

3. IDENTIFICATION OF PRACTICABLE DIRECT TECHNICAL REMEDIES

3.1 Representative Road-Receiver Configurations

The feasibility of providing direct technical remedies to existing roads depends to a large extent on the presence and arrangement of the following road and roadside features:

- Road level
- Number of carriageways
- Transportational mode other than vehicular traffic
- Verge, marginal strip and/or hard shoulder
- Central reserve
- Footway
- Embankment
- Bicycle track
- Retaining wall

A review of the spatial relationship between existing roads and the adjoining sensitive uses in Hong Kong has identified 11 road-receiver configurations. Table 2 summarizes these 11 categories and Figures 1 to 11 illustrate conceptually these relationships:

Type A: Type A configuration represents typical rural roads found in the New Territories. Noise sensitive receivers (NSRs) usually consist of isolated or clustered low-rise buildings which are distributed at some distance from either sides of the road. (e.g. Castle Peak Road near San Wai Tsuen, Yuen Long; Fan Kam Road, Pat Heung)

Type B: Type B configuration is usually found along expressways or trunk roads in both rural and urban areas. NSRs, which are normally clustered low- or high-rise buildings, are separated from either sides of the road at a moderate distance. (e.g. Lung Cheung Road, Wong Tai Sin)

Type C: Type C configuration delineates those roads with separate carriageways. NSRs are usually isolated or clustered high-rise buildings located at some distance from one side of the road. (e.g. Tuen Mun Road near Tsuen Wan)

Type D: Type D configuration denotes roads with isolated or clustered NSRs distributed at a moderate distance from one or both sides of the road. The NSRs could be low- or high-rise buildings. (e.g. Jockey Club Road, Sheng Shiu; Fung Shue Wo Road, Tsing Yi Estate)

Type E: This type of road-receiver relationship is often found in urban areas or new towns. High-rise NSRs are grouped in clusters or continuously on one or both sides of the road. Separation between the NSR and the road could range from small to moderate. (e.g. Wai Tsuen Road, Tsuen Wan; Sheung Fung Street, Wong Tai Sin; Ting Hau Temple Road, North Point)

Type F: Type F configuration represents typical road conditions in densely populated urban areas. NSRs are continuous or clustered high-rise buildings usually mushrooming at both sides of the road. There is limited building set back from the carriageway and the ground floors of the NSRs are very often occupied by commercial development. (e.g. Whitfield Road, North Point; Yen Chow Street, Sham Shui Po; Cheung Sha Wan Road, Sham Shui Po)

Type G: For this type of road-receiver configuration, NSRs are located at a moderate distance from an elevated road (or the elevated section of a road), either on one side or both sides. NSRs are usually high-rise buildings; however, they could also be low-rise buildings, particularly for those located in new towns. (e.g. Tsing Tsuen Road, Tsuen Wan; Tai Wo Road, Tai Po; Island Eastern Corridor, North Point)

Table 2 Representative Road-Receiver Configurations (Road Sections)

Section	Typical Road Type	Road Level	Carrageway	Other Traffic	Road Features		Roadside Features			
					Verge/Marginal Strip/Hard Shoulder	Central Reserve	Footway	Embankment	Bicycle Track	Retaining Wall
A	RT/RA	At Grade	Single	Nil	Yes/No	No	Yes/No	No	No	No
B	EX/UT/RT	At Grade	Dual	Nil	Yes	Yes	No	No	Yes/No	No
C	EX/UT/RT	At Grade	Dual	Nil	Yes	No	No	No	No	No
D	PD/DD	At Grade	Single/Dual	Nil	Yes/No	Yes/No	Yes/No	No	Yes/No	No
E	DD/LD	At Grade	Single/Dual	Nil	No	Yes/No	Yes	No	No	No
F	PD/DD/LD	At Grade	Single/Dual	Nil	Yes/No	Yes/No	Yes	No	No	No
G	UT/PD/DD	Elevated	Single/Dual	Nil	Yes	Yes/No	No	Yes	Yes/No	No
H	UT/PD	Elevated ^a	Single/Dual	Nil	Yes	Yes/No	Yes	No	No	No
I	DD/LD	At Grade ^b	Single	Nil	No	No	Yes	No	No	No
J	All Types	At Grade ^c	Single/Dual	Nil	Yes/No	Yes/No	Yes/No	Yes	No	Yes
K	PD/DD/LD	At Grade	Single/Dual	Tram / LRT	Yes/No	No	Yes	No	No	No

LEGENDS:	EX	Expressway
	PD	Primary Distributor
	DD	District Distributor
	RA	Rural Road
	MTR	Mass Transit Railway
	RT	Rural Trunk Road
	LD	Local Distributor
	UT	Urban Trunk Road
	LRT	Light Rail Transit

NOTES:	a	With road(s) under elevated road.
	b	Adjacent to elevated MTR line or flyover.
	c	With embankment/retaining wall at one or both sides.

