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Highways Department Technical Circular No. 2/2024

Planning and Design of Fire Fighting Facilities on New Trunk Roads, Elevated Highway Structures and Underpasses/Road Tunnel Structures

Introduction

This Circular provides the general principles on the planning and design of fire fighting facilities on highway works. It supersedes HyDTC No. 4/2010 which is hereby cancelled.

General Principles on Planning and Design

2. For the purpose of installing fire fighting facilities on new trunk roads, elevated highway structures and underpasses/road tunnel structures, agreements have been reached among Highways Department (HyD), Fire Services Department (FSD), Water Supplies Department (WSD) and other government departments on some general principles to facilitate the planning and design of our highway works as stated in paragraphs 2(i) to (xi), while the issues of detailed planning, design, operation and maintenance of fire fighting facilities shall be agreed with relevant owner/maintenance department/agent on case by case basis.

(i) FSD, WSD and other owner departments/agents, if known, shall be consulted at an early stage in the design process to ascertain the fire fighting facilities, including but not limited to fire mains, fire hydrants, pumping facilities, and detailed requirements on each and every individual case. The ownership, operation and maintenance responsibilities of such fire fighting facilities shall be discussed and resolved amongst all departments/agents concerned at the early stage of design process. The Bridges and Structures Division, HyD shall also be consulted if the fire services installations would affect the design of highway structures.

(ii) Due consideration should be given to the future inspection, maintenance, operation, accessibility, and the need of regular flushing for the designs of fire mains and hydrants during design stage.

(iii) Fire mains, in common with other utilities service installations, should normally be installed along service roads or within the existing subsidiary road network. If the location of a fire main within the highway reserve is unavoidable, it should normally be located in the roadside verge but not in the carriageway. In such circumstances, fire hydrants may be provided in the verge to FSD requirements, with adequate protection to ensure the safety of road users.

(iv) Installation of salt water fire mains should be avoided on highway structures due to potential corrosion problem.

(v) Provision of fire hydrants to at-grade trunk road:

Case 1: Normal Provision

Provision of fire hydrants to at-grade trunk road shall be at a distance of 100 m, staggered on alternate sides of the roadway.

Case 2: Provision under Extenuating Circumstances [See Note 1]

Where there are extenuating circumstances, the spacing and location could be relaxed subject to agreement with FSD. For trunk roads in urban area (urban area includes all developed area such as new town), the maximum spacing could be relaxed to 330 m. For trunk roads in rural area with no development on the roadside, the maximum spacing could be relaxed to 1000 m. Fire hydrants shall be staggered on alternate sides of the roadway if possible.

(vi) Provision of fire hydrants to elevated highway structures:

Case 1: Elevated Highway Structure with Adjacent At-grade Road

Fire hydrant may not be required on an elevated highway structure if fire fighting operations can be performed with the aid of fire hydrants along an adjacent at-grade road (Fig. 1). This would, however, be subject to actual configuration and prior agreement with FSD.

Case 2: Short Flyover

For a flyover shorter than 330 m in urban area or 1000 m in rural area with no development on the roadside, fire hydrants shall be provided at the ground approaches. (Fig. 2)

Note 1 The followings are some examples of extenuating circumstances under which laying a continuous fire main along the road verge may be impossible/very difficult and the spacing of fire hydrants may be relaxed:

(a) Land constraints
(b) Engineering constraints, e.g. excessive rock cutting or filling is involved
(c) Very congested utilities along the road verge

Case 3: Long Viaduct

For a long viaduct without alternative provision of fire hydrants as in Case 1 above, fire hydrants shall be provided on the structure at a maximum spacing of 330 m in urban area or 1000 m in rural area with no development on the roadside. Fire hydrants shall be staggered on alternate sides of the viaduct if possible. (Fig. 3)

Case 4: Long Span Cable-supported Bridge or Similar Long Span Bridge

For a long span cable-supported bridge or similar long span bridge, where it is technically infeasible to install water mains, consideration may be given to the provision of suitable water tender(s) for fire fighting purposes. Fire hydrants shall be provided outside the bridge. (Fig. 4)

(vii) Provision of fire fighting facilities in underpasses/road tunnel structures

For road tunnel structures, the requirements on provision of fire fighting facilities are stipulated in the section of "Road Tunnels" of "Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment" (Codes of Practice) published by FSD.

