

8 VISUAL IMPACT AND GLARE

8.1 INTRODUCTION

The visual impact of the terminals will be experienced during the day-time as a physical change associated with blocking of views, and during the night-time from safety and security lighting creating potential glare impact.

8.2 SENSITIVE RECEIVERS

Sensitive Receivers (SR) to day and night time impact of the terminals will include adjacent backup area developments, centres of population at Discovery Bay and Peng Chau, certain ferry routes to outlying islands and SR around the Territory with direct line of sight to the developments.

The closest SR will be the planned support works around the CT the backup area and commercial-industrial developments. Of particular concern is the potential night time glare impact experienced by drivers on Container Port Road which will be located immediately adjacent to the northern perimeter of CT10 and CT11. The centre of population who may be affected by the terminal developments are those identified as noise sensitive, principally the residents of Discovery Bay and Peng Chau. However, when assessing the visual impact of the terminals more distant receivers should also be considered. The visual envelope for CT10 and CT11 will extend towards Tsing Yi, through western Kowloon (12km) and Hong Kong Island (8km). In addition, sea traffic in the form of ferry boats *en route* to Discovery Bay, Peng Chau, Mui Wo, Macau and those travelling past Ma Wan will have views of terminal developments.

8.3 LANDSCAPE

The scale, nature and operational requirements of container terminals typically limit the extent of landscape treatment to peripheral areas only. The opportunities for incorporating landscape treatment to CT10 and CT11 include the proposed noise bund to the west, structure planting to the northern perimeter and accent planting to terminal entrances. Each category of landscape treatment is discussed below and the areas indicated on Figure 8.1.

8.3.1 NOISE BUND

The noise bunds are oriented north-south running the full width of the terminal platform. The bunds will be located at the western edge of each CT and will be 25m high and 90m wide with an average slope gradient of 1 in 1.75.

The proposed landscape treatment will involve hydroseeding for immediate soil stability and pit planting of hardy, wind and salt-tolerant tree and shrub species. To provide a suitable medium for establishing vegetation a minimum depth of 750mm topsoil and fresh water irrigation system will be required. A suitable source of topsoil would be overburden removed for quarry developments on the Tsing Chau Tsai peninsula.

8.3.2 PERIPHERAL STRUCTURE PLANTING

A 35m wide strip along the northern boundary of the Terminal will be reserved for freight rail provision in the future. However, in the short term it is proposed that this strip be landscaped using fast-growing, hardy, tree and shrub species to provide structure planting.

Landscaping of this nature cannot compete with the overall scale of the terminal. However, at the pedestrian level, dedication of a generous roadside planting reserve would be important to screen the majority of CT10 and CT11 works, particularly from pedestrians and road users in the adjacent business park and backup areas.

To accommodate the future transportation reserve development it is recommended that a further 20m wide reserve outside the terminal boundary is landscaped to serve the same structure planting screen function. Roadside planting could be extended throughout the backup areas to provide a comprehensive landscape structure using raised planters and street tree planting.

8.3.3 ENTRANCE AREAS

There are opportunities for landscaping vehicle entrances to terminals and it is proposed that such planting will provide accent and highlight to the entrances amidst the structure planting belt along the boundary. Though this should not obstruct the view of drivers using the entrances.

8.4 DAY-TIME IMPACT

A key element in the construction of the terminals is the incorporation of a 25 metre high landscaped bund at the western end of each terminal to shield sensitive receivers to the west from noise impacts. The western side of the bund will be formed with a slope gradient of 1.75 horizontal to 1 vertical with the slope adjacent to the terminal 1.5 to 1.0. Though the height of the bund is 25 metres above the general level of the Terminals, it should be remembered that the bund will be 30.6 m above the Principal Datum (PD).

Ships will moor against the southern quaywall and will be unloaded by tall rail mounted quay cranes which run parallel to the quay and reach from the quay to access the ship. These cranes are assumed to be 55 to 70 metres high with booms of upto 95 m above quay level. The visual aspect of the cranes and ships will not benefit from shielding provided by the noise bund.

Activities within the terminal itself will include the movement and stacking of containers. For stability, and to keep within the reach of terminal stacking vehicles (transtainers), it is normal practice to stack full containers four high ie a maximum height of 10.4 metres. Empty containers may be stacked up to 8 high a total of 18.4 metres.

Receivers to the west will be the most affected by the visual aspects of CT10 and CT11 developments. Residents at Discovery Bay will experience loss of their existing panoramic view from the 25 metre high, 600+ metre long noise bund though sympathetic landscaping will help to mitigate this impact. Other receivers to the south and east will be less severely affected since distance will relegate the terminal to a small part of the overall panorama. These receivers will also view the terminal against the backdrop of the TCT peninsula or Sz Pak headland.

