

# NOVOTEL SYDNEY MANLY PACIFIC, MANLY

## DA Acoustic Assessment

6 December 2019

Arkadia

TG142-03F02 Acoustic Assessment for DA (r1)

## Document Details

| Detail         | Reference                                   |
|----------------|---------------------------------------------|
| Doc Reference: | TG142-03F02 Acoustic Assessment for DA (r1) |
| Prepared for:  | Arkadia                                     |
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## Document Control

| Date       | Revision history                   | Non-issued revision | Issued revision | Prepared | Instructed | Authorised |
|------------|------------------------------------|---------------------|-----------------|----------|------------|------------|
| 06.12.2019 | Report issued to client for review | 0                   | 1               | N. Aziz  | D. Suwandi | H. Pearce  |

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# 1 Introduction

Renzo Tonin & Associates was engaged to provide acoustic consultancy services to support a Development Application (DA) for proposed new mechanical plant and extension of the lifts shaft at Novotel Sydney Manly Pacific, 55 North Steyne, Manly.

This report quantifies the noise emission from the new mechanical equipment and assesses operational noise at nearest affected residential receivers in accordance with the relevant requirements of the NSW EPA *Noise Policy for Industry* (NPfI) 2017.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

## 2 Project description

### 2.1 Site description and development overview

The site is located on the western side of North Steyne. It is surrounded by multi-storey residential buildings along Raglan Street to the south and Denison Street to the north. Figure 1 Presents the subject site location.

Figure 1: Site location



### 2.2 Acoustic Assessment Methodology

In order to assess the potential noise impact from the subject proposal, the following methodology was used:

- Identify nearest most potentially affected receiver locations to the subject site
- Use measured background noise levels to establish noise goals in accordance with the relevant noise criteria

- Using predictive noise modelling, determine the extent of noise emission from the proposal at nearby premises
- Identify if noise emission from the area under investigation may exceed the relevant criteria, and
- Where noise emission from the area under investigation may exceed the relevant criteria, provide recommendations to reduce noise impacts from the site.

## 2.3 Reference Material

The following documentation was referenced for this report:

- Architectural drawings dated 15 November 2019 provided through email by Arkadia on 18 November 2019 [ref: 19295 DA01 - DA06]
- Acoustic Assessment for DA report (Acoustic Report) for Manly Pacific Hotel dated 28 November 2013 prepared by Renzo Tonin and Associates [ref: TG142-02F02 (r2) Acoustic Assessment for DA]
- Daikin chiller technical data dated 9 November 2019 provided through email by Arkadia on 19 November 2019 [ref: Manly Pacific - Option 1 - EWWD715VZPSA1 - 686 kW<sub>r</sub>]
- BAC Cooling tower technical data dated 9 November 2019 provided through email by Arkadia on 19 November 2019 [ref: RCF1111]

### 3 Assessment locations and existing noise environment

#### 3.1 Assessment locations

The identified assessment locations are outlined in Table 1 and shown in Figure 2.

**Table 1: Assessment Locations**

| ID | Address                            | Description                                                                                                                                                                                             |
|----|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R1 | Allegra, 1 Raglan Street, Manly    | Residential apartment units on upper levels<br>Multi-storey rendered brick apartments to the south-west of the hotel. The upper levels of the apartments have a direct line of sight to the plant room. |
| R2 | Trident, 62-65 North Steyne, Manly | Residential apartment units on upper levels<br>Multi-storey rendered brick apartments to the north of the hotel. The upper levels of the apartments have a direct line of sight to the plant room.      |

**Figure 2: Assessment locations**



While residential premises were also identified immediately to the north of the development at 60 North Steyne, the receiver locations were at lower elevation (5-storey building) and would be acoustically shielded from direct noise of the plantroom. The location would not be worse affected than the nominated assessment locations.

### 3.2 Long-term noise measurement results

The long-term noise monitoring data was obtained from the previous Acoustic Report. The monitoring was carried out between Friday, 15 March to Friday, 22 March 2013.

Table 2 presents the overall single Rating Background Levels (RBL) and equivalent sound level  $L_{Aeq}$  for each assessment period, determined in accordance with the NPfl.

**Table 2: Long-term noise monitoring results, dB(A)**

| Descriptor                          | Period  | Overall dB(A) |
|-------------------------------------|---------|---------------|
| <b>Level 1, Manly Pacific Hotel</b> |         |               |
| RBL $L_{90}$                        | Day     | 59            |
|                                     | Evening | 62            |
|                                     | Night   | 60            |
| Equivalent sound level, $L_{Aeq}$   | Day     | 62            |
|                                     | Evening | 62            |
|                                     | Night   | 60            |

Notes: Day: 07:00am - 06:00pm Monday to Saturday and 08:00-18:00 Sundays & Public Holidays

Evening: 06:00pm - 10:00pm Monday to Sunday & Public Holidays

Night: 10:00pm - 07:00am Monday to Saturday and 10:00pm - 08:00am Sundays & Public Holidays

As required by the NPfl, the external ambient noise levels presented are free-field noise levels, ie. no facade reflection.

