JOB NO:	REDACTED FOR CONFIDENTIALITY
PROJECT:	REDACTED FOR CONFIDENTIALITY
CLIENT:	REDACTED FOR CONFIDENTIALITY

LEAD STRUCTURAL LTD 24
POTTERHILL ROAD GLASGOW
G53 5RR
EMAIL:
INFO@LEADSTRUCTURAL.COM
TELEPHONE:
0141 628 9009

TITLE: STRUCTURAL ROOF LOADING APPRAISAL

REVISION	PURPOSE OF ISSUE	DATE	ORIGINATOR	CHECKER	APPROVAL
0	ISSUED FOR REVIEW	01.04.25	NH	SGR	HGR

REVISION RECORD

WHERE applicable Current revisions are identified on the relevant page(s) by a vertical line in the right-hand margin adjacent to where the revision was made. All previous revision identification is removed.

REV.	DATE	REVISION DETAILS
0	01.04.25	Issued to client

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APPENDICES

SITE SURVEY INFORMATION:

[redacted] REDACTED FOR CONFIDENTIALITY [redacted] ICTURAL ASSESSMENT OF THE AFOREMENTIONED RECREATIONAL PROPERTY IN ORDER TO ASCERTAIN ITS SUITABILITY FOR A SOLAR PV INSTALLATION. THIS EVALUATION ENCOMPASSED AN ON-SITE INSPECTION, COUPLED WITH THE SYSTEMATIC COMPILATION OF REQUISITE DATA. SUBSEQUENTLY, CALCULATIONS WERE EXECUTED PERTAINING TO THE EXTENT OF ROOF LOADINGS AS WELL AS THOSE ANTICIPATED FOR THE PROPOSED SOLAR PV INSTALLATION.

THE ON-SITE INSPECTION WAS CONDUCTED UNDER GOOD WEATHER CONDITIONS, ENCOMPASSING A NON-INTRUSIVE VISUAL SURVEY OF ALL FACETS OF THE PROPERTY. PARTICULAR EMPHASIS WAS DIRECTED TOWARD THE ROOF AND ITS UNDERLYING FRAMEWORK. A VISUAL ASSESSMENT ENCOMPASSED OF THE PROPERTY'S STRUCTURAL INTEGRITY, BOTH EXTERNALLY AND INTERNALLY. THIS EXAMINATION REVEALED THAT THE PRIMARY STRUCTURAL COMPONENTS OF THE PROPERTY REMAIN IN A GOOD STATE FOR ITS AGE, AND DID NOT SHOW SIGNIFICANT SIGNS OF DEGRADATION OR DEFLECTION.

The majority of the roof was deemed to be in a good condition for the use of the buildings as recreational use.

IN LIGHT OF OUR ON-SITE EXAMINATION AND SUBSEQUENT DESIGN SCRUTINY, AS DELINEATED IN SECTIONS BELOW OF THIS REPORT, WE CONCLUDE THAT THE PROPERTY'S ROOF AND ITS ASSOCIATED STRUCTURAL FRAMEWORK ARE CAPABLE OF ACCOMMODATING THE ANTICIPATED LOADINGS STEMMING FROM THE SOLAR PV INSTALLATION.

FIXINGS TO BE DESIGNED BY OTHERS AND IS OUT WITH THE SCOPE OF THIS REPORT.

FIG 1A. SITE LOCATION PLAN AND BUILDINGS LAYOUT PLAN

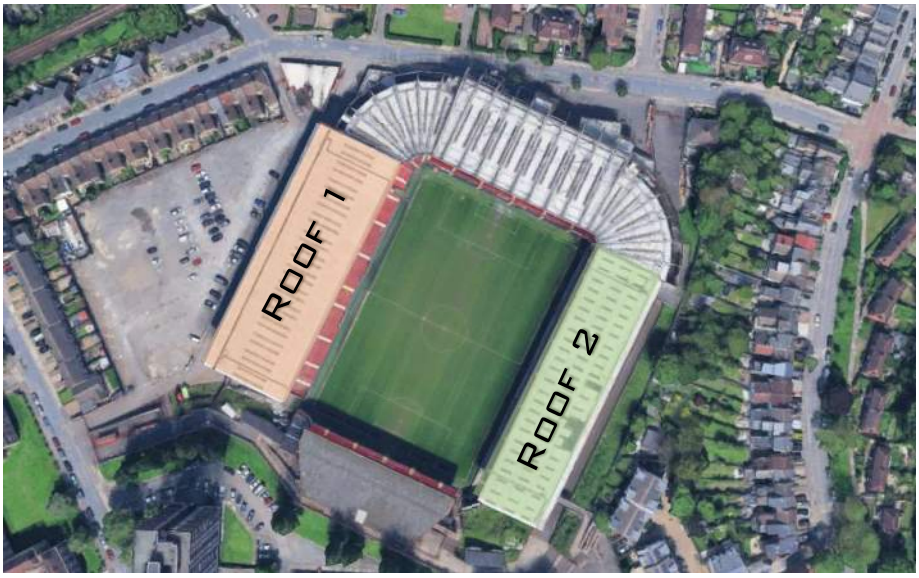


FIG 1B. ROOF LOCATION AND GEOMETRICAL PROPERTIES
ROOF GEOMETRY (PRELIM SIZES CONTRACTOR TO CONFIRM ON SITE)

SITE DATA:

- **ROOF 1** MONO PITCH, HIGH EAVES 27M, LOW EAVES 24.574M, PURLIN SPACING 1.44M C/C, BAY SPACING 7.01M C/C, SPAN 34M, LENGTH 99M.
- **ROOF 2** MONO PITCH, HIGH EAVES 14.829M, LOW EAVES 12.467M, PURLIN SPACING 1.35M C/C, BAY SPACING 6.804M C/C, SPAN 27M, LENGTH 107M.

APPLIED LOADING:

IN CONSIDERING THE APPLIED LOADING WE HAVE DESIGNED AS NOTED BELOW:
DEAD LOADS ARE BASED ON THE ACTUAL SPECIFIED MAKE UP FOR THE EXISTING ROOF.
IMPOSED FLOOR LOADS ARE BASED ON THE LOADINGS WITHIN BS 6399 & EUROCODE- 1 (BS EN 1991-1).

WIND LOADINGS ARE CALCULATED ON A SITE-SPECIFIC BASIS SEE SITE DATA USED IN WIND LOADING SECTION. APPLIED LOADS ARE AS FOLLOWS:

IT IS ASSUMED THE SERVICE LOADINGS HAS BEEN DESIGNED FOR PREVIOUSLY AT THE INSTALLATION STAGE OF THE VARIOUS SERVICES AND UTILITIES WITHIN THE BUILDING'S AREAS AND THAT THE MINIMUM IMPOSED LOAD CAPACITY OF **0.6KN/M²** HAS BEEN MAINTAINED.