In regard to the provision of fire fighting facilities to underpasses including their approach ramps, reference can be made to the same requirements stipulated in the Codes of Practice. The designer shall submit design plans to FSD for comment/vetting on the detailed fire services requirements.

The layout of underpasses could vary a lot. For example, some underpasses may be very long which may route through quite a number of roads. However, some underpasses may be short which may route through only one narrow road, with little or no level difference with adjoining at-grade roads and without approach ramps. Therefore, the detailed fire services requirements should be determined case by case in consultation with FSD.

The designer shall also take into account of the possible water leakage from the fire mains and hydrants, the risks of flooding and the consequences of pipe burst in the design of the underpasses/road tunnel structures. The drainage requirements as stipulated in paragraph 2.7 of the HyD Guidance Notes No. BS/GN/046B "Guidance Notes on Design of Road Tunnel Structures and Tunnel Buildings to be Maintained by Highways Department" should be followed for the design of drainage system of underpasses/road tunnel structures.

(viii) In general, fresh water fire hydrants shall be painted red and salt water fire hydrants shall be painted yellow. Different colours may be proposed to the exposed fire mains to match with the surrounding environment or for aesthetic effects for agreement by the owner/maintenance department/agent.

(ix) It may be necessary to build booster pumping station to provide adequate water pressure and flow for fire mains on new trunk roads, elevated highway structures or underpasses/road tunnel structures. FSD, WSD and the concerned departments responsible for the operation and maintenance of the pumping station shall be consulted for the need and layout for such pumping station.

(x) Fire hydrants should be installed with a minimum horizontal clearance of 1.5 m from vertical objects such as lighting columns, sign posts or gantry legs.

(xi) Continuity of roadside barriers and parapets of highway structures is an important factor in road safety. The practice of allowing short gaps in roadside barriers and parapets of highway structures for facilitating access to fire hydrants shall be avoided. Where necessary, the fire hydrant may be, subject to agreement by FSD and the maintenance authorities, raised to avoid obstruction by the barriers and parapets.

For fire hydrants adjacent to at-grade roadside barriers where the 1.5 m horizontal clearance requirement in paragraph 2(x) cannot be met, the hydrant outlets should be at least 100 mm above the top of the barrier and a minimal horizontal clearance of 500 mm should be maintained between the fire hydrants and the barriers wherever practicable.

The outlets of a raised fire hydrant should not be more than 950 mm above ground; otherwise, consideration should be given to provision of a concrete stepping platform for the hydrant if requested by FSD and agreed by the maintenance authorities. Details of the platform are to be agreed with FSD and the maintenance authorities based on the actual site conditions.

Mains above ground used in raising of fire hydrants should be protected by grade 20/20 concrete jacket. The external diameter of the jacket should at least equal to the diameter of the bell shaped bottom of the fire hydrant.

Fig. 5 illustrates the typical arrangement of the raising of fire hydrant above parapet to avoid obstruction. The detailed design of fire hydrant shall be agreed with the operation and maintenance parties/authorities.

