Annex E4

# Fixed Plant Operational Noise Impact Assessment (Without Mitigation)

# Annex E4-1

## Inventory of Fixed Plant Noise Sources during Operational Phase

| No. | Item | Location | Noise Source | Model No. | Specified Maximum Sound Power Level [3] (SWL, in dB(A)) | Quantity |
|---|---|---|---|---|---|---|
| 1 | VRV Outdoor Units [1] | Outdoor at G/F of NIC | VRV | PUHY-P500 YSHM-A | 68.0 | 3 |
| 2 | | | VRV | PUHY-P750 YSHM-A | 71.5 | 1 |
| 3 | VRV Outdoor Units [1] | Outdoor at G/F (between NIC and MCER) | VRV | PUHY-P750 YSHM-A | 71.5 | 4 |
| 4 | | | VRV | PUHY-P1100 YSHM-A | 73.1 | 2 |
| 5 | E/M Plant Room [2] | 1/F of MCER | - | N/A | 65 | 1 |
| 6 | E/M Plant Room [2] | G/F of Quarters | - | N/A | 50 | 1 |

**Notes:**

[1] The VRV Outdoor Units will be operated during daytime and evening time periods only.

In accordance with the relevant specification for the VRV Outdoor Units (*see attached* ), sound pressure levels measured at 1m in anechoic room are provided. The sound power levels were calculated as follows:

| Model No. | Sound Power Level (SWL), dB(A) |
|---|---|
| PUHY-P500 YSHM-A | 60+8=68.0dB(A) |
| PUHY-P750 YSHM-A | 63.5+8=71.5dB(A) |
| PUHY-P1100 YSHM-A# | 10*LOG(10^(60/10)+10^(63.5/10))+8=73.1dB(A) |

#PUHY-P1100 YSHM-A was setup with a combination of PUHY-P750 YSHM-A and PUHY-P350 YSHM-A. However, noise data for PUHY-P350 YSHM-A is not available, noise data for PUHY-P500 YSHM-A was used instead.

[2] Detailed design of the Plant Rooms is not yet available at this stage. The equipment within the Plant Rooms is expected to be operated during daytime and evening time periods only as the MCER will be closed before 23:00 hours.

The maximum allowable SWLs of the Plant Room louvers were determined by adopting standard acoustics principles. The following formula was used for calculating the maximum allowable SWLs:

$$SPL = Max\ SWL - DC + FC - BC$$

where

| | |
|---|---|
| SPL | Sound Pressure Level, in dB(A) |
| Max. SWL | Maximum Allowable Sound Power Level, in dB(A) |
| DC | Distance Attenuation, in dB(A) (i.e. 20 log D + 8 [where D is the distance in metres]) |
| FC | Facade Correction, in dB(A) (i.e. 3 dB(A)) |
| BC | Barrier Correction, in dB(A) |

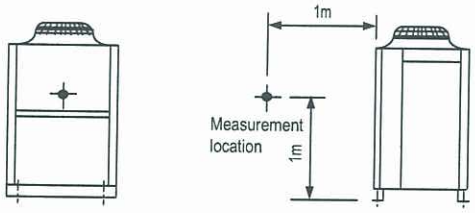
[3] The maximum allowable SWLs will be appropriately specified in the contract tender, necessary noise mitigation measures would be implemented to ensure full compliance of the noise criteria.

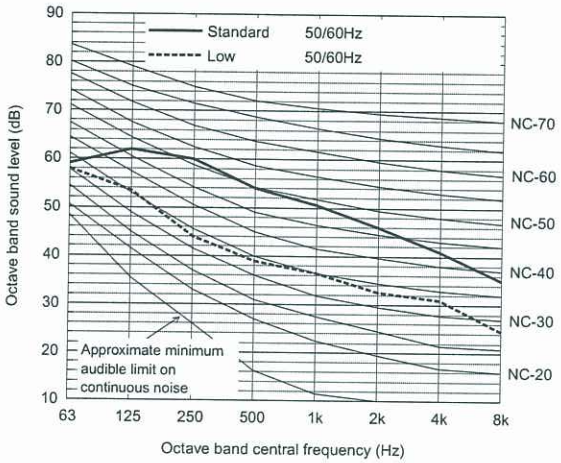
| Item | Location | Quantity | Module |
|---|---|---|---|
| VRV Outdoor Units | Outdoor at 1/F (above Reception of NIC) | 4 nos. of VRVs | PUHY-P500 YSHM-A |
| | | | PUHY-P500 YSHM-A |
| | | | PUHY-P500 YSHM-A |
| | | | PUHY-P750Y SHM-A |
| VRV Outdoor Units | Outdoor at 1/F (above the connection footpath between NIC and MCER) | 6 nos. of VRVs | PUHY-P750Y SHM-A |
| | | | PUHY-P750Y SHM-A |
| | | | PUHY-P750Y SHM-A |
| | | | PUHY-P750Y SHM-A |
| | | | PUHY-P1100Y SHM-A |
| | | | PUHY-P1100Y SHM-A |