EXISTING ROOF MAKE UP:

DEAD LOAD

EXISTING TRAPEZOIDAL SHEETS = 0.32KN/M2
EXISTING PURLINS = 0.25KN/M2 (METAL)
SERVICES = 0.15KN/M2

TOTAL DL = 0.72KN/M

IMPOSED LOADS

BS 6399:PT3:4.2 & EUROCODE- 1 (BS EN 1991-1)

ROOF LOAD = 0.60KN/M2

IT IS ASSUMED THE SERVICE LOADINGS HAS BEEN DESIGNED FOR PREVIOUSLY AT THE INSTALLATION STAGE OF THE VARIOUS SERVICES AND UTILITIES WITHIN THE BUILDING'S AREAS AND THAT THE MINIMUM IMPOSED LOAD CAPACITY OF 0.60KN/M2 HAS BEEN MAINTAINED.

EXISTING ROOF WIND LOADINGS:

CALCULATED USING TEDDS DESIGN SOFTWARE FOR BOTH POSITIVE AND NEGATIVE INTERNAL PRESSURE AND FOR WIND ACTING BOTH PERPENDICULAR AND PARALLEL TO THE FRONT ELEVATION OF THE BUILDINGS.

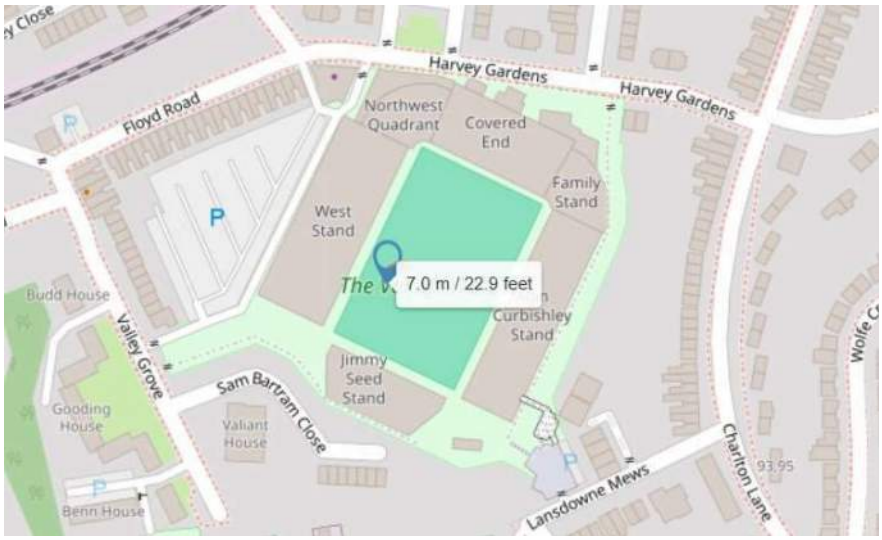


FIG 2. SITE ELEVATION

FIG 3. DISTANCE TO SEA

SITE DETAILS:

ELEVATION = 7.0M
DISTANCE TO SEA = 51.57KM "ANY WATER BODY AT LEAST 1.00 KM IN THE DIRECTION OF WIND TO BE TREATED AS THE SEA"
ENVIRONMENT = COUNTRY

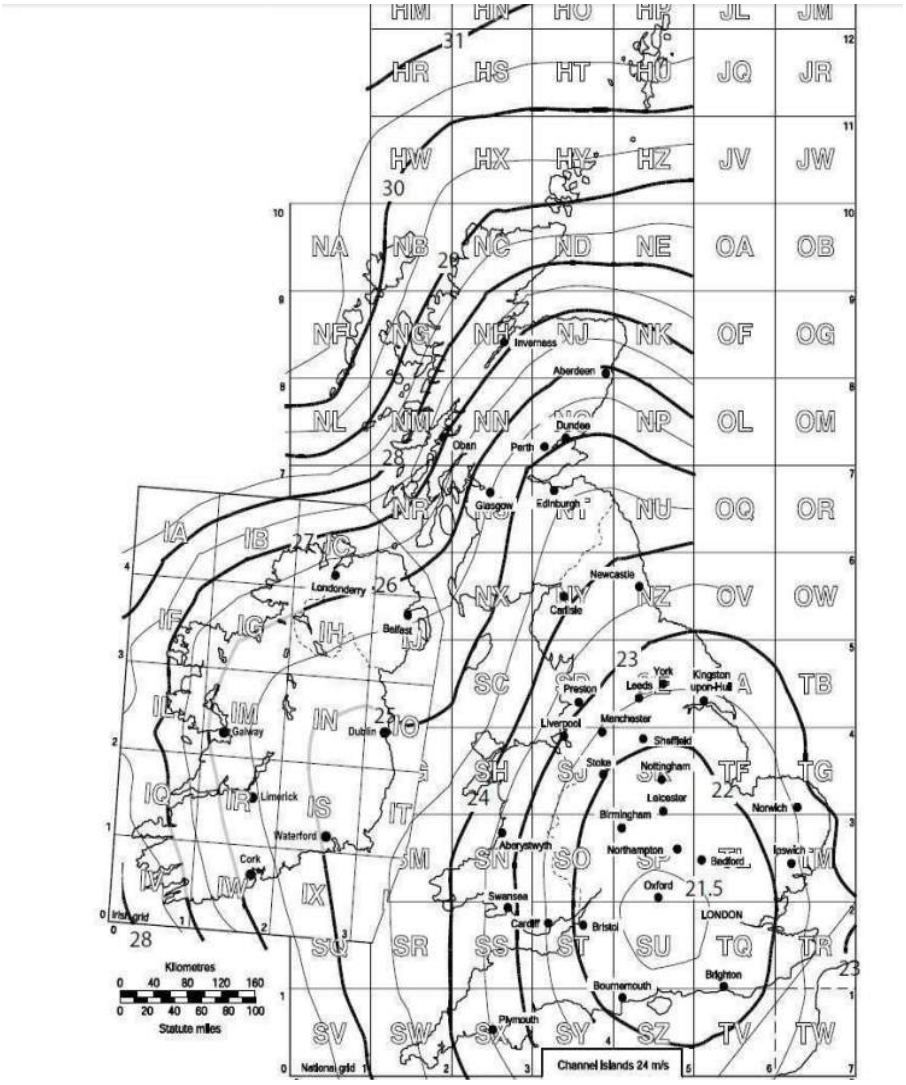


FIG 4. SITE LOCATION BASIC WIND VELOCITY TAKEN AS 21.7 M/S (WIND MAP FROM BS EN1991-1-4)