## 4 Project noise goals

### 4.1 Applicable noise criteria

Noise impact is assessed in accordance with the NSW *Noise Policy for Industry* (NPfI) 2017. The assessment procedure has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- Maintaining noise level amenity for residences and other land uses.

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels.

#### 4.1.1 Project intrusive noise levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq,15min}$  descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

$$L_{Aeq,15minute} \text{ Intrusiveness noise level} = \text{Rating Background Level (RBL) plus 5dB(A)}$$

Based on the long-term background noise monitoring results obtained in the previous Acoustic Report, the intrusiveness noise levels for residential receivers are reproduced in Table 3 below.

**Table 3: Intrusiveness noise levels**

| Receiver                                                | Intrusiveness noise level, $L_{Aeq,15min}$ |             |             |
|---------------------------------------------------------|--------------------------------------------|-------------|-------------|
|                                                         | Day                                        | Evening     | Night       |
| Level 4, Manly Pacific Hotel,<br>55 North Steyne, Manly | 59 + 5 = 64                                | 62 + 5 = 67 | 60 + 5 = 65 |

Notes: Day: 07:00am - 06:00pm Monday to Saturday and 08:00-18:00 Sundays & Public Holidays  
 Evening: 06:00pm - 10:00pm Monday to Sunday & Public Holidays  
 Night: 10:00pm - 07:00am Monday to Saturday and 10:00pm - 08:00am Sundays & Public Holidays

#### 4.1.2 Amenity noise levels

The project amenity noise levels for different time periods of day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ( $L_{Aq,period}$ ) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for total industrial noise experienced at receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

$$L_{Aeq,period} \text{ Project amenity noise level} = L_{Aeq,period} \text{ Recommended amenity noise level} - 5\text{dB(A)}$$

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the  $L_{Aeq,period}$  level to a representative  $L_{Aeq,15minute}$  level in order to standardise the time periods.

$$L_{Aeq,15minute} = L_{Aeq,period} + 3\text{dB(A)}$$

The project amenity noise levels ( $L_{Aeq, 15min}$ ) applied for this project are reproduced in Table 4 below, based on a 'urban' noise amenity area.

**Table 4: Project amenity noise levels**

| Type of Receiver | Noise Amenity Area | Time of Day | Recommended Noise Level, dB(A) |                  |
|------------------|--------------------|-------------|--------------------------------|------------------|
|                  |                    |             | $L_{Aeq, Period}$              | $L_{Aeq, 15min}$ |
| Residential      | Suburban           | Day         | 60 - 5 = 55                    | 55 + 3 = 58      |
|                  |                    | Evening     | 62 - 10 = 52 <sup>4</sup>      | 52 <sup>4</sup>  |
|                  |                    | Night       | 60 - 10 = 50 <sup>4</sup>      | 50 <sup>4</sup>  |

- Notes:
1. Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
  2. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
  3. The  $L_{Aeq}$  index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
  4. The calculation was based on the condition where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level,  $L_{Aeq}$ . The existing industrial noise levels are unlikely to reduce over time.

#### 4.1.3 NPfI Project noise trigger levels

In accordance with the NPfI project noise trigger levels, which are the lower (i.e. more stringent) value of the project intrusiveness noise level and project amenity noise level, have been determined as shown in Table 5 below.

**Table 5: Project noise trigger levels**

| Receiver location     | $L_{Aeq, 15min}$ Project noise trigger levels, dB(A) |         |       |
|-----------------------|------------------------------------------------------|---------|-------|
|                       | Day                                                  | Evening | Night |
| Residential receivers | 58                                                   | 52      | 50    |

#### 4.1.4 Sleep disturbance noise levels

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$  40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- $L_{AFmax}$  52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 6.

**Table 6: Sleep disturbance assessment levels**

| Receiver type                  | Assessment Level $L_{Aeq,15min}$ | Assessment Level $L_{AFmax}$ |
|--------------------------------|----------------------------------|------------------------------|
| R1 - 1 Raglan Street, Manly    | 60 + 5 = 65                      | 60 + 15 = 75                 |
| R2 - 62-65 North Steyne, Manly | 60 + 5 = 65                      | 60 + 15 = 75                 |

The specific sources requested by council to be assessed are steady-state, and therefore there is unlikely to be significant variation between  $L_{Aeq,15min}$  values and  $L_{AFmax}$  values, hence compliance with the more stringent project trigger noise level presented in Table 5 will result in compliance with the project's sleep disturbance criteria set out in Table 6.