Notes.
For the VRV outdoor unit "PUHY-P1100YSHM-A", please use noise data from PUHY-P500YSHM-A & PUHY-P750YSHM-A for noise calculation.

## 5. Sound Pressure Levels

•PUHY-P250YHM-A(-BS)

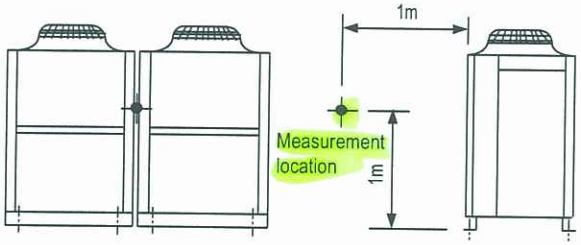


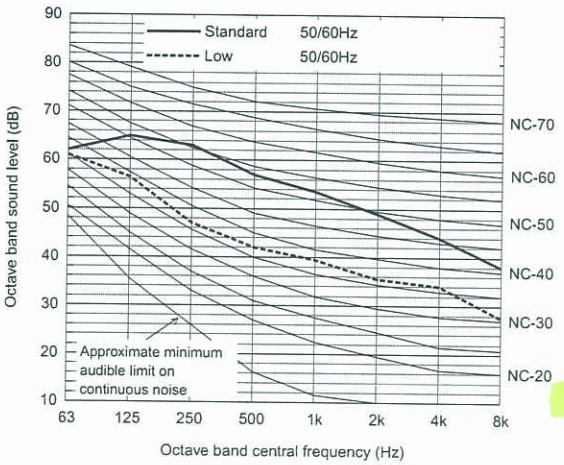




| | | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | 50/60Hz | 59.0 | 62.0 | 60.0 | 54.0 | 50.5 | 46.0 | 41.0 | 35.0 | 57.0 |
| Low Noise Mode | 50/60Hz | 58.0 | 53.5 | 44.0 | 39.0 | 36.5 | 32.5 | 31.0 | 24.5 | 44.0 |

When Low Noise Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low Noise Mode automatically in the case that the operation condition is severe.

•PUHY-P500YSHM-A(-BS)

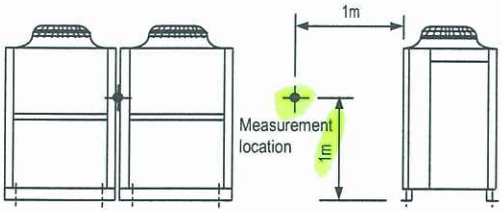


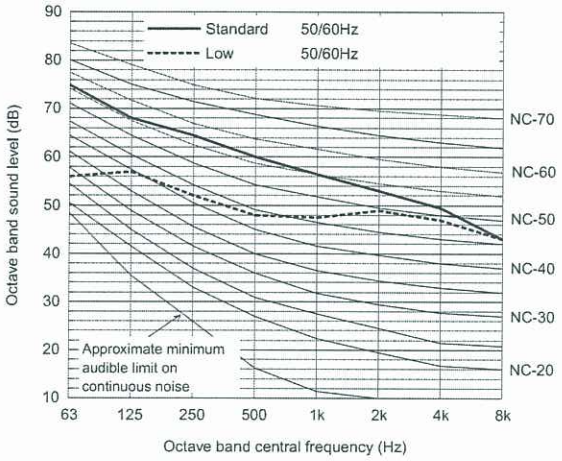




| | | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | 50/60Hz | 62.0 | 65.0 | 63.0 | 57.0 | 53.5 | 49.0 | 44.0 | 38.0 | 60.0 |
| Low Noise Mode | 50/60Hz | 61.0 | 56.5 | 47.0 | 42.0 | 39.5 | 35.5 | 34.0 | 27.5 | 47.0 |

When Low Noise Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low Noise Mode automatically in the case that the operation condition is severe.

