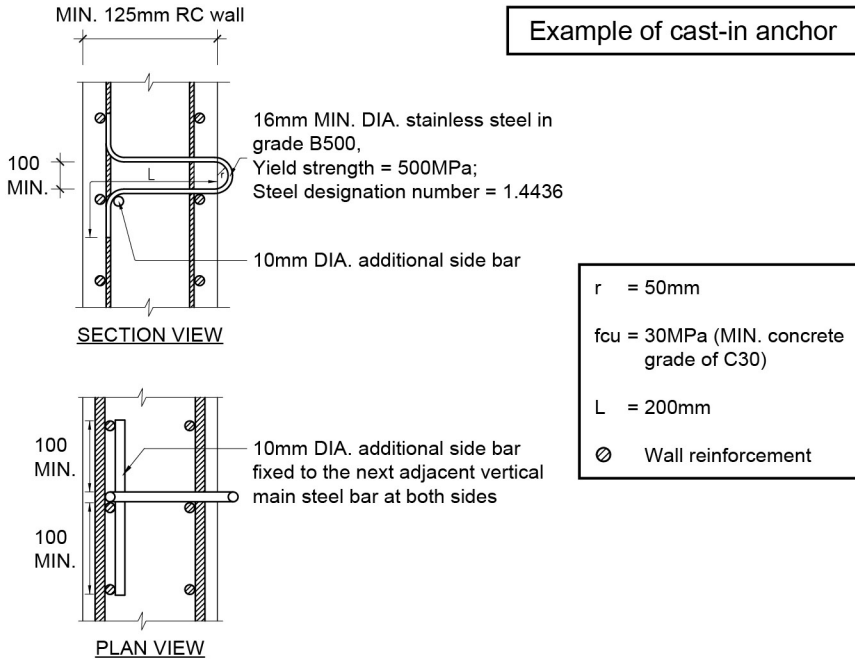
As far as necessary and practicable, the device is also recommended to be provided where cleaning, maintenance and repair works on external walls cannot be safely carried out with the use of gondolas or where no gondola is provided.

3. Technical Design

Cast-in anchors should be positioned at the external reinforced concrete (RC) walls with a minimum thickness of 125 mm or external structural elements of all new buildings in such a way that they are safely accessible and easily visible to workers when carrying out external repair and maintenance of existing buildings. They should in no case make the workers exposed to the risk of falling in the course of securing and detaching the anchorage.

² Installation and subsequent alterations of cast-in anchors are building works that require prior approval and consent from the BD under the Buildings Ordinance, Cap 123 before commencement of works.

Example of cast-in anchor



The design life of the cast-in anchors should be the same as the design life of the building, and should be taken into consideration in the design of the anchors.

The cast-in anchors should be installed at pre-determined locations before casting of the supporting structural elements. The anchor bars should be of stainless steel in Grade B500 complying with BS 6744:2016 and designation number 1.4436 or of equivalent standard with a minimum diameter of 16 mm or be designed to sustain the load test as required for Type A anchor device in BS EN 795:2012. Designers may make reference to “Structural Design of Stainless Steel” - SCI publication P291 by N.R. Baddoo and B.A. Burgan (Published by The Steel Construction Institute), Concrete Society Technical Report 51 “Guidance on the Use of Stainless Steel Reinforcement” (Published by Concrete Society (UK)), BS 6744: 2016 “Stainless steel bars - Reinforcement of concrete - Requirements and test methods”, etc.

4. Material Test

Mill certificates and test reports³ of the stainless steel bars are required to substantiate their material properties and specified strength.

Sampling and testing of stainless steel reinforcing bars should be carried out in accordance with BS 6744:2016.

All tests should be carried out and certified by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or by other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with HOKLAS, for the particular test concerned, and test reports should be submitted to and found satisfactory by the AP/RSE before installation

5. Installation

Cast-in anchors should be properly installed to the external RC wall with a minimum thickness of 125mm or the external structural elements of the building in accordance with relevant standards including the provision of adequate concrete cover and proper positioning of the stainless steel bars as specified in Concrete Society Technical Report 51 or relevant code of practice.

Subject to item (d) in Section 6, no test is required for the cast-in anchors after installation.

³ After the completion of works, the mill certificates and test reports of the stainless steel bars should be submitted to the BD together with a statement signed by the AP/RSE to confirm that the acceptance criteria appropriate to the types of stainless steel bar used have been complied with.