SNOW LOADING ZONE 3

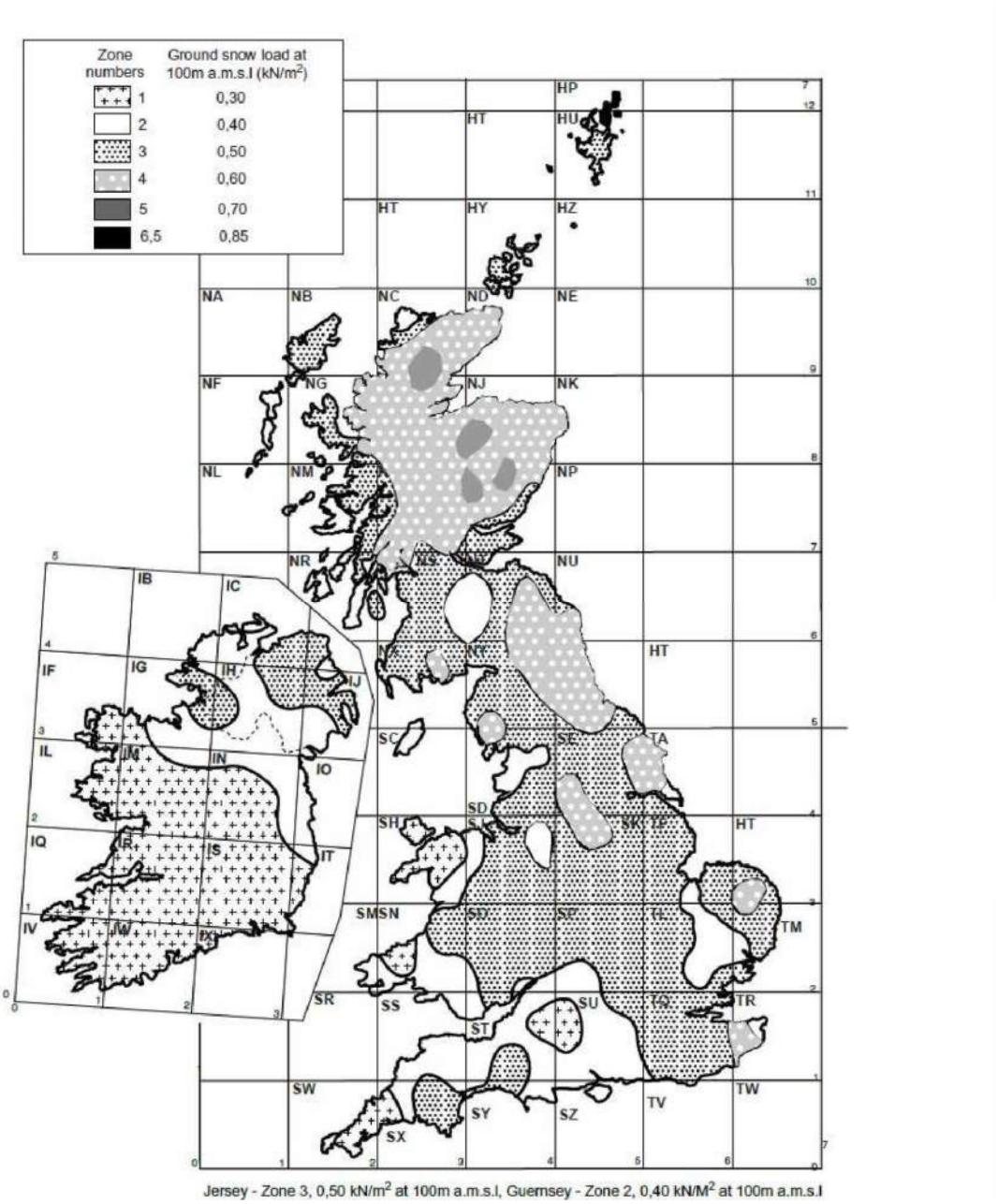


FIG 6. ZONE 3 EXISTING SITE (3,6: TQ) RIGHT TOP CORNER, GROUND SNOW LOAD AT 0,50M (KN/M^2)

WIND LOADING:

PLEASE REFER TO APPENDIX A FOR WIND LOADING TEDDS OUTPUT.

SUMMARY TABLE

ROOF NO.	TYPE	DIMENSIONS (M)	WIND LOAD(KN/M^2)
1	MONO PITCH	34M(W) X 99M(L)	0.55KN/M^2
2	MONO PITCH	27M(W) X 107M(L)	0.46KN/M^2

MAX WORST WIND LOAD: **0.55KN/M2**

SNOW LOADING:

PLEASE REFER TO APPENDIX B FOR SNOW LOADING TEDDS OUTPUT.

SUMMARY TABLE

ROOF NO.	TYPE	DIMENSIONS	SNOW LOAD(KN/M^2)
1	MONO PITCH	34M(W) X 99M(L)	0.26KN/M^2
2	MONO PITCH	27M(W) X 107M(L)	0.32KN/M^2

MAX WORST SNOW LOAD: **0.32KN/M2**

JUSTIFICATION OF PANELS FOR GRAVITY LOADINGS:

FROM THE CALCULATED LOADS WE SEE THAT EACH PANEL WEIGHS 21KG AND IS 1754MM BY 1096MM.

THEREFORE, THE WEIGHT PER M2 = 10.9KG/M^2. OR 0.11KN/M^2

THE SUPPORT FRAME WEIGHS 2KG/M^2 OR 0.01KN/M^2

THE ALLOWABLE VERTICAL IMPOSED LOAD IS 0.60KN/M^2 OR 60KG/M^2 WHICH IS FAR MORE THAN THE WEIGHT OF THE PANELS BEING PLACED ON THE ROOF. 0.11KN/M^2 VS 0.6KN/M^2.

ONCE THE SOLAR PANEL IS IN PLACE, THIS SPECIFIC SECTION OF THE ROOF WILL NOT BE SUBJECTED TO FOOT TRAFFIC. CONSEQUENTLY, THERE IS NO NECESSITY TO FACTOR IN THE ACTUAL WEIGHT OF THE PANEL AS AN ADDITIONAL IMPOSED LOAD ON THE ROOF STRUCTURE. IT SHOULD BE NOTED THAT STEPPING ON THE PANEL WOULD RESULT IN ITS DESTRUCTION, AND THE PROPERTY OWNER IS COMMITTED TO ENFORCING STRINGENT MEASURES TO ENSURE THAT NO ONE ATTEMPTS TO WALK ON THE PANEL AT ANY TIME. AS SUCH, THIS PORTION OF THE ROOF CAN BE DEEMED TO BEAR A LOAD LESS THAN THE DESIGN-IMPOSED LOAD SPECIFIED IN BS EN 1991-1. CONSEQUENTLY, THERE EXISTS NO IMPERATIVE FOR STRUCTURAL REINFORCEMENT DUE TO THE COMBINED EFFECTS OF THE IMPOSED LOAD AND THE PRESENCE OF THE SOLAR PANEL.

