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BS4142 Noise Assessment

Report No: 2149-R1 – Co-Operative Stores, Balloon Street, Manchester.

For: Wellsfield Associates

Table of Contents

1. Introduction 2
2. Site Description 3
3. Scope 4
4. Assessment Methodology 4
5. Survey Information 6
6. Survey Results 7
7. Assessment 7
8. Conclusion 9
9. Appendix 11

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2149-R1	12/11/2013	Initial Report	
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1. Introduction

Clover Acoustics has been appointed by Wellsfield Associates to carry out a BS4142 noise assessment on a proposed new refrigeration equipment installation at Balloon Street, Manchester. The equipment will service the adjacent Co-Operative store and will potentially be operational throughout a 24-hour period.

The purpose of this report is to demonstrate that due consideration for noise affecting the nearest neighboring residential properties has been made and to assess the significance of any noise impact from the operation of the unit.

2. Site Description

Balloon Street is a commercial road in Manchester City centre. Through traffic is not permitted as a tram system is in operation. The road is open to pedestrian access. The Co-Operative store has a storage yard access fronting onto Balloon Street with the main store access being on Corporation Street. The proposal is for a new refrigeration plant to be installed at the site of existing air handling equipment on Balloon Street. As the equipment will service refrigeration units it can potentially operate at any time of the night or day.

The predominant noise on site was noted to be road traffic and general background noise from the surrounding city centre area. No residential accommodation is apparent in the immediate area, with the nearest identifiable dwellings being serviced apartments on Dantzic Street. Figure 1 shows the site layout. More pictures can be seen in the Appendix.



Figure 1 – Site Layout

3. Scope

The scope for this assessment has been made in accordance with the following standards and documents:

- BS4142: 1997 – Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.
- BS8233:1999 – Sound Insulation and Noise Reduction for Buildings.
- World Health Organisation – Guidelines for Community Noise 1999.

4. Assessment Methodology

An assessment of noise affecting nearby residences from the air-conditioning unit has been made in accordance with BS4142:1997. Measurements have also been compared with guidance in BS8233:1999, and WHO Guidelines.

BS4142:1997 Method for Rating industrial noise affecting mixed residential and industrial areas.

BS4142 gives a method for rating noise from industrial sources affecting residential properties. The rating level (this is the specific noise level of the source with any corrections or penalties for tonality) of the noise source is compared to the existing background noise level at the property. The greater the difference between the two, the greater the likelihood for complaints.

- a difference of +10dB indicates that complaints are likely;
- a difference of +5dB is of marginal significance;
- if the rating level is more than 10dB below the measured background noise level, this is a positive indication that complaints are unlikely.

BS8233:1999 Sound Insulation and Noise Reduction for Buildings.

BS8233 gives guidance for internal noise levels within buildings to achieve reasonable or good resting/sleeping conditions within residential properties as follows:

Room Type	Good dB L_{Aeq}	Reasonable dB L_{Aeq}
Living Rooms	30	40
Bedrooms	30	35

World Health Organisation – Guidelines for Community Noise 1999.

The World Health Organisation gives further guidance for maximum recommended noise levels outside residential properties as follows:

Specific Environment	Critical health effect	dB L_{Aeq}	Time (hr)	dB L_{Amax}
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

5. Survey Information

Unattended monitoring was undertaken between Friday 8th November 2013 and Monday 11th 2013 to provide background noise (dB L_{A90}) for this assessment. A background monitoring period has been selected to reflect a worst case scenario when background levels are expected to be lowest.

Measurement Instrumentation

The measurement instrumentation used on the survey was as follows:

Equipment	Manufacturer & Type	Serial Number	Calibration Certificate
Sound Level Meter	Norsonic 118	30559	U10596
Acoustic Calibrator	Norsonic 1251	32856	U12134

The equipment was calibrated to comply with section 4.2 of BS7445:1-2003 before and after the surveys. The calibration was as follows:

Meter	Serial	Before		After	
Norsonic 118	30559	113.8	-26.0	113.8	-26.0

Measurements & Timescales

During the 24-hour survey 5-minute measurements were made and subsequently analysed into hourly periods.

The following measurements are reported: $L_{Aeq,T}$, $L_{A90,T}$

The measurements and their interpretation shall be in accordance with BS 7445: Parts1 and 2. All sound pressure levels are in dB (re 20µPa).

