



HIGHWAYS DEPARTMENT

**GUIDANCE NOTES ON INSTALLATION OF BARRIERS
AT EMERGENCY CROSSING
AND
CONTINGENCY CROSSING
IN CENTRAL DIVIDER OF DUAL CARRIAGEWAY**

Research & Development Division

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Introduction

1. Emergency crossing (EC) and contingency crossing (CC) are openings provided in the central reserves of dual carriageways as stipulated in the Transport Planning and Design Manual (TPDM). An EC is provided to facilitate the manoeuvre of emergency vehicles across the central reserves in emergencies, whereas a CC is provided for diversion of traffic in major traffic incidents. Some crossings serve dual purposes as both EC and CC. More details of these crossings are given in Volume 2 Chapter 3 Section 3.4.8 of the TPDM.
2. Tubular crash gates had been widely used to close ECs and CCs and were designed in such a manner that they could be knocked down easily for quick passageway of vehicles. They are therefore not strong enough to prevent errant vehicles from straying onto the opposite carriageway in case of accident. Broken gates may also be projected onto opposite traffic lanes upon collision and endanger road users. With a view to alleviating the above hazards, studies have identified movable steel barriers (MSBs) and removable concrete barriers (RCBs) as generally feasible alternative installations to replace crash gates at ECs and CCs respectively. MSBs and RCBs shall be used on all new carriageways unless otherwise requested by the traffic authorities. For existing openings in central dividers, TD, FSD, HKPF and HyD have reviewed the closure of surplus openings by permanent barriers or RCBs, and the replacement of crash gates for ECs with MSBs. When an EC is not suitable to be retrofitted with an MSB system (e.g. where the ends of the adjacent central divider are railings), emergency access gates (EAGs) as shown in HyD Standard Drawing No. H2276B may be considered. This type of EAG allows the gate to bend about the ground before breakage and thus no detachment would become dangerous projectiles upon impact by an errant vehicle.
3. Installation of MSBs or RCBs on highway structures should be avoided as far as practicable. Where such installations cannot be avoided, the concrete end anchor blocks of the barriers should be specially designed in order not to jeopardize the structural integrity of the supporting highway structure.

Barrier for EC

4. To facilitate the manoeuvre of emergency vehicles, the barrier at an EC should be able to be opened and closed within a few minutes. Yet it should provide a containment capacity comparable to that of a normal barrier when it is closed. The MSB has been identified as a suitable facility that satisfies these functional requirements.

5. To serve the intended purpose, an MSB system should meet the specifications in the **Appendix**. The typical layout of the MSB system is given in HyD Standard Drawings Nos. H2273 to H2275. The type of MSB to be adopted should be agreed by HyD, TD, FSD and HKPF.
6. Currently, both ArmorGuard Gate System (AGS)¹ and Vulcan Gate System (VGS) are the approved products for the MSB system in Hong Kong. TD, FSD and HKPF have no objection in principle to their installation at ECs, subject to the following:
- a) Each proposed installation shall be forwarded to FSD, HKPF and the relevant Regional Office of TD in advance for formal agreement.
 - b) Staff of FSD and HKPF shall be given the opportunity to practise the operation of the MSB on site before commissioning of the facility. Practice sessions shall be arranged by the respective Regional Office of HyD or the project office. When several MSBs are installed in the same district, the number of practice sessions may be reduced if agreed by FSD and HKPF.
7. If the longitudinal gradient and/or crossfall at the EC exceeds the designed operating limits of the MSB to be installed, the manufacturer shall be consulted to ascertain whether installation of the MSB at that EC is suitable or whether the EC should be relocated to a position acceptable to TD, FSD and HKPF.
8. Other types of MSB that satisfy the functional requirements may also be considered subject to the agreement of TD, FSD and HKPF.