THE COMBINED LOADINGS ON THE ROOF DURING THE INSTALLATION OF THE SOLAR PANELS ARE WITHIN THE ALLOWABLE LOADING LIMITS AND WE CONSIDER THESE COMBINED LOADS TO BE ACCEPTABLE.

WITH REGARDS TO SNOW LOADING WE SEE THAT THE MAXIMUM SNOW LOAD IS 0.32KN/M^2. THIS LOAD WILL BE CUMULATIVE TO THE WEIGHT OF THE PANEL, WITH THE PANEL AND FRAME WEIGHING 12.9KG/M^2 OR 0.11KN/M2.

Taking into account FOS from Eurocodes and In accordance with EC1990:2002 Load Combinations.

Table A1.2(C) – Design values of actions (STR/GEO)(Set C)

The following assumptions are made:

- There is low variability in G_k and therefore that $G_{k,sup}$ and $G_{k,inf}$ need not be used.
- Variable actions include imposed loads, snow loads, wind loads, and temperature (non-fire) loads.

PERMANENT ACTIONS (UNFAVOURABLE)	PERMANENT ACTIONS (FAVOURABLE)	LEADING VARIABLE ACTION	ACCOMPANYING VARIABLE ACTIONS
$1.00G_{k,j}$	$1.00G_{k,j}$	$1.3Q_{k,1}$ (0 when favorable)	$1.3\psi_{0,i}Q_{k,i}$ (0 when favourable)

PV LOADS 1.0XGK + SNOW LOADING 1.3XQK = 1.0X0.11+1.3X0.32 = **0.526KN/M2** VS 1.5X0.6 IMPOSED AT EXISTING = **0.9KN/M2**

HOWEVER, THIS COMBINED LOADING IS 0.526KN/M^2 WHICH MUST BE EQUAL TO OR LESS THAN THE DESIGN-IMPOSED LOAD OF 0.9KN/M2. HENCE ACCEPTABLE.

the combined snow and panel load would therefore require no additional strengthening works in order to carry this increase in dead load. the existing roof structure is therefore adequate as it stands at present.

In addition to this the frame for the solar panels and fixings thereof will be designed by others to take into consideration the findings of this report and any local effects as required by site constraints including service loadings or other finishes as required.

JUSTIFICATION OF PANELS FOR UPLIFT LOADINGS:

BASED ON OUR CALCULATIONS, IT IS ADVISABLE TO POSITION THE SOLAR PANELS WITHIN THE CENTRAL REGIONS OF THE ROOF, WHERE THERE IS MINIMAL OR NO SUSCEPTIBILITY TO WIND UPLIFT FORCES. SINCE THE PANEL FIXINGS WILL TRANSMIT THE LOAD INTO THE EXISTING ROOF, AND THE ROOF WAS ORIGINALLY DESIGNED TO WITHSTAND THESE WIND LOADS, NO ADDITIONAL STRENGTHENING MEASURES WILL BE NECESSARY FOR THE ROOF STRUCTURE.

TO COMPUTE THE ACTUAL WIND UPLIFT ON THE PV ARRAY, WE REFERENCE BRE DIGEST 489. AS PER OUR PREVIOUS CALCULATIONS, WE HAVE DETERMINED THAT Q (WIND LOAD) EQUALS 0.55 KN/M². IN CASES WHERE A MODULE IS SITUATED AT A DISTANCE LESS THAN 0.3 METERS FROM THE ROOF SURFACE, THE WIND UPLIFT NET PRESSURE COEFFICIENT FOR PANELS LOCATED IN THE CENTRAL SECTION OF THE ROOF IS -1.50. MULTIPLYING THESE VALUES, WE GET:

$0.55 kN/m^2 \times -1.50 = -0.825 kN/m^2$

IT'S CRUCIAL TO NOTE THAT ALL ROOF FIXINGS MUST BE CAPABLE OF WITHSTANDING THIS WIND UPLIFT LOAD. NO FIXINGS ARE TO BE INSTALLED INTO THE SHEETING. FIXING SHOULD BE DESIGNED BY A SUITABILITY QUALIFIED ENGINEER.

Conclusions:

based on our calculations, the combined loadings on the roof during the installation of the solar panels are within the allowable loading limits and we consider these combined loads to be acceptable.

with regards to snow loading we see that the maximum snow load is 0.32kn/m^2. this load will be cumulative to the weight of the panel, with the panel and frame weighing 12.9kg/m^2 or 0.11kn/m2.

Taking into account FOS from Eurocodes and In accordance with EC1990:2002 Load Combinations.

Table A1.2(C) – Design values of actions (STR/GEO)(Set C)

The following assumptions are made:

- There is low variability in G_k and therefore that $G_{k,sup}$ and $G_{k,inf}$ need not be used.
- Variable actions include imposed loads, snow loads, wind loads, and temperature (non-fire) loads.

PERMANENT ACTIONS (UNFAVOURABLE)	PERMANENT ACTIONS (FAVOURABLE)	LEADING VARIABLE ACTION	ACCOMPANYING VARIABLE ACTIONS
$1.00G_{kj}$	$1.00G_{kj}$	$1.3Q_{k,1}$ (0 when favorable)	$1.3\psi_{0,i}Q_{k,1}$ (0 when favourable)

Pv loads 1.0xGk + snow loading 1.3xQk = 1.0x0.11+1.3x0.32 = **0.526kn/m2** vs 1.5x0.6 imposed at existing = **0.9kn/m2**

however, this combined loading is 0.526kn/m^2 which must be equal to or less than the design-imposed load of 0.9kN/m2. Hence acceptable.

the combined snow and panel load would therefore require no additional strengthening works in order to carry this increase in dead load. the existing roof structure is therefore adequate as it stands at present.
provided compliance with noted points.

solar panels should be placed in such a way as to avoid solar panels in areas where snow drift buildup is possible leaving space between the differing heights of the roofs.

this report is to be read in conjunction with the roof condition report for further information.