Type H: Type H configuration is similar to Type G except the NSRs encountered are usually high-rise buildings and there is limited separation between the NSR and the elevated road. (e.g. Tsing Fung Street Flyover, North Point; Canal Road Flyover, Wanchai)

Type I: For Type I configuration, the road(s) is running adjacent to a flyover or an elevated MTR line. Continuous high-rise NSRs spread along either sides of the road(s). Buffer distance between the road and the NSR could vary from a few meters to over tens of meters. (e.g. Kwun Tong Road, Ngau Tau Kok; Boundary Street at Cheung Sha Wan Road, Mong Kok)

Type J: Type J configuration represents those sections of roads with embankments or retaining walls on either sides. High- or low-rise NSRs are usually situated at some distance from the roads. (e.g. slip roads at Tai Po Road/So Kwun Po Road, Fanling)

Type K: This type of configuration is similar to Type F except there is a tram line or Light Rail Transit (LRT) line running on the road. (e.g. Shau Kei Wan Road, Shau Kei Wan; Tuen Mun Heung Sze Wui Road, Tuen Mun)

3.2

Available Forms of Practicable Noise Mitigation

A wide variety of direct technical remedies are available to abate road traffic noise. Experience with the application abroad has shown that the following forms, when suitably implemented, are effective :

- Roadside barriers (conventional, inverted, curved, landscaped, absorptive panel, etc.)
- Noise enclosures (semi-enclosed, fully enclosed and noise control shelter)
- Topographical features (earth mound, earth bank, road cutting, etc.)
- Road decking
- Low noise road surfaces (e.g. friction course).

However, Hong Kong has a unique road-receiver environment which differs considerably from that in other countries. The high-rise, high density nature of developments, compounded by close proximity of noise sensitive receivers to noisy roadways, have rendered traffic noise very difficult to ameliorate. The situation is even worse for existing roads due to past neglect.

While the potential application of noise mitigation measures on existing roads is subject to a wide range of factors (e.g. safety, structural considerations, ventilation requirements, maintenance considerations and public disturbance, etc. as detailed in Section 4.1 below), the forms of mitigation measures are, to a large extent, dictated by the road-receiver configurations.

For instance, Types E, F, G, H, I and K are the most common road-receiver configurations in Hong Kong. In order to provide adequate protection of the sensitive receivers in these cases, semi-enclosure, enclosures and, to a lesser extent, barriers stand out as the more rational choices. Low noise road surfacing is also applicable where maintenance would not totally preclude its use. On the other hand, topographical features such as earth mounds or earth banks have a very limited application here because of the severe land intake requirements. Road decking is seldom applicable because of the need to integrate building development with road construction and maintenance. For those road-receiver configurations involving low-rise buildings and/or with large buffer distance like Types A and B configurations, roadside barriers or semi-enclosures are appropriate.

Therefore, it is unlikely that all the above-mentioned noise reduction measures can be practically applied in Hong Kong. Consequently and given that low noise road surface is under other concurrent study/program by EPD and HyD, four different forms of noise mitigation measures have been identified for further discussion. All of these mitigation options have been successfully adopted in Hong Kong and broad local experience has been gained:

- Plain barrier (maximum 3.5 m high)
- Plain barrier (maximum 7 m high)
- Semi-enclosure
- Full enclosure

Figures 12, 13, 14 and 14A illustrate the conceptual arrangement of the identified forms of direct mitigation options. All these noise barriers and enclosures are free-standing structures supported on spread or piled foundations. In addition, the noise structures are either located at the back of the footpath or, in the absence of any footpath, at minimum 1m from the carriageway slab. For the purpose of this study, it has been assumed that a semi-enclosure could be erected to cover the entire kerbside lane while a full enclosure could have a single span up to 25m.

Noise barriers and enclosures can be constructed of various materials. Common materials used for noise screening structures include steel, aluminium, polycarbonate or acrylic sheets, concrete, masonry, brick, glassfibre reinforced concrete (GRC), wood and proprietary acoustic panels. Each material has its specific merits and dismerits, both acoustically and non-acoustically. To achieve a more satisfactory result, a combination of different materials may sometimes be needed. The ultimate choice of materials will, however, depend on the noise environment of the existing roads, as well as spacial relationships between roads and receivers.