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Lightweight Retractable Noise Barrier in Hong Kong

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ABSTRACT

Construction noise is one of the major noise pollution sources in urban area. In Hong Kong, the Noise Control Ordinance (NCO) states that construction works at night time and holiday with Powered Mechanical Equipment (PME) are only allowed if the PME noise levels are controlled within the Acceptable Noise Level (ANL) calculated at nearby Noise Sensitive Receivers (NSRs). In many cases, night work required noise barrier to minimize the PME noise levels. However, conventional noise barriers of 3m to 6m height required a heavy base in order to sustain occasional heavy gust wind loading. Those heavy base required cranes to install and relocate which may not feasible under some site constraints. SilentUP® Retractable Noise Barrier has been invented in Hong Kong to meet this demand. It is a 7m high noise barrier without concrete foundation. The modular design and magnet connecting mechanism allows SilentUP® to form a continuous wall. It can be installed, uninstalled and relocated by people without using any machines. The entire process is quiet enough to be completed at night. To enhance the stability and safety features, a patented automatic wind load relieving mechanism is incorporated so that the lightweight structure remains safe during occasional gusts. It reduces up to 95% structural loading requirement and hence a lightweight design can be adopted. The on-site insertion loss performance of SilentUP® Retractable Noise Barrier is varied from 11-21 dB(A) depending on the noise source and size of barrier / enclosure.

1. INTRODUCTION

Modern construction activities are governed by the legislation that regulate the time and type of work conducted in construction sites. The Noise Control Ordinance (NCO) of Hong Kong stipulates that the restricted hours for construction work are from 7 pm to 7 am on weekdays and full day on Sundays. Any work involving the use of Powered Mechanical Equipment (PME) during restricted hours must obtain a valid Construction Noise Permit (CNP) from the Environmental Protection Department (EPD) of Hong Kong. Construction companies need a noise mitigation measure to control the PMEs noise level within the Acceptable Noise Level (ANL) at Noise Sensitive Receivers (NSRs) so they can continue working during restricted hours. The erection process of conventional noise barrier with heavy foundation design is very slow and expensive which is not feasible to implement during restricted hours. In recent years, SilentUP®retractable noise barrier that can be erected without machines is widely implemented in construction site for CNP purpose.

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2. SilentUP®Retractable Noise Barrier

SilentUP® is a lightweight, modular and relocatable structure which can be installed and uninstalled by people without any machines even during restricted hours. SilentUP® incorporated 3 major design features for use in restricted hours and space congested construction sites in urban areas, including 1) Patented wind load relieving mechanism, 2) Installation without machine and concrete foundation, 3) Magnetic automatic gap sealing to prevent noise leakage.

Figure 1: SilentUP® Retractable Noise Barrier

2.1. Patented wind load relieving mechanism

In order to avoid toppling during strong wind, SilentUP® incorporated a patented wind load relieving mechanism. This advanced technology is invented to restrict the wind load induced on structure by the use of magnets between the SilentUP® panels. When the wind load increases past the magnetic attraction force between panels, the barrier able to react and prevent the barrier from toppling. Under normal wind conditions, the barrier behaves as a continuous noise barrier wall and provides noise insulation.

As wind speed increases above 25kph, the panels can automatically open and allow passage of wind. This reduces the surface area of barrier and reduces wind load on structure.

Figure 2: SilentUP® at wind speed <25kph

Figure 3: SilentUP® opens when wind speed >25kph

2.2. Installation without machine and concrete foundation

SilentUP® comprises lightweight noise insulation panels that can be easily mounted on a modular structure by people without using any machines. The panels are mounted from ground level and push up layers by layers until the panels have reached the desired height. Moreover, the wind load relieving mechanism allows SilentUP® to be erected without concrete foundation.

The lightweight components and easy to relocate features allows a manual installation and uninstallation without machine, therefore the construction planning can be more flexible. The operating companies do not need to apply for a CNP for this barrier's erection and relocation during restricted hours. The whole process is quiet enough to be conducted during nighttime.

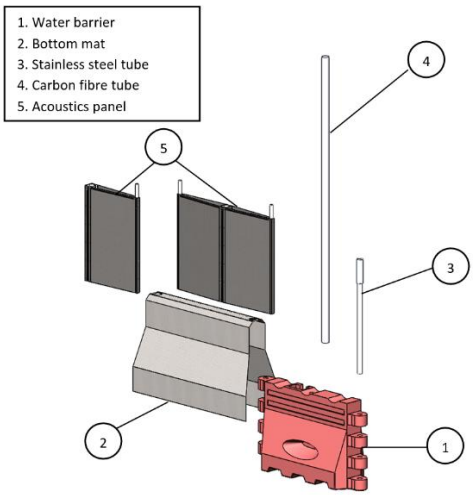

Figure 4: SilentUP® lightweight components (less than 10kgs each) allows manual installation

2.3. Magnetic automatic gap sealing

SilentUP® incorporated magnetic automatic gap sealing mechanism in the panels. When neighboring columns are held from ground level and brought closer, the magnets in panels are attracted to each other and locked. This effectively seals the gap between two columns and a continuous barrier wall can be formed.