Calculations

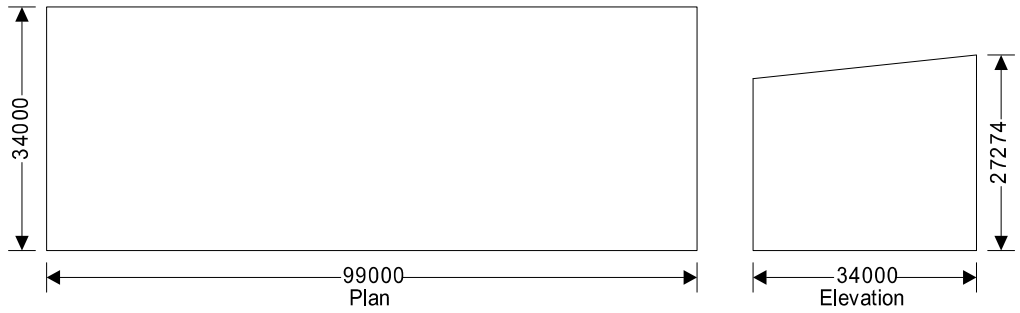
appendix a – wind loading

	Project			Job Ref.	
SOLAR SURVEYS	REDACTED FOR CONFIDENTIALITY uk			LS24-1083	
	Section			Sheet no./rev.	
	WIND LOADING (Roof 1)			1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	NH	4/1/2025	SGR	4/1/2025	HGR	4/1/2025

WIND LOADING (EN1991-1-4)

In accordance with EN1991-1-3:2005+A1:2010 and the recommended values

TEDDS calculation version 3.0.19



Building data

Type of roof	Monopitch
Length of building	L = **99000** mm
Width of building	W = **34000** mm
Height to low eaves	H = **24000** mm
Pitch of roof	α_0 = **5.5** deg
Total height	h = **27274** mm

Basic values

Fundamental basic wind velocity	$v_{b,0}$ = **21.7** m/s
Season factor	c_{season} = **1.00**
Direction factor	c_{dir} = **1.00**
Shape parameter K	K = **0.2**
Exponent n	n = **0.5**
Air density	ρ = **1.250** kg/m^3
Probability factor	$c_{prob} = [(1 - K \times \ln(-\ln(1-p)))/(1 - K \times \ln(-\ln(0.98)))]^n$ = **1.00**
Basic wind velocity (Exp. 4.1)	$v_b = c_{dir} \times c_{season} \times v_{b,0} \times c_{prob}$ = **21.7** m/s
Reference mean velocity pressure	$q_b = 0.5 \times \rho \times v_b^2$ = **0.294** kN/m^2

Orography

Orography factor not significant	c_o = 1.0
Terrain category	IV
Displacement height (sheltering effect excluded)	h_{dis} = 0mm

The velocity pressure for the windward face of the building with a 0 degree wind is to be considered as 1 part as the height h is less than b (cl.7.2.2)

The velocity pressure for the windward face of the building with a 90 degree wind is to be considered as 1 part as the height h is less than b (cl.7.2.2)

Peak velocity pressure - windward wall - Wind 0 deg and roof

Reference height (at which q is sought)	z = **24000**mm
Displacement height (sheltering effects excluded)	h_{dis} = **0** mm
Roughness length (Table 4.1)	z_0 = **1000** mm
Roughness length (Category II)	$z_{0,II}$ = **50** mm
Minimum height (Table 4.1)	z_{min} = **10000** mm

SOLAR SURVEYS	Project: REDACTED FOR CONFIDENTIALITY uk				Job Ref.: LS24-1083	
	Section: WIND LOADING (Roof 1)				Sheet no./rev.: 2	
	Calc. by: NH	Date: 4/1/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025

Maximum height	z_{max} = **200000** mm
Terrain factor	$k_r = 0.19 \times (z_0 / z_{0,II})^{0.07}$ = **0.234**
Roughness factor	$c_r = k_r \times \ln(z / z_0)$ = **0.74**
Mean wind	$v_m = c_r \times c_o \times v_b$ = **16.2** m/s
Turbulence factor	k_I = **1.0**
Turbulence intensity	$I_v = k_I / (c_o \times \ln(z / z_0))$ = **0.315**
Peak velocity pressure	$q_p = (1 + 7 \times I_v) \times 0.5 \times \rho \times v_m^2$ = **0.52** kN/m^2

Structural factor

Structural factor	c_{sCd} = **1.000**

Peak velocity pressure - windward wall - Wind 90 deg and roof

Reference height (at which q is sought)	z = **27274**mm
Displacement height (sheltering effects excluded)	h_{dis} = **0** mm
Terrain factor	$k_r = 0.19 \times (z_0 / z_{0,II})^{0.07}$ = **0.234**
Roughness factor	$c_r = k_r \times \ln(z / z_0)$ = **0.77**
Mean wind	$v_m = c_r \times c_o \times v_b$ = **16.8** m/s
Turbulence factor	k_I = **1.0**
Turbulence intensity	$I_v = k_I / (c_o \times \ln(z / z_0))$ = **0.302**
Peak velocity pressure	$q_p = (1 + 7 \times I_v) \times 0.5 \times \rho \times v_m^2$ = **0.55** kN/m^2

Peak velocity pressure for internal pressure

Peak velocity pressure – internal (as roof press.)	$q_{p,i}$ = **0.55** kN/m^2

Pressures and forces

Net pressure	$p = c_{sCd} \times q_p \times c_{pe} - q_{p,i} \times c_{pi}$
Net force	$F_w = p_w \times A_{ref}$

Roof load case 1 - Wind 0, c_{pi} 0.20, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
F (-ve)	-1.66	0.55	-1.02	149.46	-153.06
G (-ve)	-1.18	0.55	-0.76	393.06	-298.65
H (-ve)	-0.58	0.55	-0.43	2839.05	-1227.08

Total vertical net force	$F_{w,v}$ = **-1671.07** kN
Total horizontal net force	$F_{w,h}$ = **-160.90** kN

Walls load case 1 - Wind 0, c_{pi} 0.20, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A	-1.20	0.55	-0.77	267.56	-206.24
B	-0.80	0.55	-0.55	604.10	-332.61
D	0.77	0.52	0.29	2376.00	699.20
E	-0.45	0.52	-0.34	2700.11	-928.59

Overall loading

Equiv leeward net force for overall section	$F_l = F_{w,wE}$ = **-928.6** kN

Net windward force for overall section $F_w = F_{w,wD} =$ **699.2** kN

Lack of correlation (cl.7.2.2(3) – Note) $f_{corr} =$ **0.85** as h/W is 0.802

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h} =$ **1222.7** kN

Roof load case 2 - Wind 0, c_{pi} -0.3, +c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
F (+ve)	0.01	0.55	0.17	149.46	25.51
G (+ve)	0.01	0.55	0.17	393.06	67.09
H (+ve)	0.01	0.55	0.17	2839.05	484.58