Enquiries

3. Enquires on this Circular shall be addressed to SE/P2, B&S Division (Tel no. 3903 6504).

(Tony YAU)
Director of Highways

CASE 1 : ELEVATED HIGHWAY STRUCTURE WITH ADJACENT AT-GRADE ROAD

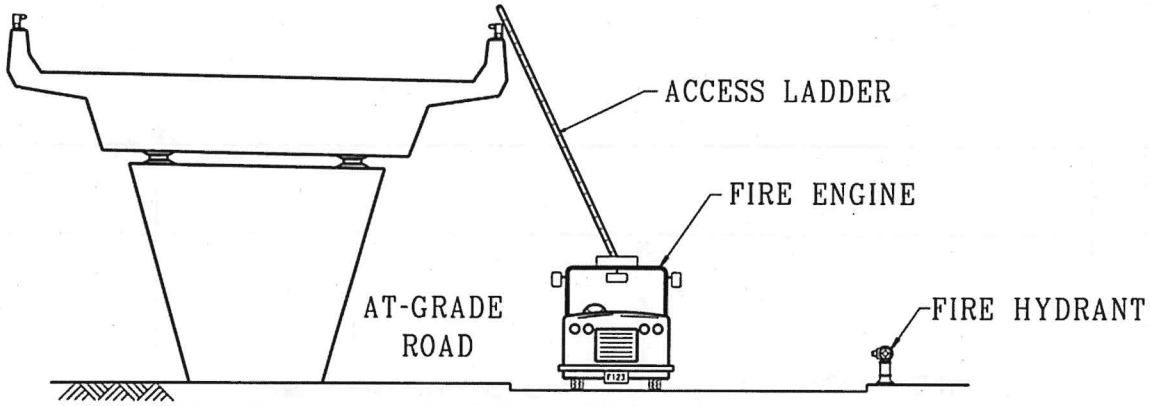


FIG. 1

CASE 2 : SHORT FLYOVER

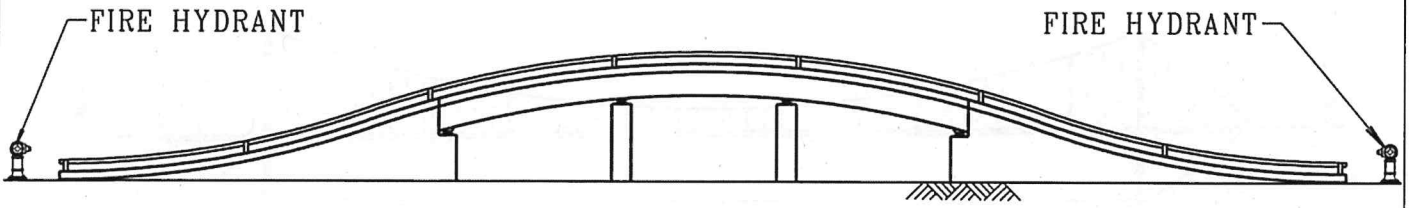


FIG. 2

CASE 3 : LONG VIADUCT

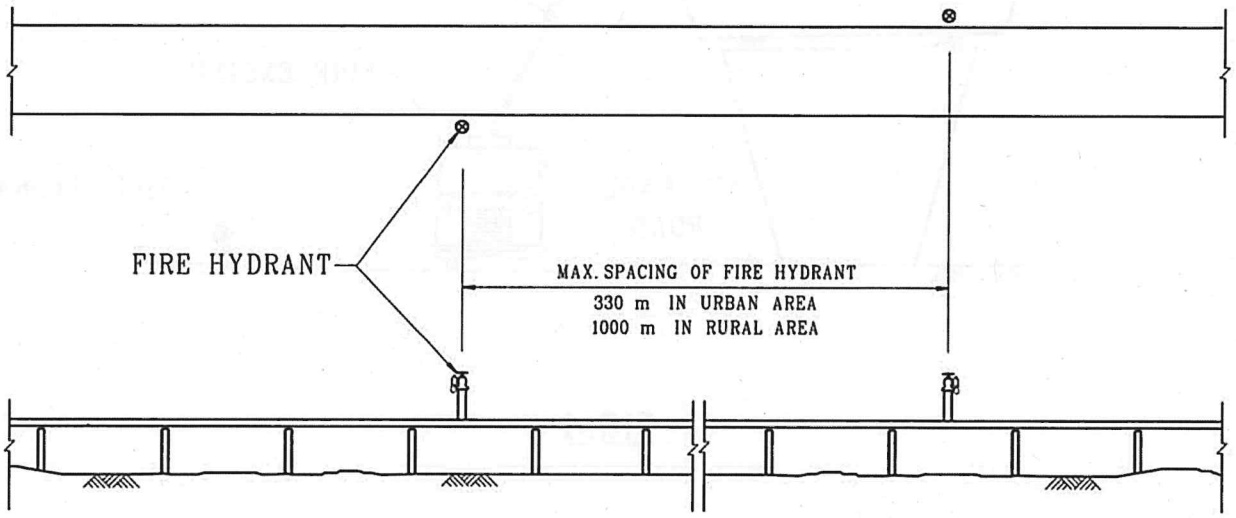
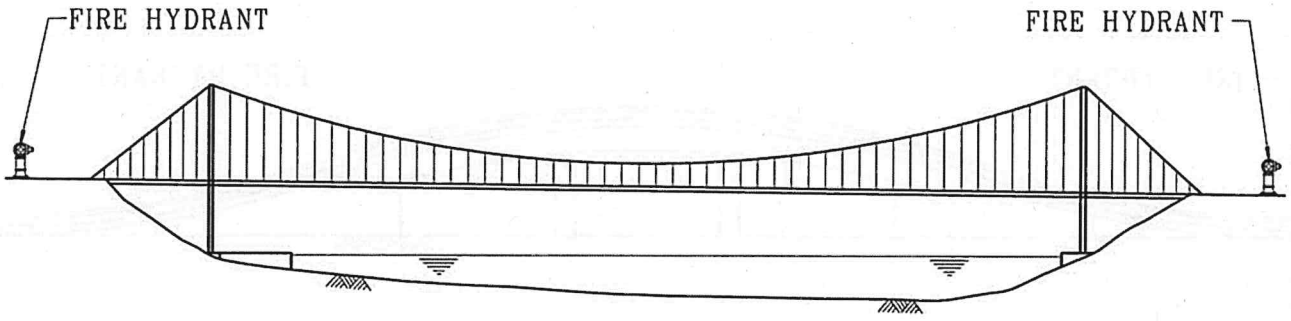