Barrier for CC

9. Unlike an EC, opening of a CC in one to two hours under contingency situations is generally acceptable. According to the TPDM, RCBs are to be provided at CCs as a standard provision under normal circumstances. When an EC is no longer required but it is desirable to retain the crossing to cater for future temporary traffic diversion, TD may instruct installation of RCBs to close up the crossing. Details of the RCB are given in HyD Standard Drawings Nos. H2254 to H2256.
10. For CCs at strategic locations where a rapid traffic diversion will be required in major traffic incidents (e.g. a single traffic route to the airport), the use of other suitable devices may be

¹ Previously called SafeGuard Gate System (SGS)

requested by the traffic authorities. For existing CCs, TD will consider whether the use of RCBs or other devices is more suitable. For new CCs, the project office should consult TD (Major Projects Division, Regional Offices and Transport Incident Management Section), HKPF, the Regional Offices of HyD, and other relevant parties. Technical advice on the use of other suitable devices may be sought from the Research and Development Division of HyD.

Barrier for crossings which serve as both EC and CC

11. In general, a 16m MSB system should be considered for dual-purpose crossings located at strategic locations of major roads with:
- dual 3-lane configuration or above; and
 - legal speed limit of 70km/h or above.

Maintenance of MSB and RCB

12. To ensure that MSBs and RCBs can perform satisfactorily during emergencies / contingencies, proper maintenance of these facilities is of paramount importance. Section 11 of the Maintenance Administration Handbook shall be strictly complied with for the maintenance of MSBs and RCBs.

Enquiries

13. Enquiries on these guidance notes should be directed to the Research and Development Division of HyD.

Appendix - Specifications of Movable Steel Barrier (MSB) System

Appendix

Specifications of Movable Steel Barrier System

Specifications of Movable Steel Barrier (MSB) System

1. The MSB system shall comprise 8m or 16m long “ArmorGuard Gate Systems” manufactured by Barrier Systems Inc. or “Vulcan Gate Systems” manufactured by Energy Absorption Systems, Inc., or any other approved products with equivalent functions or performance. The typical layout of the MSB system is shown in HyD Standard Drawings Nos. H2273 to H2275. The MSB system shall comply with the evaluation criteria for Tests 3-10, 3-11 and 3-21 stipulated in Table 3.1 of the National Cooperative Highway Research Program Report 350. The maximum dynamic deflection of the MSB system in the tests shall not exceed a value that would cause the barrier to encroach upon the opposite traffic lane after impact.

The Contractor shall provide details of the proposed MSB and a copy of the relevant crash test certificates for approval of the Engineer before delivery of the MSB system or commencement of site works, whichever is earlier.

2. The MSB system shall be able to be opened by swinging about its end anchors towards either side of a road smoothly up to 45 degrees on site (taking into account the longitudinal and transverse gradients of the carriageway and the central reserve), and then closed properly without affecting its containment capability. After the MSB system is swung open, the passageway created along the central reserve should be 8m or 16m wide depending on the type of MSB installed.
3. Opening and closing of the MSB system shall be able to be completed within 2 minutes by 2 adults for an 8m MSB and 4 adults for a 16m MSB, operating on site by hand using a non-powered mechanical system (use of compressed air or any other powered means is not allowed) built into the MSB (e.g. a hand-operated jacking system), without the need for any additional tools. The MSB system shall also be provided with a built-in mechanism to prevent it from sliding during opened or closed on site.
4. If the proposed MSB is not a type previously agreed by TD, FSD and HKPF for installation at an emergency crossing (EC), the Contractor shall obtain the agreement of these traffic and rescue authorities to the use of the MSB system in advance.
5. The Contractor shall arrange training sessions for the staff of FSD and HKPF to practise the operation of the MSB on site before commissioning of each new MSB system. Such

training shall be provided regardless of whether the proposed MSB has previously been agreed for use at other ECs, unless otherwise agreed by FSD and HKPF.

6. The Contractor shall, in consultation with the MSB manufacturer and taking into account the actual site conditions, provide the detailed design of the reinforced concrete end anchors for the MSB. The Contractor shall inspect the proposed site before carrying out detailed design of the end anchor blocks and shall identify any necessary modifications to existing features and installations on site. The Contractor shall demonstrate that the detailed design is agreed by the MSB manufacturer, and shall submit the design to the Engineer for approval.
7. The protruding ends of any bolts on an MSB or its anchors that are exposed to traffic shall be capped with dome nuts.
8. The Contractor shall submit the installation manual and maintenance manual for the MSB at least 7 calendar days before commencement of installation of the MSB system.
9. The Contractor shall provide detailed mechanical drawings of the MSB and as-built drawings of the works together with a detailed schedule of accessories and components for the MSB.