Total vertical net force $F_{w,v} =$ **574.52** kN

Total horizontal net force $F_{w,h} =$ **55.32** kN

Walls load case 2 - Wind 0, c_{pi} -0.3, +c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A	-1.20	0.55	-0.50	267.56	-132.58
B	-0.80	0.55	-0.28	604.10	-166.31
D	0.77	0.52	0.57	2376.00	1353.31
E	-0.45	0.52	-0.07	2700.11	-185.26

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE} =$ **-185.3** kN

Net windward force for overall section $F_w = F_{w,wD} =$ **1353.3** kN

Lack of correlation (cl.7.2.2(3) – Note) $f_{corr} =$ **0.85** as h/W is 0.802

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h} =$ **1363.1** kN

Roof load case 3 - Wind 90, c_{pi} 0.20, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
FU (-ve)	-2.12	0.55	-1.27	29.03	-37.01
FL (-ve)	-2.08	0.55	-1.25	29.03	-36.37
G (-ve)	-1.80	0.55	-1.10	58.07	-64.10
H (-ve)	-0.61	0.55	-0.45	464.54	-207.18
I (-ve)	-0.51	0.55	-0.39	2800.89	-1094.93

Total vertical net force $F_{w,v} =$ **-1432.96** kN

Total horizontal net force $F_{w,h} =$ **0.00** kN

Walls load case 3 - Wind 90, c_{pi} 0.20, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A_U	-1.20	0.55	-0.77	185.46	-142.96
B_U	-0.80	0.55	-0.55	741.85	-408.46
C_U	-0.50	0.55	-0.39	1772.80	-683.26
A_L	-1.20	0.52	-0.74	163.20	-120.34
B_L	-0.80	0.52	-0.53	652.80	-344.88
C_L	-0.50	0.52	-0.37	1560.00	-579.51
D	0.70	0.55	0.28	871.66	241.60
E	-0.31	0.55	-0.28	871.66	-243.23

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE}$ = **-243.2** kN

Net windward force for overall section $F_w = F_{w,wD}$ = **241.6** kN

Lack of correlation (cl.7.2.2(3) – Note) f_{corr} = **0.85** as h/L is 0.275

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h}$ = **412.1** kN

Roof load case 4 - Wind 90, c_{pi} -0.3, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
FU (-ve)	-2.12	0.55	-1.00	29.03	-29.01
FL (-ve)	-2.08	0.55	-0.98	29.03	-28.37
G (-ve)	-1.80	0.55	-0.83	58.07	-48.12
H (-ve)	-0.61	0.55	-0.17	464.54	-79.29
I (-ve)	-0.51	0.55	-0.12	2800.89	-323.85

Total vertical net force $F_{w,v}$ = **-506.31** kN

Total horizontal net force $F_{w,h}$ = **0.00** kN

Walls load case 4 - Wind 90, c_{pi} -0.3, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A_U	-1.20	0.55	-0.50	185.46	-91.90
B_U	-0.80	0.55	-0.28	741.85	-204.23
C_U	-0.50	0.55	-0.11	1772.80	-195.22
A_L	-1.20	0.52	-0.46	163.20	-75.41
B_L	-0.80	0.52	-0.25	652.80	-165.16
C_L	-0.50	0.52	-0.10	1560.00	-150.05
D	0.70	0.55	0.55	871.66	481.56
E	-0.31	0.55	0.00	871.66	-3.26

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE}$ = **-3.3** kN

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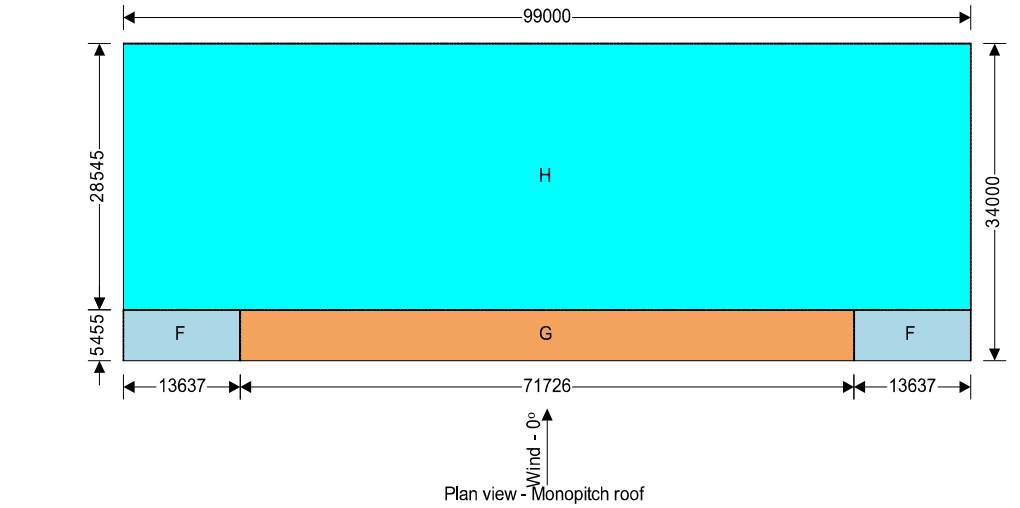
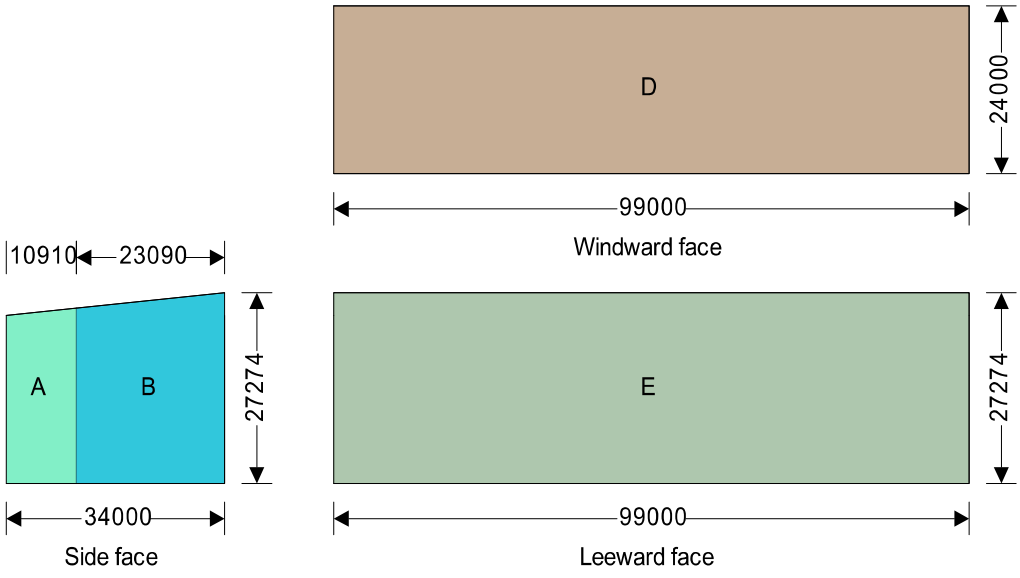
Net windward force for overall section — $F_w = F_{w,wD} =$ **481.6** kN