8.5 GLARE ASSESSMENT

8.5.1 GENERAL

The principal adverse impact during night time will be from glare created by the lighting, required for the safe and efficient operation of the terminals. A definition of glare is to describe it as the discomfort or impairment of vision experienced when parts of the visual field are excessively bright in relation to the general surroundings. Glare impact may be caused by viewing a bright light source against a dark background - the luminance does not change but the perceived luminosity is increased. In the initial stages of operation the terminals will be the only brightly illuminated activity area. As the backup and ancillary works areas develop there will be more lighting introduced into the area. Glare effect is reduced with distance as light experiences absorption during transmission through air.

To accommodate 24 hour terminal operations, a high intensity overhead lighting system will be installed. The lighting scheme within each terminal will comprise 25 lighting towers and 3 light masts, each with a height of 40 m. There is particular concern that drivers on the planned road network adjacent to the terminal developments may be affected by unacceptable glare impact. Other SR that may be affected are residents at Discovery Bay and Peng Chau.

Direct glare can be restricted by careful positioning and aiming of the floodlights and the use of hoods, spill rings and louvres to screen lamps from sight of normal viewing angles.

To reduce the glare impact on SR to the west it would be prudent to light areas from one side from as high as practical, up to 40 metres above the ground. High mast and tower systems are used at container terminals where it is a prime requirement to save space. The high towers use smaller numbers of floodlights with higher wattage than conventional lighting systems. This is likely to be combined with conventional lighting to illuminate the perimeter, access roadways and for safety and security purposes.

The assessment of night-time glare was carried out following the draft CIE technical report "Glare Evaluation System for Outdoor Sports and Area Lighting" and the CIBSE Lighting Guides. These provide the technical methodology for calculating a Glare Rating (GR).

8.5.2 ASSESSMENT METHODOLOGY

An assessment of the lighting glare resulting from a proposed floodlighting system for CT10 and CT11 was carried out. The method used was essentially the same as that employed in the CT8 and CT9 glare assessments. A glare rating (GR) was calculated according to the following formula:

$$GR = 27 + 24 \log (L_{v1} / L_{ve}^{0.9})$$

L_{v1} = veiling luminance produced by the luminaires.

L_{ve} = veiling luminance produced by the environment.

The resulting GR value is a number between 0 and 100, with higher values representing greater glare impact. Glare ratings are interpreted according to the following scale:

<u>Glare Rating</u>	<u>Interpretation</u>
10	unnoticeable
30	noticeable
50	just admissible
70	disturbing
90	unbearable

It should be noted that according to the draft CIE report, the above formula is not strictly applicable to the evaluation of the effect of spill light outside the illuminated area. However, in these areas glare effects may still be evaluated on a comparative basis. The effects of glare were assessed for sensitive receiver positions along Container Port Road, on Peng Chau and at Discovery Bay.

8.5.3 LIGHTING SCHEME AND ASSESSMENT ASSUMPTIONS

To assess the effects of glare, a number of assumptions were employed, most of which were similar to those used for CT8 and CT9:

1. The height of all lighting towers and light masts is 40m.
2. All lamps are 1000W SON-T floodlights.
3. Light tower assumptions:
 - o Towers provide illumination in two directions, parallel to the Container Port Road.
 - o Lamps directed towards area A are angled at 70 degrees to the vertical (aiming angle). All other lamps are angled at 80 degrees to the vertical. Lamps aimed at area A are distributed four per tower. Lamps aimed at area B are distributed six per tower.
 - o Lamps aimed at the areas to the west and east of the terminal are distributed two per tower.
4. Light mast assumptions:
 - o Each mast has four lamps aiming in mutually perpendicular directions and at 45 degrees to the Container Port Road centre line.
 - o All lamps have an aiming angle of 20 degrees to the vertical.
5. The background illumination level in Container Port Road is 25 lux. Background illumination levels at Peng Chau and Discovery Bay are both 10 lux.
6. The floor reflectance at all receiver positions is 0.15.
7. All viewing directions are on a horizontal plane. For the Container Port Road receiver positions, viewing directions are parallel to the road centre line. For Peng Chau, the viewing direction is north and Discovery Bay, viewing directions are north-east or east locations.
8. All viewing positions are at the same vertical height as the base of the light towers except for the Peng Chau receiver position (35m higher) and one of the Discovery Bay receiver positions (35m higher).

8.5.4 IMPACTS AND MITIGATION

Container Port Road

Glare ratings were calculated for eight receiver positions and their values range from 33 to 45 (see below). Since the Highways Department considers a glare rating in excess of 25 to be unacceptable, it will be necessary to provide amelioration measures to reduce the glare effect on the road. The results below also show the effect of providing cut-off louvres for 13 of the light towers of *each* Terminal, closest to the road. These louvres must restrict the light emitted from each lamp to within 8 degrees of the peak intensity line. As a result, the glare rating at each of the receiver position will be reduced to a value of 25 or below.

<u>Position 1</u>	<u>GR (No louvres)</u>	<u>GR (with louvres)</u>
1	45	25
2	44	23
3	41	20
4	37	15
5	33	8
6	39	16
7	42	20
8	45	24

Peng Chau

The glare rating for an observer looking in a northerly direction approximately 2 km from the Terminals is 26, which is just above the critical 25 value. Amelioration measures may be necessary (note that the glare rating formula does not strictly apply to a position as far away from the illuminated area as Peng Chau). The effect of the cut-off louvres discussed above on the Peng Chau glare rating is to reduce it to a value of 23. As the main residential areas of Peng Chau are effectively screened by the northern promontory, only a few isolated SR on this headland would be subject to impact.

