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113 High Holborn
London

Planning Compliance Report
Report 29347.PCR.01

113 High Holborn
London
WC1A 6JQ

Report 29347.PCR.01 Revision History			
First Issue Date: 11/10/2024			
A	.	D	
B		E	
C		F	

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1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Palestine House, 113 High Holborn, London, WC1A 6JQ, to undertake a noise impact assessment of the plant unit installation serving the building at 113 High Holborn, London, WC1A 6JQ.

The previous plant installation serving the building has been removed and replaced with new units at the roof level.

A noise impact assessment has been carried out in general accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound*' as part of the planning requirements of the London Borough of Camden.

This report presents calculations to provide an indication as to the likelihood of the noise emissions from the installed plant unit installation having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE

2.1 Site Description

As shown in Figure 2.1, the site is bounded by a hotel to the north and northwest, Commercial units to the east and west, and A40 to the south.

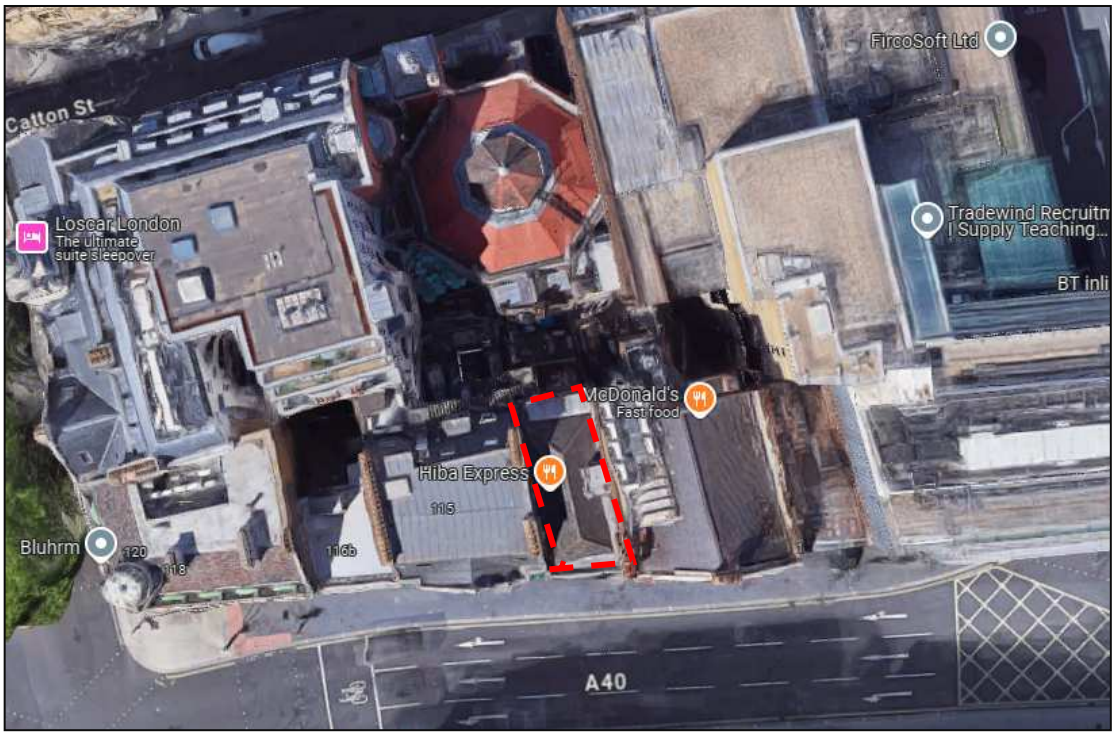

Figure 2.1 Site Location Plan (Image Source: Google Maps)

3.0 NOISE ASSESSMENT GUIDANCE

3.1 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq,\ Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible*'
- **Impulsivity** – '*A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible*'
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

- **Other sound characteristics** – '*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB could be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

3.2 Local Authority Guidance

The guidance provided by The London Borough of Camden for noise emissions of new plant in this instance is as follows:

The noise criteria, as per the Local Plan 2017 of London Borough of Camden, British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' should be considered as the main reference document for the assessment. The resultant 'Rating Level' would be considered as follows:

Period	Assessment Location	Rating Level Acceptability Range		
		Green: noise is considered to be at an acceptable level	**Amber:** noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development	**Red:** noise is observed to have a significant adverse effect.
Daytime (7:00-23:00)	Garden used for main amenity (free field) and Outside living or dining or Bedroom window (façade)	10dB below background	9 dB below and 5dB above background	5dB above background
Night-time (23:00-7:00)	Outside bedroom window (façade)	10dB below background and no events exceeding 57dB L_{Amax}	9db below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	5dB above background and/or events exceeding 88dB L_{Amax}

Table 3.1 Camden noise criteria for plant and machinery

4.0 NOISE IMPACT ASSESSMENT

4.1 Plant Installations

The previous external plant has been removed, with all plant serving 113 High Holborn now situated at the upper roof level. To assess the likely impact from this plant upgrade/relocation, the noise from the previous plant will be compared to the noise from the current plant at the nearest noise sensitive residential receiver.

BS4142 and the Local Authority plant noise criteria has been considered, however as the plant installation is an upgrade/change of location/plant removal, it was deemed that the noise impact on surrounding noise sensitive developments is best to be assessed through the comparison of noise due to the original plant, and the noise due to the new plant installation.

It is understood that the plant installation now removed was comprised of the following units:

Top roof level

- 1No. Daikin RZQG125L9V1B Condenser Unit
- 2No. Daikin RXS35L3V1B Condenser Units

On Wall Beneath Fire Escape

- 4No. Daikin RXS35L3V1B Condenser Units

Lower Roof Level

- 4No. Daikin RZQG125L9V1B Condenser Units
- 6No. Daikin REYQ10T7Y1B Condenser Units
- 1No. Daikin RYYQ14T71B Condenser Unit
- 2No. Daikin RXS35L3V1B Condenser Units

It is understood that the new plant installation is comprised of the following units:

Top roof level

- 6No. Daikin RZASG100M7V1B Condenser Units

Extract Fan (Same Unit Relocated)

- 1No. Helios Gigabox 630/4 Extract Fan

The installation location for the previous and current plant, and the location of the nearest noise sensitive window, is shown in Figure 4.1 below:

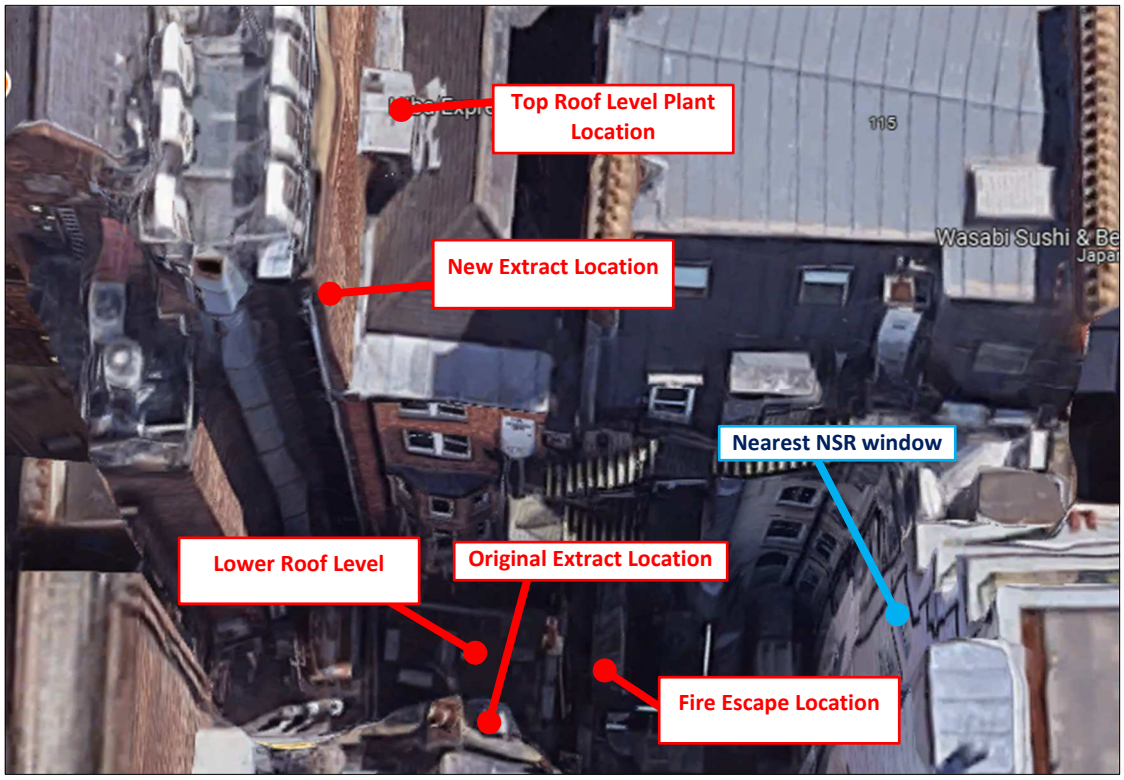

Figure 4.1 Plant installation locations (image source: Google Maps)

The noise emission levels as provided by the manufacturer for the units are shown in Table 4.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
Original Plant										
Daikin RZQG125L9V1B	SPL@1m (dB)	58	53	51	49	44	43	40	28	51
Daikin REYQ10T7Y1B	SWL (dB)	87	81	79	77	71	71	67	61	79
Daikin RYYQ14T71B	SWL (dB)	87	83	80	80	74	70	70	64	81
Daikin RXS35L3V1B	SPL@1m (dB)	40	45	43	42	37	32	27	19	49
New Plant										
Daikin RZASG100M7V1B	SWL (dB)	77	72	72	69	61	56	53	47	70
Extract Fan (Relocated)										
Helios Gigabox 630/4 Extract	SWL (dB)	81	81	82	84	84	82	77	81	90

Table 4.1 Plant Units Noise Emission Levels as provided by the manufacturer

The closest residential noise sensitive receiver to the proposed installation location has been identified as being a residential window of L'Oscar hotel located approximately 15 metres from the new rooftop plant installation location, as shown in Figure 4.1.

It should be noted the proposed plant unit would be partially out of line of sight of the receiving window due to screening from the building envelope.

4.2 Calculations

Taking all acoustic corrections into consideration, the predicted noise level contribution from both the original and newly installed plant expected at the closest residential window to the newly installed plant would be as shown in Table 4.2. Detailed calculations are shown in Appendix B1 and B2.

Receiver	Noise Level at 1m From the Closest Noise Sensitive Window	
	Original	New
4th Floor Window	58dB(A)	52dB(A)

Table 4.2 Predicted noise level and criterion at nearest noise sensitive location

As shown in Appendix B1 and B2 and Table 4.2, transmission of noise to the nearest noise sensitive windows from the new plant installation is 6dB lower than the original plant installation. Furthermore, there are fewer sensitive windows overlooking the new plant installation location, therefore the noise impact of the newly installed plant would be much lower than that of the original plant.

5.0 CONCLUSION

A noise assessment has been undertaken for the newly installed plant serving 113 High Holborn, London.

Manufacturer's noise data of both the proposed and former plant units has been used to obtain the Rating Noise Level at the nearest noise sensitive receiver.

The noise level of the newly installed plant was compared with the noise level of the original plant to assess the likelihood of impact considering the environmental noise context of the area.

It has been concluded that transmission of noise to the nearest noise sensitive windows from the new plant installation is 6dB lower than the original plant installation. Furthermore, there are fewer sensitive windows overlooking the new plant installation location, therefore the noise impact of the newly installed plant would be much lower than that of the original plant.

APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B1

113 High Holborn

PLANT NOISE EMISSIONS CALCULATIONS - ORIGINAL PLANT

Source: Previously Removed Plant Serving 113 High Holborn Receiver: L'Oscar London Hotel 4th floor	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Top Roof									
1No. Daikin RZQG125L9V1B (Sound Pressure Level @1m)	58	53	51	49	44	43	40	28	51
Daikin RXS35L3V1B (Sound Pressure Level @1m)	40	45	43	42	37	32	27	19	49
Correction due to number of units (2), dB	3	3	3	3	3	3	3	3	
2No. Daikin RXS35L3V1B (Sound Pressure Level @1m)	43	48	46	45	40	35	30	22	46
Total sound pressure level of both type of unit (1m)	58	54	52	51	46	44	40	29	52
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-5	-5	-6	-6	-7	-9	-11	-13	
Minimum attenuation provided by distance (16m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Total SPL due to Top Roof Plant at 1m from NSR	**32**	**28**	**26**	**23**	**17**	**14**	**8**	**-5**	**24**
On Wall Beneath Fire Escape									
Daikin RXS35L3V1B (Sound Pressure Level @1m)	40	45	43	42	37	32	27	19	49
Correction due to number of units (4), dB	6	6	6	6	6	6	6	6	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (10m), dB	-20	-20	-20	-20	-20	-20	-20	-20	
Total SPL due to Plant by fire escspe at 1m from NSR	**29**	**34**	**32**	**31**	**26**	**21**	**16**	**8**	**32**
Lower Roof Level									
1No. Daikin RZQG125L9V1B (Sound Pressure Level @1m)	58	53	51	49	44	43	40	28	51
Correction due to number of units (4), dB	6	6	6	6	6	6	6	6	
4No. Daikin RZQG125L9V1B (Sound Pressure Level @1m)	64	59	57	55	50	49	46	34	57
1No. Daikin REYQ10T7Y1B (Sound Power Level)	87	81	79	77	71	71	67	61	79
Correction due to number of units (6), dB	8	8	8	8	8	8	8	8	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
6No. Daikin REYQ10T7Y1B (Sound Pressure Level @1m)	84	78	76	74	68	68	64	58	76
1No. Daikin RYYQ14T71B (Sound Power Level)	87	83	80	80	74	70	70	64	81
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
1No. Daikin RYYQ14T71B (Sound Pressure Level @1m)	76	72	69	69	63	59	59	53	70
1No. Daikin RXS35L3V1B (Sound Pressure Level @1m)	40	45	43	42	37	32	27	19	43
Correction due to number of units (2), dB	3	3	3	3	3	3	3	3	
2No. Daikin RXS35L3V1B (Sound Pressure Level @1m)	43	48	46	45	40	35	30	22	46
Total sound pressure level of all units at Lower Roof Level (1m)	85	79	77	75	69	68	65	59	77
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by distance (14m), dB	-23	-23	-23	-23	-23	-23	-23	-23	
Total SPL due to Lower Roof Plant at 1m from NSR	**65**	**59**	**57**	**55**	**49**	**48**	**45**	**39**	**57**
Extraction Fan - Noise Emissions from Duct Termination Point									
Helios Gigabox 630/4 Extract (Sound Power Level)	81	81	82	84	84	82	77	69	90
Attenuation due to approximate duct length (8m), dB	-7	-5	-3	-1	-1	-1	-1	0	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Lw at Grille, dB	66	72	78	83	83	81	76	69	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Minimum attenuation provided by distance (10m), dB	-20	-20	-20	-20	-20	-20	-20	-20	
Total Noise Emissions from Extraction Fan Duct Termination Point, dB	35	41	47	52	52	50	45	38	56
Sound Pressure Level at Receiver due to All Units, dB	**65**	**59**	**57**	**57**	**54**	**52**	**48**	**42**	**59**

APPENDIX B2

113 High Holborn

PLANT NOISE EMISSIONS CALCULATIONS - NEW PLANT

Source: New Plant Serving 113 High Holborn Receiver: L'Oscar London Hotel 4th floor	*Frequency, Hz* *63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Top Roof									
1No. Daikin RZASG100M7V1B (Sound Power Level)	76	72	72	69	61	56	53	43	70
Correction due to number of units (6), dB	8	8	8	8	8	8	8	8	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	-4
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-4	-4	-3	0	0	0	0	0	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Total Noise Emissions from Daikin Units, dB	48	44	45	45	37	32	29	19	45
Extraction Fan - Noise Emissions from Duct Termination Point									
Helios Gigabox 630/4 Extract (Sound Power Level)	81	81	82	84	84	82	77	69	90
Attenuation due to approximate duct length (15m), dB	-12	-10	-5	-2	-2	-2	-2	0	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Lw at Grille, dB	61	67	76	82	82	80	75	69	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Total Noise Emissions from Extraction Fan Duct Termination Point, dB	26	33	42	47	47	45	40	34	51
Sound Pressure Level at Receiver due to All Units, dB	**48**	**45**	**47**	**49**	**48**	**45**	**40**	**35**	**52**