3. Application in Hong Kong

SilentUP® has been used at various sites of Hong Kong. Major contractors have utilized SilentUP® in different area in order to get CNP from the authority.

3.1. Concreting works

Concreting works normally happens less than 3 times a week. Therefore, the quick installation feature of SilentUP® helps the contractors install and dismount noise barrier in a short period.

Figure 6: 7m (H) x 43m(L) SilentUP® at Happy Valley Racecourse

Figure 7: 5m (H) x 16m(L) SilentUP® at Liantang / Heung Yuen Wai

3.2. Roadworks

Road works are usually space constrained. The works have to be conducted within one traffic lane width because the other has traffic flow. It is also conducted on a large area span such that the one lane is blocked for construction over a long distance. The easy installation and the movability of SilentUP® are highly appreciated by the contractors.

Figure 8: 5m (H) x 11m(L) SilentUP® at Castle Peak Road

Figure 9: 3m (H) x 55m(L) SilentUP® at Hiram's Highway

3.3. Piling work / Site formation

The ground condition of piling works and construction site before site formation is normally comprised of loose sand and soft clay. SilentUP® does not required heavy foundation that suits for all kind of ground condition.

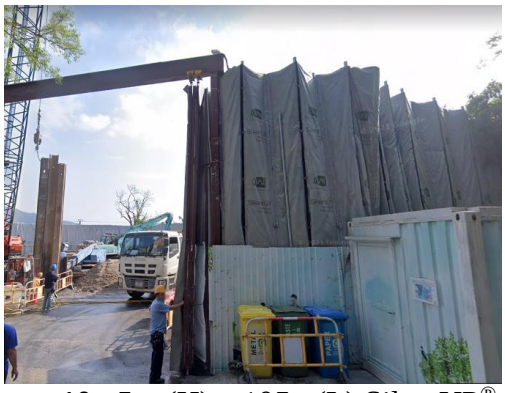

Figure 10: 5m (H) x 105m(L) SilentUP® at Mai Po

Figure 11: 5m (H) x 16m(L) SilentUP® at Castle Peak Road

Figure 12: 5m (H) x 50m(L) SilentUP® at Castle Peak Road

Figure 13: 5m (H) x 7m(L) SilentUP® at Liantang / Heung Yuen Wai

Figure 14: 7m (H) x 82m(L) SilentUP® at Tung Chung New Town

Figure 15: 5m (H) x 8m(L) SilentUP® at United Christian Hospital

3.4. Shaft cover / enclosure cover

The lightweight and magnetic connection of SilentUP® allows the contractor easily relocate the noise panels for covering shaft opening or top part of enclosure.

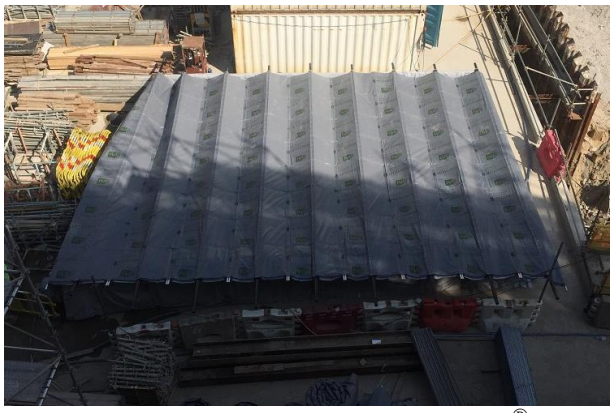

Figure 16: 8m (W) x 11m(L) SilentUP® at Hong Kong West Kowloon Station

Figure 17: 7m (H) x 38m(L) x 33m(W) SilentUP® at Central Kowloon Route

Figure 18: 7m (H) x 18m(L) x 15m(W) SilentUP® at Central Kowloon Route

Figure 19: 7m (H) x 18m(L) x 15m(W) SilentUP® at Central Kowloon Route

4. CONCLUSIONS

SilentUP® Retractable Noise Barrier is temporary noise barrier that can be installed, uninstalled and relocated by people without using any PME and concrete foundation during erection process. Its lightweight panels can be installed from ground level and are incorporated with reduced wind load mechanism to relieve excessive wind load on the barrier structure. The on-site insertion loss performance of SilentUP® Retractable Noise Barrier is varied from 11-21 dB(A) depending on the noise source and size of barrier / enclosure.

SilentUP® is highly recognised by the construction industry and authorities in recent years. Various sites in Hong Kong have used SilentUP® retractable noise barrier for construction noise control in order to achieve noise requirement during the restricted hours. SilentUP® is also granted as "*most*

commonly applied Pre-approved Technologies among SMEs" under Advanced Technological Solutions in the CITF Digest Issue 9. With the successful experience in Hong Kong, SilentUP® also expanded its availability in Singapore and championed by Singapore LTA at the 23rd Annual Safety, Health and Environmental Awards Convention.

5. REFERENCES

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