Large Metal Gates

The installation of metal gates in buildings is primarily for security purpose. Recent incidents of collapse of large metal gates have aroused serious safety concern. Not only proper design can ensure the safety of large metal gates, correct installation, proper use and regular maintenance are also important. This practice note provides guidelines on design and installation of large metal gates at fence walls or entrance of building.

2. Metal gates are building works as defined under the Buildings Ordinance, whether they be manually or electrically operated. For new buildings, metal gates should be shown on the building plans submitted for prior approval and consent by the Building Authority. For large metal gates with a height exceeding 2.2m and the weight of any gate leaf exceeding 300 Kg, plans showing structural details of the metal gates including design calculations are also required to be submitted for approval. For the installation of new metal gates in existing buildings, if the height of the metal gate exceeds 2.2m and the weight of any gate leaf exceeds 300 Kg, both building and structural plans are required to be submitted for approval prior to installation.

Design and Installation Requirements

3. In general, all metal gates should be constructed of suitable materials and satisfy the performance requirements stipulated in the Building (Construction) Regulation 3. They should be properly designed and constructed in accordance with recognized standards to ensure their satisfactory and safe operation under the expected conditions of use. All parts of the metal gate installations, whether fixed or movable, including the fixings, should in all respects be of sound construction, adequate strength and free from obvious defects for their intended working life.

4. The installation of large metal gates should be under the qualified supervision of a registered general building contractor to ensure that the works are carried out in accordance with the approved plans and the required standards are complied with. Upon completion of installation, the metal gate should be inspected and trial operated to ensure that it has been properly installed.

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5. Where submission of structural details of metal gate is required, special attention should be paid to the following:

(a) design wind load should be in accordance with the appropriate provisions in the Code of Practice on Wind Effects in Hong Kong 2004;

(b) details and design for the elements of the gate framework, post support and foundation should be given to demonstrate the stability of the metal gate during operation;

(c) design of connection to fix the gate framework to the surrounding structure and the design check on the supporting structure should be provided;

(d) for swing-type metal gate, details of hinge pin fittings to permit pivotal movement should be given;

(e) for sliding metal gate, details of end stoppers to prevent the metal gate from over-travel at both ends should be shown; similar provisions should be made for multi-passing metal gate which also serve as connection between gate leaves;

(f) additional measures should be provided to stop the metal gate from being lifted off or derailment during operation; and

(g) details of decorative parts of the metal gate need not be submitted.

Additional Measures and Reference Standards

6. Recommendations on additional measures and design considerations for enhancing the safety of metal gates are given in Appendix A. Some relevant standards/specifications for the design and installation of metal gates are given in Appendix B. Authorized Person (AP) and Registered Structural Engineer (RSE) may also make reference to other international or national standards and specifications if equivalent performance can be demonstrated.

Tests on Anchors

7. Where drilled-in anchors are proposed to secure the stability of metal gate, at least 5 numbers of each type and size of the anchors installed should be tested by pull-out test to demonstrate that its pull-out capacity is not less than 1.5 times the recommended tensile load as specified by the anchor manufacturer. The tested anchor should be considered satisfactory if it does not show any signs of separation, plastic deformation or deleterious effect during the test. Such tests should be carried out under the direction of the AP/RSE.

/Electrically.....

Electrically Operated Metal Gates

8. For electrically operated metal gates, reference should also be made to the "Code of Practice for Installation of Electrically Operated Sliding Gates, Sliding Glass Doors and Rolling Shutters" published by the Director of Electrical and Mechanical Services.

Guidelines for Registered Contractors

9. A similar practice note is issued to Registered Contractors.

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Appendix A
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Recommendations for Enhancing the Safety of Metal Gates

Swing-Type Metal Gate

1. All hinge fittings of a swing-type metal gate should be welded all round to the gate framework and should be able to withstand the dead weight of the metal gate and wind loads during normal operation.

2. A minimum of 3 hinges should be provided for the connection between the metal gate and each supporting post. To prevent the metal gate being lifted off from its hinges after installation, measures such as installing one of the hinge fittings with the hinge pin pointing in a reverse direction should be incorporated for providing restraint against vertical movement.

Sliding Metal Gate

3. The gate leaf as well as any other moving parts of a sliding metal gate should be designed and constructed in such a way as to prevent them from falling down, collapsing or derailment during normal operation or in case of contact with stationary obstacles. Proper design and provisions of guide and metal gate stopper of adequate size and strength are required to maintain lateral stability of the metal gate and to resist the imposed loads and impact force.

Folding Metal Gate

4. Paragraphs 1 to 3 above are applicable to a folding metal gate with two or more hinged leaves, guided and/or supported at the top or at the bottom. Similar provisions for preventing the gate leaf from being lifted off should be made for the hanging fittings connecting the hinged leaves.

Installation and Use

5. Before installation, all members and components of the metal gate should be visually inspected to ensure that they are free from visual defects and comply with the approved structural details.

/Maintenance.....

Maintenance and Repair

6. All parts of the metal gate providing mechanical resistance and connection, whether fixed or movable, are subject to normal deterioration of wear and tear. Regular inspection and maintenance should be provided to safeguard the metal gate from disengagement or derailment.

7. The AP should coordinate with the Registered Contractor to prepare documentation on the safe operation and maintenance of the metal gate installed, for regular maintenance and repair to be arranged by the Incorporated Owners/management company. Routine inspection and maintenance work such as cleaning of dirt and obstacles from the track and guide rail, and application of lubrication to enable smooth movement of the metal gate should be carried out every three months.

(12/2008)

Appendix B
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Relevant Standards and Specifications for Metal Gates

The various standards, specifications for the design and installation of metal gates as listed below are intended to provide reference information and the lists are not exhaustive. Other international or national standards and specifications may also be referred to if equivalent performance can be demonstrated.

BS 4092:Part 1:1996	:	Domestic front entrance gates – Specification for metal gates
BS EN 12433-1:2000	:	Industrial, commercial and garage doors and gates – Terminology – Part 1: Types of doors
BS EN 12433-2:2000	:	Industrial, commercial and garage doors and gates – Terminology – Part 2: Parts of doors
BS EN 12604:2000	:	Industrial, commercial and garage doors and gates – Mechanical aspects – Requirements
BS EN 12605:2000	:	Industrial, commercial and garage doors and gates – Mechanical aspects - Test methods
BS EN 12635:2002	:	Industrial, commercial and garage doors and gates – Installation and use
BS EN 13241-1:2003	:	Industrial, commercial and garage doors and gates – Product Standard – Part 1: Products without fire resistance or smoke control characteristics
BS EN 1461		Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
BS EN ISO 12944 -1 to 8:1998		Paints and varnishes - Corrosion protection of steel structures by protective paint systems
BS EN ISO 14713: 1999		Protection against corrosion of iron and steel in structures - Zinc and aluminium coatings - Guidelines
BS EN 1176-1:1998		Playground equipment- Part 1: General safety requirements and test methods