Meteorology

During the survey visit the weather was considered to be predominantly dry through Friday and Sunday, with some rainfall on Saturday.

Position of Monitoring Equipment

During the survey the equipment was positioned at a location on Dantzic Street considered representative of the background and ambient noise level at the nearest residential window. A -3dB façade correction has been made.

6. Survey Results

Background Noise Monitoring

The table below shows a summary of the background monitoring periods.

Monitoring Position 1 - Friday				
Measurement	**Daytime**	**Hour Ending/ Period**	**Night-time**	**Hour Ending/ Period**
Maximum dB $L_{Aeq,1hr}$	62	23:00	63	02:00
Minimum dB $L_{Aeq,1hr}$	52	08:00	52	05:00
Average dB $L_{Aeq,16hr}$/$L_{Aeq,8hr}$	58	07:00 – 23:00	60	23:00 – 07:00
Minimum dB $L_{A90,5Min}$	42	08:00	42	06:00

Monitoring Position 1 - Saturday				
Measurement	**Daytime**	**Hour Ending/ Period**	**Night-time**	**Hour Ending/ Period**
Maximum dB $L_{Aeq,1hr}$	60	23:00	61	02:00
Minimum dB $L_{Aeq,1hr}$	48	08:00	50	07:00
Average dB $L_{Aeq,16hr}$/$L_{Aeq,8hr}$	56	07:00 – 23:00	62	23:00 – 07:00
Minimum dB $L_{A90,5Min}$	43	08:00	42	06:00

Monitoring Position 1 - Sunday				
Measurement	**Daytime**	**Hour Ending/ Period**	**Night-time**	**Hour Ending/ Period**
Maximum dB $L_{Aeq,1hr}$	56	15:00	51	01:00
Minimum dB $L_{Aeq,1hr}$	50	23:00	45	02:00
Average dB $L_{Aeq,16hr}$/$L_{Aeq,8hr}$	55	07:00 – 23:00	48	23:00 – 07:00
Minimum dB $L_{A90,5Min}$	44	23:00	38	02:00

7. Assessment

BS4142:1997 Method for Rating industrial noise affecting mixed residential and industrial areas.

Subjectively the noise climate at the background location was dominated by busy city centre and road traffic noise with occasional audible events from passing trams. The refrigeration equipment is not yet installed and the manufacturer has been approached for details of noise output. Space Engineering has identified a worst-case noise level of 45dB(A) @10m. This has been used as the specific noise level for the assessment.

This type of plant can generally be said to carry distinctive noise characteristic and as such it would be prudent to include a +5dB acoustic correction giving a specific noise level of 50dB(A). As the nearest sensitive receiver is some 100m from the unit distance attenuation can be calculated using the following formula:

$$L_{p2} = L_{p1} + 20\log\left(\frac{r_1}{r_2}\right)$$

This would give a distance attenuation of -20dB. In addition, the receiver is effectively screened by the Printworks, a substantial entertainment complex. A conservative estimate of 10dB barrier attenuation is in our view reasonable in this instance. This gives a rating level of 20dB(A). The lowest case background recorded throughout the measurement period was 38dB $L_{A90,5min}$.

It can be seen from this that the predicted noise levels at the nearest sensitive receiver during the proposed hours of operation of the equipment would be 18dB below *the lowest* L_{A90} background reading recorded. According to BS4142 this is a “positive indication that complaints are unlikely.”

BS4142 Assessment – Hours of Operation		dB
Specific Noise Source		45
Distinctive characteristic penalty		5
Distance Attenuation		-20
Screening Attenuation		-10
Rating Level		20
Lowest Background LA90		38
Rating Below Background		-18

BS8233:1999 Sound Insulation and Noise Reduction for Buildings.

BS8233 gives guidance for internal noise levels within buildings to achieve reasonable or good resting/sleeping conditions within residential properties as follows:

Room Type	Good dB L_{Aeq}	Reasonable dB L_{Aeq}
Living Rooms	30	40
Bedrooms	30	35

Based on the assumed specific noise level, the predicted rating level outside the nearest sensitive receiver window would ensure internal levels below the good criteria for internal living spaces from BS8233.

World Health Organisation – Guidelines for Community Noise 1999.