## 4.2 Project noise goals

### 4.2.1 Mechanical plant noise

The mechanical noise goals within Table 7 have been established from measured noise levels set out in Section 3.2.

**Table 7: Mechanical noise goals**

| Receiver                | Assessment period | $L_{Aeq,15min}$ Operational mechanical noise goal, dB(A) |
|-------------------------|-------------------|----------------------------------------------------------|
| R1 - 1 Raglan Street    | 7:00am - 6:00pm   | 58                                                       |
|                         | 6:00pm - 10:00pm  | 52                                                       |
|                         | 10:00pm - 7:00am  | 50                                                       |
| R2 - 62-65 North Steyne | 7:00am - 6:00pm   | 58                                                       |
|                         | 6:00pm - 10:00pm  | 52                                                       |

| Receiver | Assessment period | $L_{Aeq, 15min}$ Operational mechanical noise goal, dB(A) |
|----------|-------------------|-----------------------------------------------------------|
|          | 10:00pm - 7:00am  | 50                                                        |

## 5 Noise assessment

### 5.1 Noise sources

The various items of plant equipment with the associated noise levels are presented in Table 8 below. It is advised that all existing plant and equipment associated with the previous development are assumed to be certified and verified as a part of its approval.

**Table 8: Sound level data**

| Items                         | Existing/new | Location | Brand & model no.    | Calculated / reported sound power level, dB(A) |
|-------------------------------|--------------|----------|----------------------|------------------------------------------------|
| Cooling Tower                 | New          | Level 8  | BAC RCF 1111-3-N     | 98 <sup>1</sup>                                |
| Chiller with associated pumps | New          | Level 8  | Daikin EWWD715VZPSA1 | 105 <sup>2</sup>                               |

Notes:

- Noise data obtained from manufacturers' technical data sheet or brochure
- Calculated based on sound pressure level data obtained from manufacturers' technical data sheet or brochure

Plant and equipment not listed above has not been assessed.  
Contractor or supplier is to use the sound power level data and the associated frequency spectrum for equipment selection.

### 5.2 Prediction methodology

The noise predictions were based upon the architectural drawings and carried out in accordance with ISO9613 as implemented by CadnaA noise modelling software, which takes into account sound radiation patterns, acoustic shielding and potential reflections from intervening building elements and noise attenuation due to distance.

For a conservative assessment against the noise goals, it is assumed that all plant and equipment operate continuously at 100% capacity during the night period (10pm - 7am).

The following assumptions presented in Table 9 regarding the acoustic performance of the walls and roof associated with the plantroom have been made for the acoustic assessment.

**Table 9: Plant room envelope acoustic performance**

| Construction element                   | Construction material                | Acoustic rating $R_w$ assumed | Indicative construction                                                                                                                      |
|----------------------------------------|--------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Wall construction                      | Plasterboard and stud                | $R_w$ 41                      | Single 92mm Rondo stud wall with 600mm centres, 1x13mm plasterboard on each side with empty cavity, fully sealed with GIB Soundseal          |
| Roof construction (chiller plant room) | Flat metal with plasterboard ceiling | $R_w$ 38                      | Flat wooden roof frame with 0.56mm galvanised steel decking and 2 layers of 9mm plasterboard ceiling and 50mm glass fibre blanket b/w joists |

| Construction element         | Construction material | Acoustic rating $R_w$ assumed | Indicative construction                                                                                                                                                                                                          |
|------------------------------|-----------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acoustic louvre construction | Fantech SBL1          | Refer to Table 10             | 1.2mm thick galvabond case with a return fold all around to increase unit rigidity. The 300mm deep louvre is manufactured from galvabond and filled with acoustic infill. Each splitter is filled with sound-absorbing material. |

Table 10 presents the insertion loss spectrum of the louvre specified above.

**Table 10: Plant room envelope acoustic performance**

| Construction element         | Descriptor          | Octave band centre frequency - Hz (dBZ) |    |     |     |     |    |    |    |    |
|------------------------------|---------------------|-----------------------------------------|----|-----|-----|-----|----|----|----|----|
|                              |                     | 31.5                                    | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Fantech SBL1 Acoustic Louvre | Insertion Loss (IL) | -                                       | 4  | 7   | 9   | 13  | 14 | 12 | 12 | 8  |

### 5.3 Noise prediction results & assessment

Table 11 summarises the results of the noise assessment, presenting the predicted noise emission levels at the identified assessment locations against the established noise goals.