Lack of correlation (cl.7.2.2(3) – Note) — $f_{corr} =$ **0.85** as h/L is 0.275

Overall loading overall section — $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h} =$ **412.1** kN



Plan view - Monopitch roof



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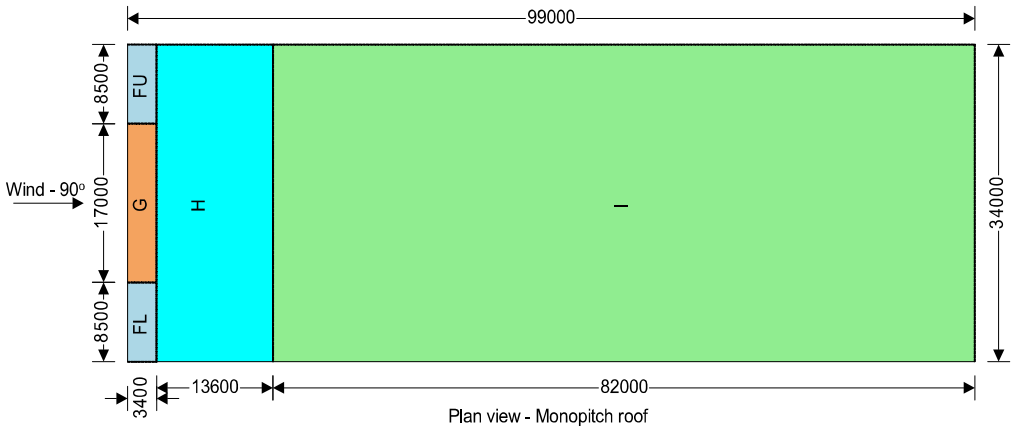
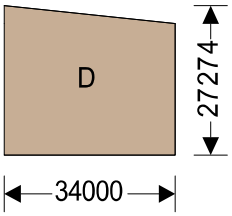
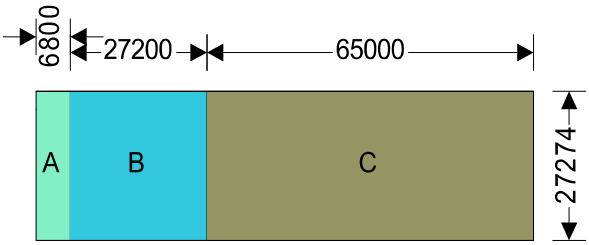
	Calc. by: NH	Date: 4/1/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025



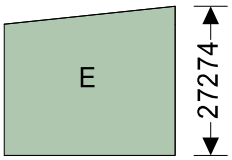
Plan view - Monopitch roof



Windward face



Side face



Leeward face

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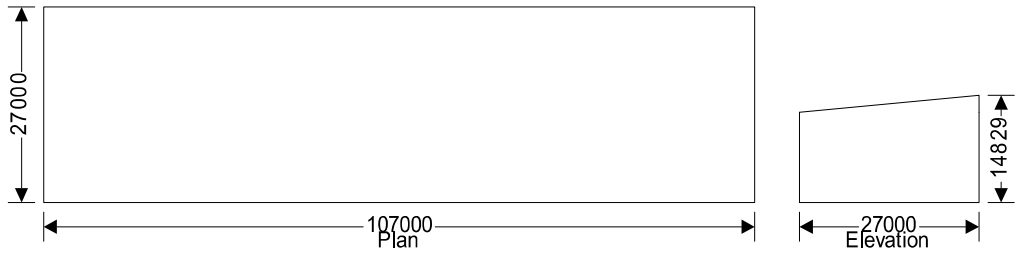
	Section: WIND LOADING (Roof 2)				Sheet no./rev.: 1	
	Calc. by: NH	Date: 4/2/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025

WIND LOADING (EN1991-1-4)

In accordance with EN1991-1-3:2005+A1:2010 and the recommended values

TEDDS calculation version 3.0.19



Building data

Type of roof	Monopitch
Length of building	L = **107000** mm
Width of building	W = **27000** mm
Height to low eaves	H = **12467** mm
Pitch of roof	α_0 = **5.0** deg
Total height	h = **14829** mm

Basic values

Fundamental basic wind velocity	$v_{b,0}$ = **21.7** m/s
Season factor	c_{season} = **1.00**
Direction factor	c_{dir} = **1.00**
Shape parameter K	K = **0.2**
Exponent n	n = **0.5**
Air density	ρ = **1.250** kg/m^3
Probability factor	$c_{prob} = [(1 - K \times \ln(-\ln(1-p)))/(1 - K \times \ln(-\ln(0.98)))]^n$ = **1.00**
Basic wind velocity (Exp. 4.1)	$v_b = c_{dir} \times c_{season} \times v_{b,0} \times c_{prob}$ = **21.7** m/s
Reference mean velocity pressure	$q_b = 0.5 \times \rho \times v_b^2$ = **0.294** kN/m^2

Orography

Orography factor not significant	c_o = 1.0
Terrain category	IV
Displacement height (sheltering effect excluded)	h_{dis} = 0mm

The velocity pressure for the windward face of the building with a 0 degree wind is to be considered as 1 part as the height h is less than b (cl.7.2.2)

The velocity pressure for the windward face of the building with a 90 degree wind is to be considered as 1 part as the height h is less than b (cl.7.2.2)

Peak velocity pressure - windward wall - Wind 0 deg and roof

Reference height (at which q is sought)	z = **12467**mm
Displacement height (sheltering effects excluded)	h_{dis} = **0** mm
Roughness length (Table 4.1)	z_0 = **1000** mm
Roughness length (Category II)	$z_{0,II}$ = **50** mm
Minimum height (Table 4.1)	z_{min} = **10000** mm
Maximum height	z_{max} = **200000** mm
Terrain factor	$k_r = 0.19 \times (z_0 / z_{0,II})^{0.07}$ = **0.234**