The World Health Organisation gives guidance for maximum recommended noise levels outside residential properties as follows:

Specific Environment	Critical health effect	dB L_{Aeq}	Time (hr)	dB L_{Amax}
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

The predicted noise level of 20dB(A) at the nearest sensitive receiver is below both the 50-55dB criteria for outdoor living areas and sleep disturbance criteria.

8. Conclusion

Clover Acoustics has undertaken a noise assessment at the site of the Co-Operative store on Balloon Street Manchester with regard to the proposed installation of refrigeration plant. The assessment has been carried out following the assessment methodology in BS4142:1997, BS8233:1999, and the WHO Guidelines for Community Noise.

A rating level of -18dBA below the lowest recorded background noise level has been predicted. According to BS4142 this is a "positive indication that complaints are unlikely".

The predicted levels have also been shown to be below BS8233 criteria for internal living spaces and WHO guideline values for outside residential properties.



Steve Clow MIOA
Acoustic Consultant

9. Appendix

Glossary of Terms

Specific Noise Source
The noise source under investigation for assessing the likelihood of complaints.

Specific Noise Level, $L_{Aeq,T}$
The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

Rating Level, $L_{A,T}$
The specific noise level plus any adjustment for the characteristic features of the noise.

Background Noise Level, $L_{A90,T}$
The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T.

Residual Noise
The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

Ambient Noise
Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Reference Time Interval, T
The specified interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$
The A-weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$
The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}
The highest short duration A-weighted sound level recorded during a noise event.

A-Weighting
The 'A' weighting is a correction term applied to the frequency range in order to approximate to the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies.

Octave Band
A frequency band in which the upper limit of the band is twice the frequency of the lower limit.

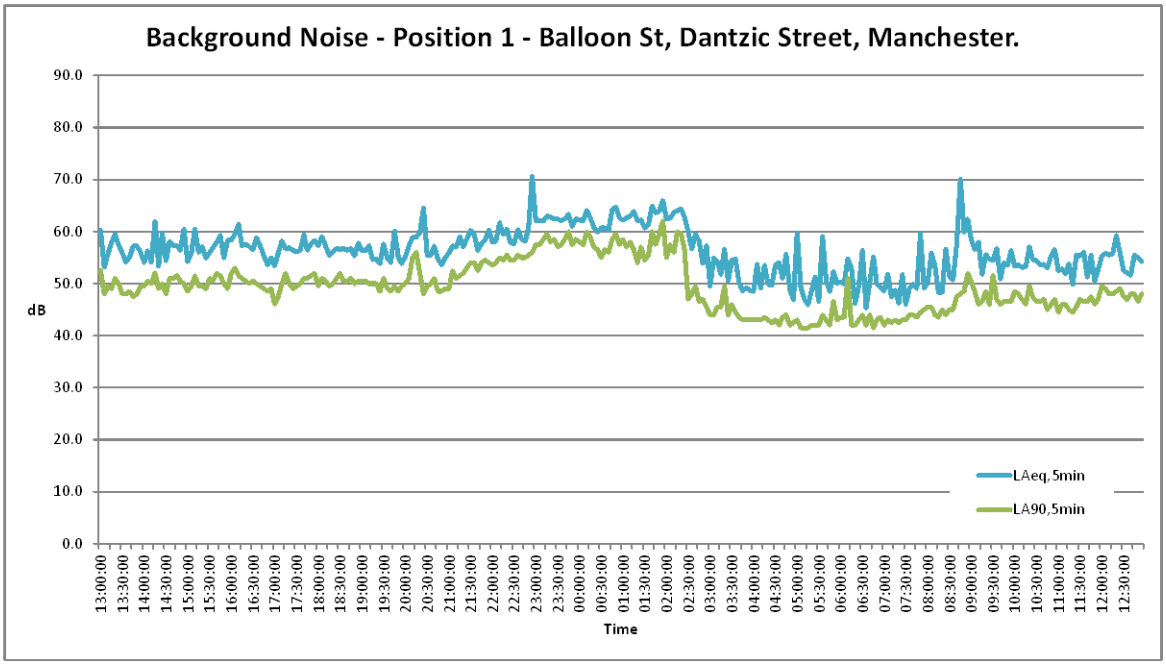
One-third-octave Band
A frequency band in which the upper limit of the band is 1/3 times the frequency of the lower limit.