**Table 11: Predicted noise level assessment**

| Receiver                            |                        | Description      | Overall, dB(A) |
|-------------------------------------|------------------------|------------------|----------------|
| R1 - Level 11 of 1 Raglan Street    | Predicted noise levels | New equipment    | <b>51</b>      |
|                                     | Noise trigger level    | 10:00pm - 7:00am | 50             |
| R2 - Level 11 of 62-65 North Steyne | Predicted noise levels | New equipment    | 43             |
|                                     | Noise trigger level    | 10:00pm - 7:00am | 50             |

Note: Bold indicates exceedance of the established noise trigger level

The findings from the assessment are:

- The proposed new mechanical equipment at Level 8 complies with the established noise trigger levels at noise sensitive receivers R1 and R2. A 1dB exceedance was found at receiver R1, however a 1dB noise level difference is not perceptible to the average listener and so would sound the same as a technically compliant system.
- Recommendations for the management of noise from the use are set out in Section 5.4.

### 5.4 Recommendations

Recommendations below are in-principle noise control solutions to manage noise impacts to the identified assessment locations. This information is presented for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.

The advice provided is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

#### **5.4.1 Mechanical plant operational capacity**

The new mechanical equipment is proposed to operate at 100% capacity during the day (7:00am to 6:00pm) and evening (6:00pm to 10:00pm) period. During the night-time period (10:00pm to 7:00am), it is recommended that the cooling towers (CT1, CT2, and CT3) operate at reduced capacity to maintain the operational mechanical noise below the noise criteria.

#### **5.4.2 Vibration isolation**

Chillers and cooling towers shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 '*Rotating and Reciprocating Machinery - Mechanical Vibration*'.

## 6 Conclusion

Renzo Tonin & Associates has completed an environmental noise assessment for the proposed installation of new mechanical plants and extension of the lifts shaft at Novotel Sydney Manly Pacific, 55 North Steyne, Manly.

Assessment of the proposed mechanical equipment on Level 8 rooftop area was assessed in accordance with the standard noise conditions set out by the NSW EPA Noise Policy for Industry 2017.

On the basis of the proposed design, our assessment concluded:

- The proposed new mechanical equipment at Level 8 complies with the established noise goals at the nearest noise sensitive receivers external to the hotel except for an imperceptible exceedance at night period, which does not justify additional treatment
- Recommendations have been made with regard to the operational capacity of the mechanical equipment to meet the noise goal during the night-time period

## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adverse Weather    | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).                                                                                                                                                                                                                                        |
| Ambient Noise      | The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.                                                                                                                                                                                                                                                                                                                                                                                                           |
| Assessment Period  | The period in a day over which assessments are made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Assessment Point   | A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Background Noise   | Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the $L_{90}$ noise level (see below).                                                                            |
| Decibel [dB]       | The units that sound is measured in. The following are examples of the decibel readings of every day sounds:<br>0dB The faintest sound we can hear<br>30dB A quiet library or in a quiet location in the country<br>45dB Typical office space. Ambience in the city at night<br>60dB CBD mall at lunch time<br>70dB The sound of a car passing on the street<br>80dB Loud music played at home<br>90dB The sound of a truck passing on the street<br>100dB The sound of a rock band<br>115dB Limit of sound permitted in industry<br>120dB Deafening |
| dB(A)              | A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.                                                              |
| Frequency          | Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.                                                                                                                                                                                                                                                            |
| Impulsive noise    | Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.                                                                                                                                                                                                                                                                                                                                                                                                   |
| Intermittent noise | The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.                                                                                                                                                                                                                                                                                                                                 |
| $L_{Max}$          | The maximum sound pressure level measured over a given period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| $L_{Min}$          | The minimum sound pressure level measured over a given period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| $L_1$              | The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| $L_{10}$           | The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                      |                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L <sub>90</sub>      | The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L <sub>90</sub> noise level expressed in units of dB(A).                                                                                                                                                                                                              |
| L <sub>eq</sub>      | The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.                                                                                                                                                                                                                                               |
| Reflection           | Sound wave changed in direction of propagation due to a solid object obscuring its path.                                                                                                                                                                                                                                                                   |
| SEL                  | Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations. |
| Sound                | A fluctuation of air pressure which is propagated as a wave through air.                                                                                                                                                                                                                                                                                   |
| Sound Absorption     | The ability of a material to absorb sound energy through its conversion into thermal energy.                                                                                                                                                                                                                                                               |
| Sound Level Meter    | An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.                                                                                                                                                                                                    |
| Sound Pressure Level | The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.                                                                                                                                                                                                                                          |
| Sound Power Level    | Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.                                                                                                                                                                                                                                         |
| Tonal noise          | Containing a prominent frequency and characterised by a definite pitch.                                                                                                                                                                                                                                                                                    |