Discovery Bay

The glare ratings calculated for the three sensitive receiver positions 1, 2 and 3 approximately 2.5 km from the terminals are 21, 25 and 23 respectively. No amelioration measures are likely to be necessary. However, by using the cut-off louvres described above, the glare ratings at positions 1, 2 and 3 could be reduced to 10, 18 and 18 respectively.

8.5.5 CONCLUSIONS

Without amelioration measures, the glare rating at certain positions along the Container Port Road may be significant and would exceed the guideline limit considered acceptable by the Highways Department for CT9 glare assessment. However, glare ratings may be reduced to within this level (below 25) by providing cut-off louvres for 13 of the light towers of each of the Terminals.

Glare assessments at Peng Chau and Discovery Bay indicate that glare ratings will be within guideline limits at these locations.

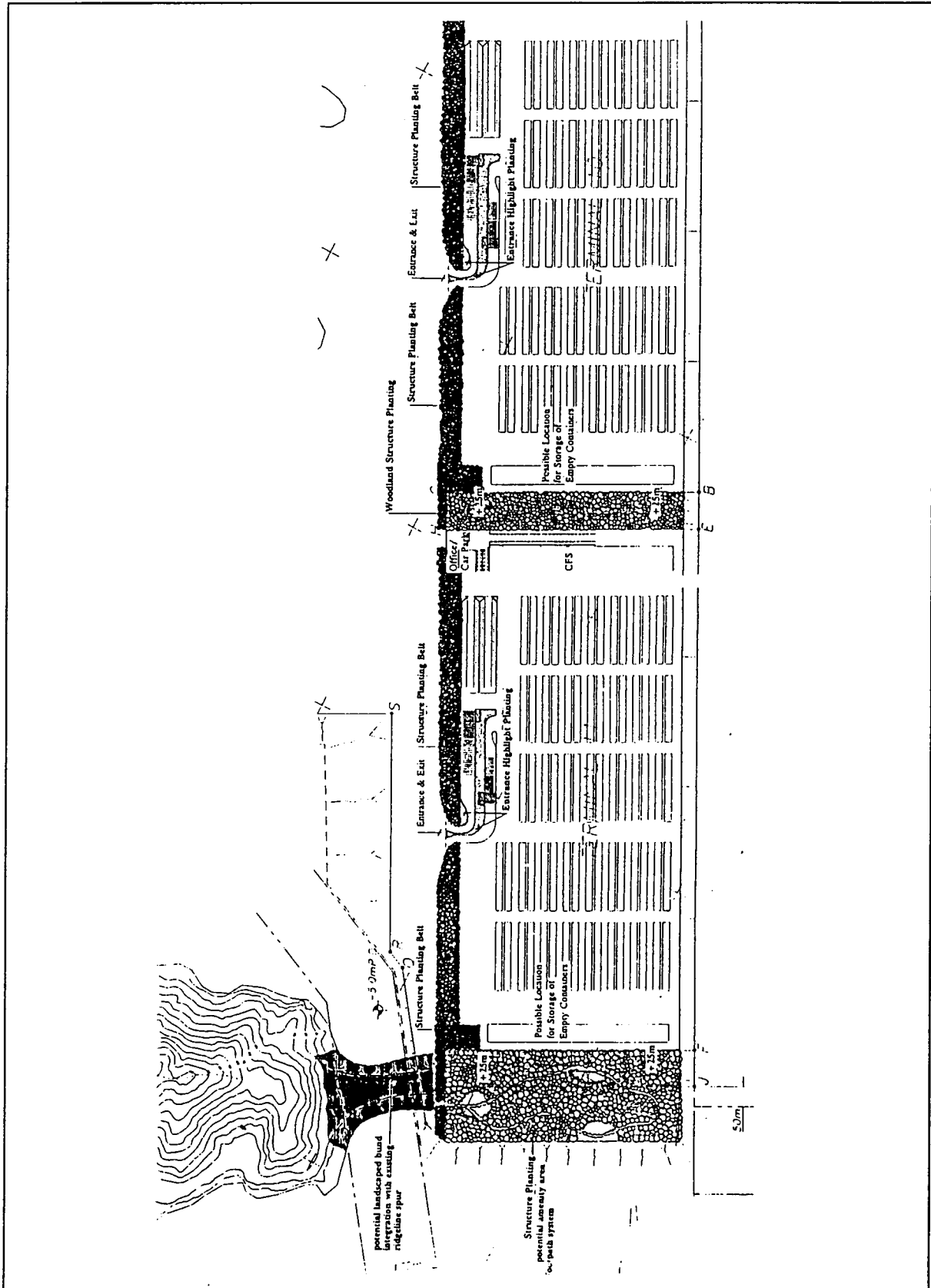


Figure 8.1 Landscape