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Site: Position 1 - Balloon St, Dantzic Street, Manchester.
Table: 1 Summary
Report: 2149-R1
Start Date: 08/11/2013
End Date: 09/11/2013

Hourly Summary

Hour End	LAeq,1Hour	Min LA90,5min	Max LAMax, 5min
00:00	62.4	57.0	82.2
01:00	62.4	55.0	83.7
02:00	63.3	54.0	87.3
03:00	61.5	45.5	79.7
04:00	52.8	43.0	77.9
05:00	52.0	42.0	77.3
06:00	53.4	41.5	79.8
07:00	52.0	41.5	72.7
08:00	51.8	42.0	79.2
09:00	60.9	43.5	85.3
10:00	55.6	46.0	78.8
11:00	54.5	45.0	73.8
12:00	53.6	44.5	78.9
13:00	55.3	46.5	81.5
14:00	57.1	47.5	80.3
15:00	57.7	48.0	81.6
16:00	57.2	48.5	79.3
17:00	57.8	48.5	80.0
18:00	57.0	46.0	78.4
19:00	56.9	49.5	82.9
20:00	56.1	48.5	81.9
21:00	58.4	48.0	85.0
22:00	58.3	49.0	82.2
23:00	62.4	53.5	94.5

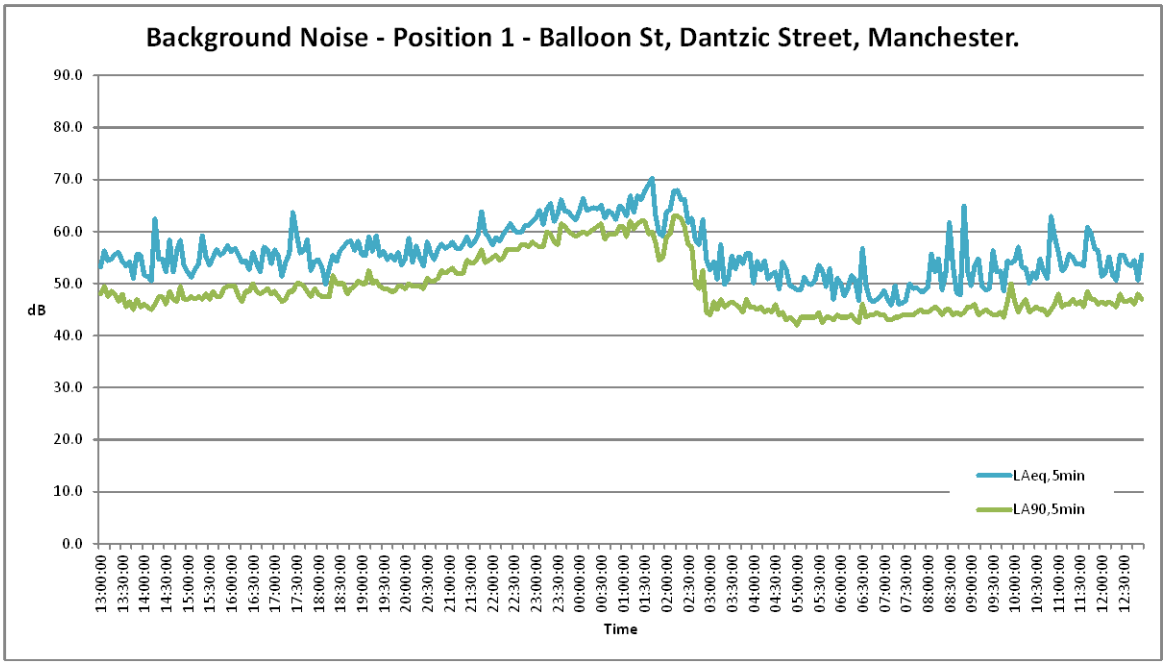


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Site: Position 1 - Balloon St, Dantzic Street, Manchester.
Table: 2 Summary
Report: 2149-R1
Start Date: 09/11/2013
End Date: 10/11/2013