## •PUHY-P750YSHM-A(-BS)




| | | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard | 50/60Hz | 75.0 | 68.0 | 64.5 | 60.0 | 56.5 | 53.0 | 49.5 | 43.0 | 63.5 |
| Low Noise Mode | 50/60Hz | 56.0 | 57.0 | 52.0 | 48.0 | 47.5 | 49.0 | 47.0 | 43.0 | 55.0 |

When Low Noise Mode is set,the A/C system's capacity is limited. The system could return to normal operation from Low Noise Mode automatically in the case that the operation condition is severe.

## Annex E4-2

### Operational Noise Impact Assessment

**NSR:** GQ1 Guest Quarter within the NIC

| No. | Item | Location | Noise Source | Model No. | Max. Allowable SWL, dB(A) | Quantity | Distance from source to NSR (d2),m | Corrections For | | | | Predicted Noise Level (dB(A) $L_{eq, 30min}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Quantity dB(A) [1] | Distance dB(A) [2] | Façade dB(A) | Barrier dB(A) [3] | |
| **Daytime & Evening Time Periods (between 0700 to 2300 hours)** | | | | | | | | | | | | |
| 1 | VRV Outdoor Units [4] | Outdoor at G/F of NIC | VRV | PUHY-P500 YSHM-A | 68.0 | 3 | 31 | 5 | -37.7 | 3 | -10 | 28 |
| 2 | | | VRV | PUHY-P750 YSHM-A | 71.5 | 1 | 31 | 0 | -37.7 | 3 | -10 | 27 |
| 3 | VRV Outdoor Units [4] | Outdoor at G/F (between NIC and MCER) | VRV | PUHY-P750 YSHM-A | 71.5 | 4 | 58 | 6 | -43.2 | 3 | -10 | 27 |
| 4 | | | VRV | PUHY-P1100 YSHM-A | 73.1 | 2 | 58 | 3 | -43.2 | 3 | -10 | 26 |
| 5 | Plant Room [5] | 1/F of MCER | - | N/A | 65 | 1 | 54 | 0 | -42.6 | 3 | 0 | 25 |
| 6 | Plant Room [5] | G/F of Quarters | - | N/A | 50 | 1 | 65 | 0 | -44.3 | 3 | 0 | 9 |
| | | | | | | | | | | **Predicted Façade Noise Level (dB(A)) =** | | **34** |

**Notes:**

[1] Correction for quantity = 10*log(Quantity)

[2] Distance correction for SWL = -10*log(2π(d2)$^2$)

[3] Reference was also made from IND-TM, a negative correction of 10dB(A) will be applied for noise source totally screened by barrier or building such that none will be visible when viewed from any window, door or other opening of the NSR.

[4] The VRV Outdoor Units will be operated during daytime and evening time periods only.

In accordance with the relevant specification for the VRV Outdoor Units, sound pressure levels measured at 1m in anechoic room are provided. The sound power levels were calculated as follows:

| Model No. | Sound Power Level (SWL), dB(A) |
|---|---|
| PUHY-P500 YSHM-A | 60+8=68.0dB(A) |
| PUHY-P750 YSHM-A | 63.5+8=71.5dB(A) |
| PUHY-P1100 YSHM-A# | 10*LOG(10^(60/10)+10^(63.5/10))+8=73.1dB(A) |

#PUHY-P1100 YSHM-A was setup with a combination of PUHY-P750 YSHM-A and PUHY-P350 YSHM-A. However, noise data for PUHY-P350 YSHM-A is not available, noise data for PUHY-P500 YSHM-A was used instead.

[5] Detailed design of the Plant Rooms is not yet available at this stage. The equipment within the Plant Rooms is expected to be operated during daytime and evening time periods only as the MCER will be closed before 23:00 hours.