6. Operation / Maintenance

AP/RSE and other concerned parties including building owners, owners' corporations, management companies and the contractors engaged in the repair and maintenance works on the external walls should note the following requirements regarding the proper use of the cast-in anchors and the secure fencing of A/C platforms:

- (a) Each cast-in anchor should only be used by one worker at any one time;
- (b) Cast-in anchors should be the connection point of the fall arrest equipment such that the worker will not fall more than the height specified by the specifications of the safety belt, nor contact any lower level structures. The distance of fall should be minimized as far as practicable. In particular, where cast-in anchors are provided as anchorage for fall protection to workers making access to and egress from A/C platforms via windows, the anchors should be located on the external walls of the buildings at a position near to the access windows and higher than the sill of the openable part of the access windows (preferably at least at a level of 1500mm above the floor of the A/C platforms), and should be reachable by hands to facilitate use/ inspection/ testing of the cast-in anchors. The access windows when opened should not obstruct the workers from using the cast-in anchors;
- (c) Under Section 6 of the Occupational Safety and Health Regulation, Cap 509A, if a platform could be a danger to the safety of persons, the platform should be securely fenced to a height of 900-1,000mm (guard-rails⁴). Taking into account the nature of the work to be performed on the A/C platforms, suitable intermediate guard-rails of 450mm - 600mm high should also be provided. With due regard to the position of the air-conditioning units installed on the A/C platforms, the height of the guard-rails should be suitably increased to reduce workers' falling risk during work (i.e. to provide fall protection to a height of 900-1,000mm from the anticipated raised foothold of workers). Guard-rails should be of suitable and sound materials of sufficient strength and capacity, and should be designed to resist the imposed loads⁵ and wind loads⁶, where appropriate;

- (d) At least once in the preceding 12 months before use, the cast-in anchors should be inspected by a Registered Professional Engineer (RPE) in Building, Civil or Structural Discipline or otherwise be inspected and tested by a Competent Person who possesses a valid certificate issued by the Occupational Safety and Health Council on the training course on inspection and testing of cast-in anchor devices for attachment of personal fall protection equipment;
- (e) Suitable type of lanyard and safety belt system should be used. Reference can be made to “Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems” published by the Occupational Safety and Health Branch, LD, and relevant British European Standards;
- (f) The requirements stipulated by the LD for using the anchor devices should be followed;
- (g) If the cast-in anchors have been subjected to impact force or misused, they should not be used again until inspected and determined by a RPE in Building, Civil or Structural Disciplines, to be undamaged and suitable for reuse; and
- (h) All inspection records of the anchors should be properly maintained for a period of at least 18 months from the date of inspection.

⁴ Installation and subsequent alterations of guard-rails for A/C platforms are building works that require prior approval and consent from the BD under the Buildings Ordinance, Cap 123 before commencement of works.

⁵ Guard-rails should be designed to resist the imposed loads under the category of “Areas where congregation of people is not expected” as prescribed in Table 3.13 of the “Code of Practice for Dead and Imposed Loads” published by the BD.

⁶ If guard-rails would be subjected to wind loads, they should be designed to resist the more stringent requirement of either the required imposed load or the design wind loads as prescribed in the “Code of Practice on Wind Effects in Hong Kong” published by the BD.



Feedback Form

[GUIDELINES on The Design, Installation and Maintenance of Cast-in Anchors at External Walls of New Buildings (Version 2)]

Thank you for reading this publication. To improve our future editions, we would be grateful to have your comments.

(Please put a " ✓ " in the appropriate box)

| | | | | | |
|--|---|---------------------------------------|--|----------------------------------|----------------------------------|
| 1. As a whole, I feel that the publication is: | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| Informative | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Comprehensive | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Useful | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Practical | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Does the publication enable you to understand more about the Design, Installation and Maintenance of Cast-in Anchors at External Walls of New Buildings? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No Comment <input type="checkbox"/> | | |
| 3. Have you made reference to the publication in your work? | Quite Often <input type="checkbox"/> | Sometimes <input type="checkbox"/> | Never <input type="checkbox"/> | | |
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| 5. Overall, how would you rate our publication? | Excellent <input type="checkbox"/> | Very Good <input type="checkbox"/> | Satisfactory <input type="checkbox"/> | Fair <input type="checkbox"/> | Poor <input type="checkbox"/> |
| 6. Other comments and suggestions, please specify (use separate sheets if necessary). | | | | | |
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