FIG. 3

CASE 4 : LONG SPAN CABLE-SUPPORTED BRIDGE



NOTE: WATER TENDERS SHALL BE PROVIDED TO FSD REQUIREMENTS

FIG. 4

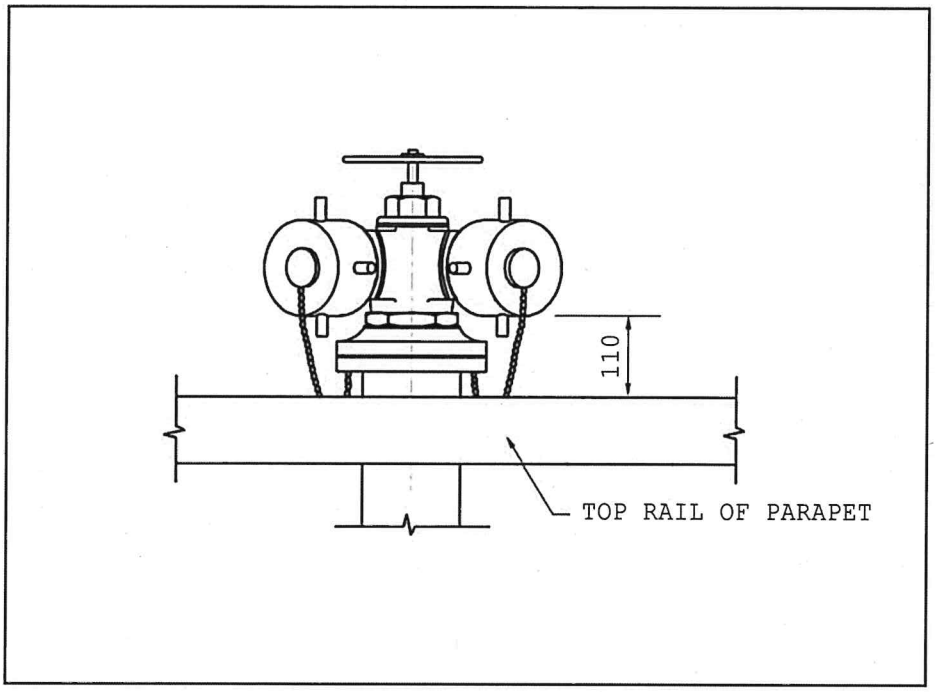


FIG.5 - RAISING OF FIRE HYDRANT ON ELEVATED HIGHWAY STRUCTURES TO AVOID OBSTRUCTION (INDICATIVE ONLY)