The maximum allowable SWLs of the Plant Room louvers were determined by adopting standard acoustics principles. The following formula was used for calculating the maximum allowable SWLs:

SPL = Max SWL – DC + FC - BC

where

| | |
|---|---|
| SPL | Sound Pressure Level, in dB(A) |
| Max. SWL | Maximum Allowable Sound Power Level, in dB(A) |
| DC | Distance Attenuation, in dB(A) (i.e. 20 log D + 8 [where D is the distance in metres]) |
| FC | Facade Correction, in dB(A) (i.e. 3 dB(A)) |
| BC | Barrier Correction, in dB(A) |

## Annex E4-3

### Operational Noise Impact Assessment

**NSR:** SQ1 Quarters within the Development Site

| No. | Item | Location | Noise Source | Model No. | Max. Allowable SWL, dB(A) | Quantity | Distance from source to NSR (d2),m | Corrections For | | | | Predicted Noise Level (dB(A) $L_{eq, 30min}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Quantity dB(A) [1] | Distance dB(A) [2] | Façade dB(A) | Barrier dB(A) [3] | |
| **Daytime & Evening Time Periods (between 0700 to 2300 hours)** | | | | | | | | | | | | |
| 1 | VRV Outdoor Units [4] | Outdoor at G/F of NIC | VRV | PUHY-P500 YSHM-A | 68.0 | 3 | 63 | 5 | -44.0 | 3 | -10 | 22 |
| 2 | | | VRV | PUHY-P750 YSHM-A | 71.5 | 1 | 63 | 0 | -44.0 | 3 | -10 | 20 |
| 3 | VRV Outdoor Units [4] | Outdoor at G/F (between NIC and MCER) | VRV | PUHY-P750 YSHM-A | 71.5 | 4 | 75 | 6 | -45.5 | 3 | -10 | 25 |
| 4 | | | VRV | PUHY-P1100 YSHM-A | 73.1 | 2 | 75 | 3 | -45.5 | 3 | -10 | 24 |
| 5 | Plant Room [5] | 1/F of MCER | - | N/A | 65 | 1 | 48 | 0 | -41.6 | 3 | 0 | 26 |
| 6 | Plant Room [5] | G/F of Quarters | - | N/A | 50 | 1 | 27 | 0 | -36.6 | 3 | 0 | 16 |
| | | | | | | | | | | **Predicted Façade Noise Level (dB(A)) =** | | **31** |

**Notes:**

[1] Correction for quantity = 10*log(Quantity)

[2] Distance correction for SWL = $-10*\log(2\pi(d2)^2)$

[3] Reference was also made from IND-TM, a negative correction of 10dB(A) will be applied for noise source totally screened by barrier or building such that none will be visible when viewed from any window, door or other opening of the NSR.

[4] The VRV Outdoor Units will be operated during daytime and evening time periods only.

In accordance with the relevant specification for the VRV Outdoor Units, sound pressure levels measured at 1m in anechoic room are provided. The sound power levels were calculated as follows:

| Model No. | Sound Power Level (SWL), dB(A) |
|---|---|
| PUHY-P500 YSHM-A | 60+8=68.0dB(A) |
| PUHY-P750 YSHM-A | 63.5+8=71.5dB(A) |
| PUHY-P1100 YSHM-A# | 10*LOG(10^(60/10)+10^(63.5/10))+8=73.1dB(A) |

#PUHY-P1100 YSHM-A was setup with a combination of PUHY-P750 YSHM-A and PUHY-P350 YSHM-A. However, noise data for PUHY-P350 YSHM-A is not available, noise data for PUHY-P500 YSHM-A was used instead.

[5] Detailed design of the Plant Rooms is not yet available at this stage. The equipment within the Plant Rooms is expected to be operated during daytime and evening time periods only as the MCER will be closed before 23:00 hours.

The maximum allowable SWLs of the Plant Room louvers were determined by adopting standard acoustics principles. The following formula was used for calculating the maximum allowable SWLs:

SPL = Max SWL – DC + FC - BC

where

| | |
|---|---|
| SPL | Sound Pressure Level, in dB(A) |
| Max. SWL | Maximum Allowable Sound Power Level, in dB(A) |
| DC | Distance Attenuation, in dB(A) (i.e. 20 log D + 8 [where D is the distance in metres]) |
| FC | Facade Correction, in dB(A) (i.e. 3 dB(A)) |
| BC | Barrier Correction, in dB(A) |