Hourly Summary

Hour End	LAeq,1Hour	Min LA90,5min	Max LAMax, 5min
00:00	63.7	57.0	84.7
01:00	64.3	58.5	83.5
02:00	66.2	54.5	88.4
03:00	64.2	44.5	85.0
04:00	54.3	44.0	80.2
05:00	52.2	43.0	72.9
06:00	50.9	42.0	73.5
07:00	50.4	42.5	75.0
08:00	48.2	43.0	71.2
09:00	57.2	44.0	86.7
10:00	52.7	43.5	76.9
11:00	56.1	44.0	79.7
12:00	56.4	45.5	82.0
13:00	53.7	45.5	73.2
14:00	54.7	45.0	82.8
15:00	56.3	45.0	83.9
16:00	55.4	47.0	80.1
17:00	55.2	46.5	80.1
18:00	57.5	46.5	87.4
19:00	55.9	47.5	80.5
20:00	56.2	48.5	78.5
21:00	56.3	49.0	81.1
22:00	59.0	52.0	83.3
23:00	60.2	54.5	83.1



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Site: Position 1 - Balloon St, Dantzic Street, Manchester.
Table: 3 Summary
Report: 2149-R1
Start Date: 10/11/2013
End Date: 11/11/2013

Hourly Summary

Hour End	LAeq,1Hour	Min LA90,5min	Max LAMax, 5min
00:00	49.3	42.5	69.6
01:00	50.8	39.5	82.5
02:00	44.8	38.5	70.3
03:00	45.5	38.5	66.6
04:00	45.0	39.0	69.7
05:00	45.6	39.5	68.7
06:00	45.4	39.5	75.9
07:00	50.1	42.0	72.5
08:00	54.0	44.5	78.7
09:00	54.7	45.0	79.4
10:00	55.0	45.5	75.9
11:00	55.7	45.5	80.3
12:00	55.2	45.0	78.1
13:00	55.0	46.0	78.9
14:00	54.9	45.0	80.2
15:00	55.8	45.0	78.9
16:00	54.6	46.5	76.0
17:00	55.4	46.5	91.6
18:00	55.3	47.0	80.9
19:00	53.3	45.5	76.9
20:00	53.4	45.0	74.6
21:00	54.2	45.5	79.9
22:00	52.3	44.5	80.5
23:00	50.3	43.5	74.7

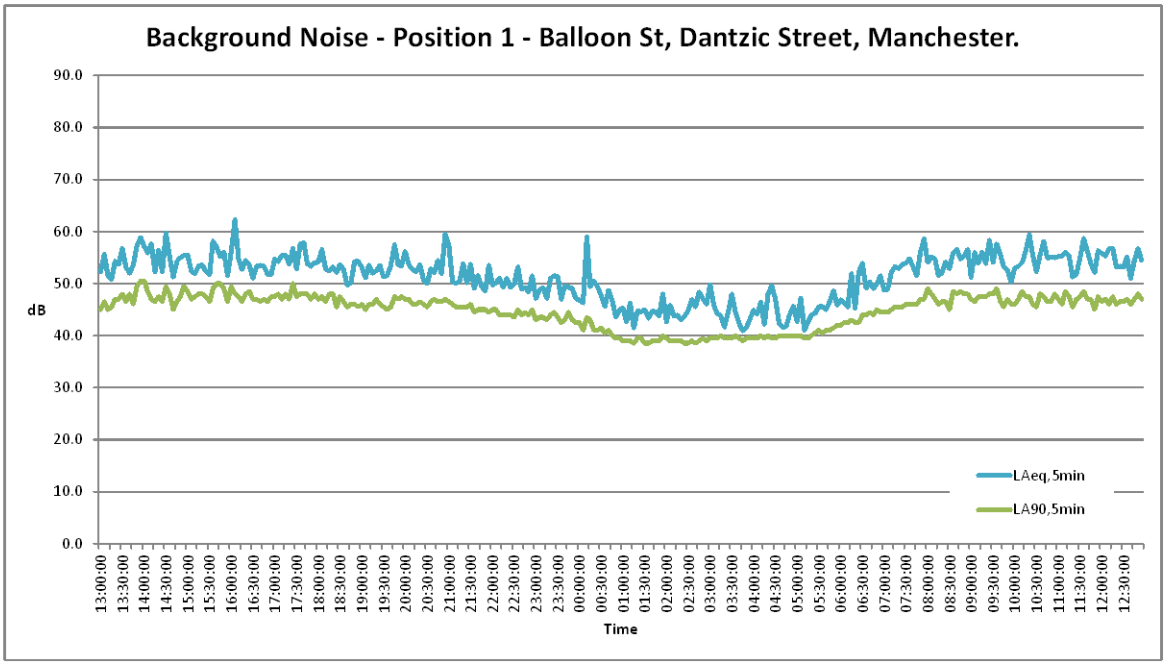


Photo Appendix

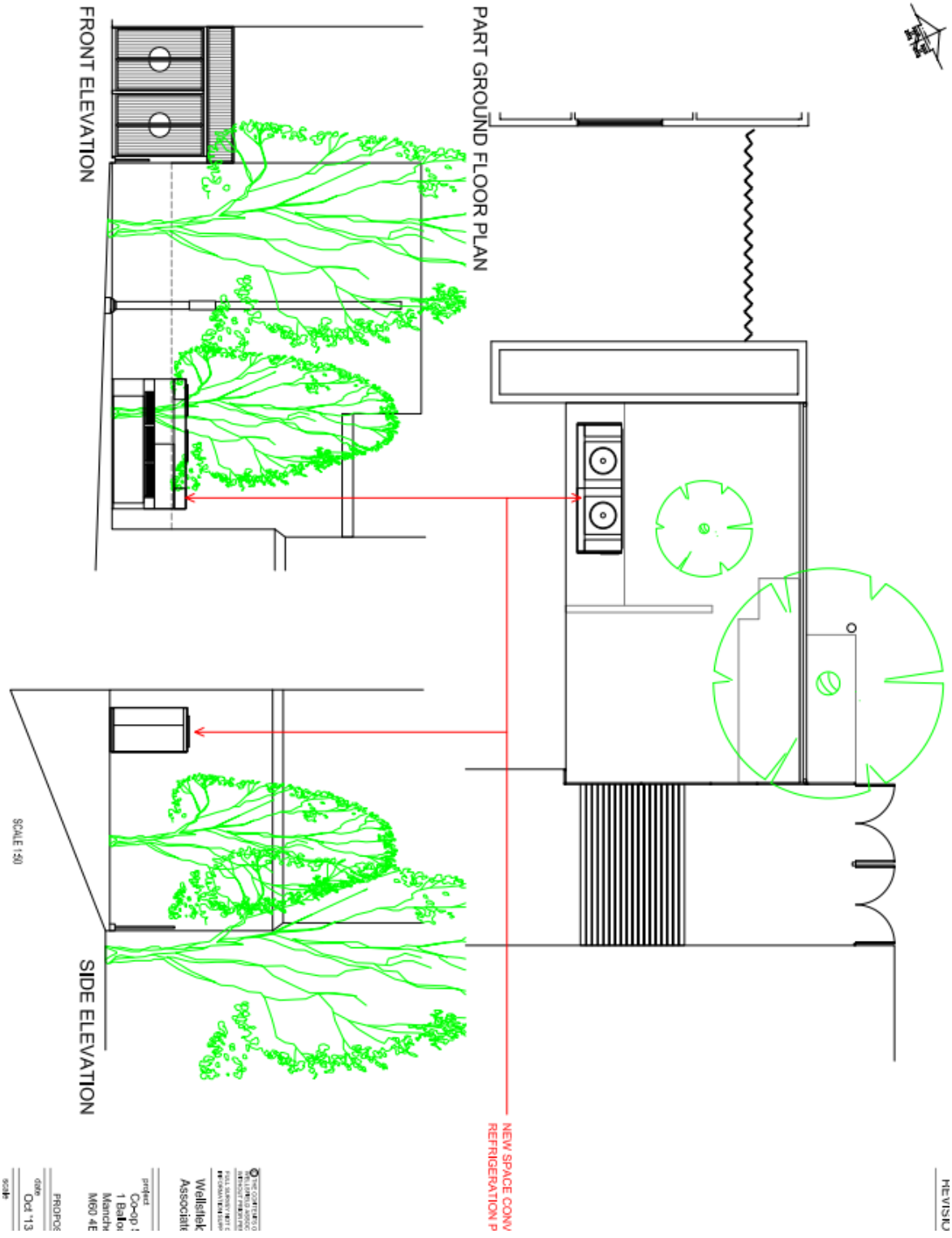


Figure 2 – View toward proposed installation – Balloon St

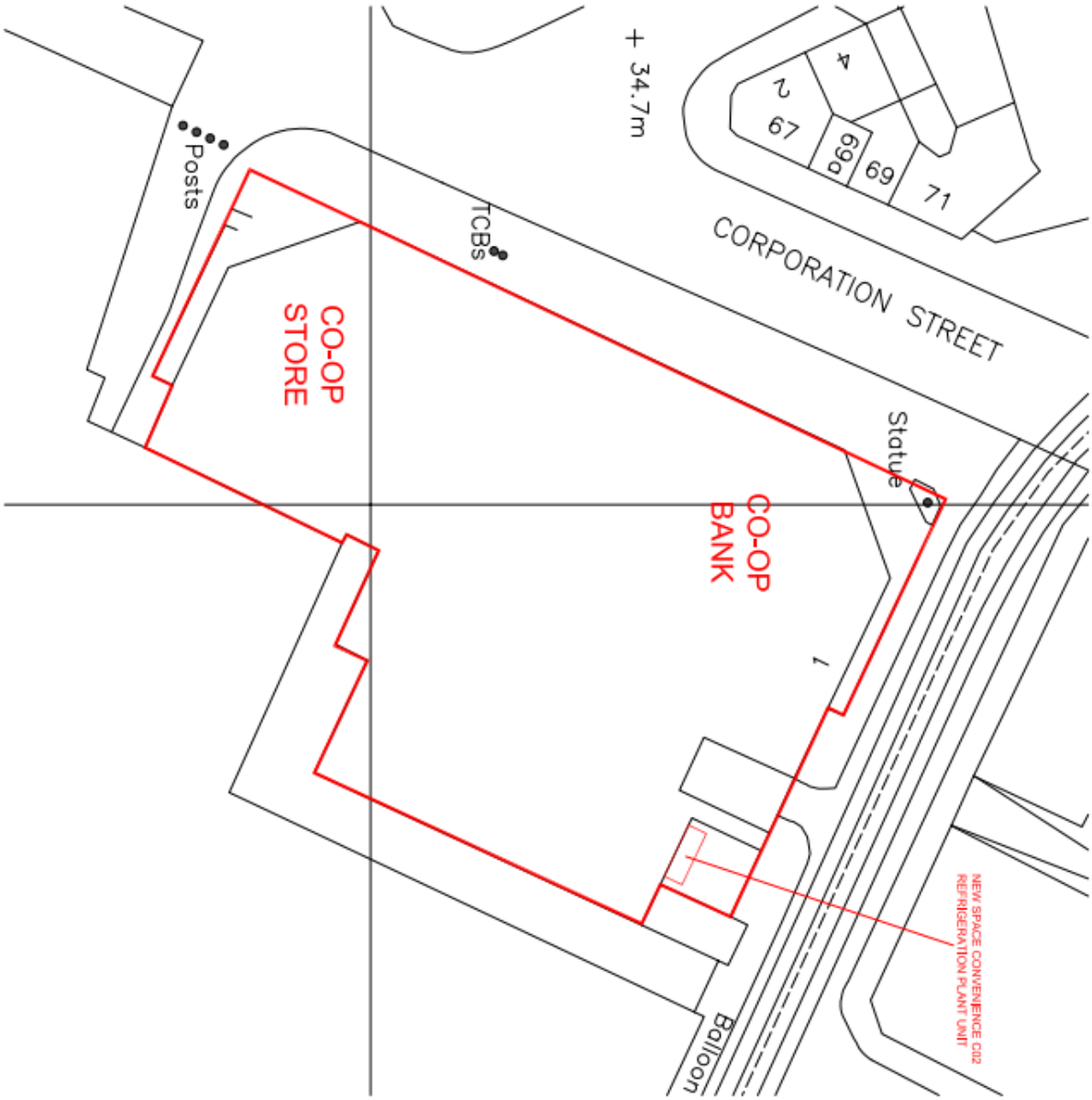


Figure 3 - View to nearest receiver – Dantzic Street

Site Plans


FRONT ELEVATION
PART GROUND FLOOR PLAN
SIDE ELEVATION
SCALE 1:50
NEW SPACE CONV
REFRIGERATION P

FRONT ELEVATION
PART GROUND FLOOR PLAN
LINE OF FENCE
SIDE ELEVATION
SCALE 1:100
EXISTING GAS COOLER
Co-op Store
1 Balloon Street,
Manchester
M60 4EP
EXISTING DETAILS
Oct '13
DMR


+ 34.7m
Posts
TCBs
CO-OP STORE
CO-OP BANK
CORPORATION STREET
Statue
Balloon
NEW SPACE CONVENIENCE CI02 REFRIGERATION PLANT UNIT
67
69a
69
71