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Roughness factor $c_r = k_r \times \ln(z / z_0) = \mathbf{0.59}$

Mean wind $v_m = c_r \times c_o \times v_b = \mathbf{12.8}$ m/s

Turbulence factor $k_I = \mathbf{1.0}$

Turbulence intensity $I_v = k_I / (c_o \times \ln(z / z_0)) = \mathbf{0.396}$

Peak velocity pressure $q_p = (1 + 7 \times I_v) \times 0.5 \times \rho \times v_m^2 = \mathbf{0.39}$ kN/m^2

Structural factor

Structural factor $c_{sCd} = \mathbf{1.000}$

Peak velocity pressure - windward wall - Wind 90 deg and roof

Reference height (at which q is sought) $z = \mathbf{14829}$mm

Displacement height (sheltering effects excluded) $h_{dis} = \mathbf{0}$ mm

Terrain factor $k_r = 0.19 \times (z_0 / z_{0,II})^{0.07} = \mathbf{0.234}$

Roughness factor $c_r = k_r \times \ln(z / z_0) = \mathbf{0.63}$

Mean wind $v_m = c_r \times c_o \times v_b = \mathbf{13.7}$ m/s

Turbulence factor $k_I = \mathbf{1.0}$

Turbulence intensity $I_v = k_I / (c_o \times \ln(z / z_0)) = \mathbf{0.371}$

Peak velocity pressure $q_p = (1 + 7 \times I_v) \times 0.5 \times \rho \times v_m^2 = \mathbf{0.42}$ kN/m^2

Peak velocity pressure for internal pressure

Peak velocity pressure – internal (as roof press.) $q_{p,i} = \mathbf{0.42}$ kN/m^2

Pressures and forces

Net pressure $p = c_{sCd} \times q_p \times c_{pe} - q_{p,i} \times c_{pi}$

Net force $F_w = p_w \times A_{ref}$

Roof load case 1 - Wind 0, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
F (-ve)	-1.70	0.42	-0.80	44.15	-35.45
G (-ve)	-1.20	0.42	-0.59	274.41	-162.33
H (-ve)	-0.60	0.42	-0.34	2581.48	-872.66

Total vertical net force $F_{w,v} = \mathbf{-1066.37}$ kN

Total horizontal net force $F_{w,h} = \mathbf{-93.29}$ kN

Walls load case 1 - Wind 0, c_{pi} 0.20, $-c_{pe}$

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A	-1.20	0.42	-0.59	75.49	-44.66
B	-0.80	0.42	-0.42	293.01	-123.81
D	0.74	0.39	0.20	1333.97	270.51
E	-0.38	0.39	-0.23	1586.72	-368.09

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE} = \mathbf{-368.1}$ kN

Net windward force for overall section $F_w = F_{w,wD} = \mathbf{270.5}$ kN

Lack of correlation (cl.7.2.2(3) – Note) $f_{corr} = \mathbf{0.85}$ as h/W is 0.549

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h}$ = **449.5** kN

Roof load case 2 - Wind 0, c_{pi} -0.3, +c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
F (+ve)	0.00	0.42	0.13	44.15	5.60
G (+ve)	0.00	0.42	0.13	274.41	34.79
H (+ve)	0.00	0.42	0.13	2581.48	327.25

Total vertical net force $F_{w,v}$ = **366.23** kN

Total horizontal net force $F_{w,h}$ = **32.04** kN

Walls load case 2 - Wind 0, c_{pi} -0.3, +c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A	-1.20	0.42	-0.38	75.49	-28.71
B	-0.80	0.42	-0.21	293.01	-61.91
D	0.74	0.39	0.41	1333.97	552.35
E	-0.38	0.39	-0.02	1586.72	-32.85

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE}$ = **-32.9** kN

Net windward force for overall section $F_w = F_{w,wD}$ = **552.3** kN

Lack of correlation (cl.7.2.2(3) – Note) f_{corr} = **0.85** as h/W is 0.549

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h}$ = **529.5** kN

Roof load case 3 - Wind 90, c_{pi} 0.20, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
FU (-ve)	-2.10	0.42	-0.97	18.29	-17.78
FL (-ve)	-2.10	0.42	-0.97	18.29	-17.78
G (-ve)	-1.80	0.42	-0.85	36.59	-30.92
H (-ve)	-0.60	0.42	-0.34	292.71	-98.95
I (-ve)	-0.50	0.42	-0.30	2534.14	-749.58

Total vertical net force $F_{w,v}$ = **-911.53** kN

Total horizontal net force $F_{w,h}$ = **0.00** kN

Walls load case 3 - Wind 90, c_{pi} 0.20, -c_{pe}

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Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A_U	-1.20	0.42	-0.59	80.08	-47.37
B_U	-0.80	0.42	-0.42	320.31	-135.35
C_U	-0.50	0.42	-0.30	1186.34	-350.91
A_L	-1.20	0.39	-0.55	67.32	-37.06
B_L	-0.80	0.39	-0.40	269.29	-106.41
C_L	-0.50	0.39	-0.28	997.36	-277.92
D	0.70	0.42	0.21	368.50	77.86
E	-0.30	0.42	-0.21	368.50	-77.86

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE} =$ **-77.9** kN

Net windward force for overall section $F_w = F_{w,wD} =$ **77.9** kN

Lack of correlation (cl.7.2.2(3) – Note) $f_{corr} =$ **0.85** as h/L is 0.139

Overall loading overall section $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h} =$ **132.4** kN

Roof load case 4 - Wind 90, c_{pi} -0.3, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
FU (-ve)	-2.10	0.42	-0.76	18.29	-13.91
FL (-ve)	-2.10	0.42	-0.76	18.29	-13.91
G (-ve)	-1.80	0.42	-0.63	36.59	-23.19
H (-ve)	-0.60	0.42	-0.13	292.71	-37.11
I (-ve)	-0.50	0.42	-0.08	2534.14	-214.16

Total vertical net force $F_{w,v} =$ **-301.14** kN

Total horizontal net force $F_{w,h} =$ **0.00** kN

Walls load case 4 - Wind 90, c_{pi} -0.3, -c_{pe}

Zone	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p, (kN/m^2)	Net pressure p (kN/m^2)	Area A_{ref} (m^2)	Net force F_w (kN)
A_U	-1.20	0.42	-0.38	80.08	-30.45
B_U	-0.80	0.42	-0.21	320.31	-67.67
C_U	-0.50	0.42	-0.08	1186.34	-100.26
A_L	-1.20	0.39	-0.34	67.32	-22.83
B_L	-0.80	0.39	-0.18	269.29	-49.51
C_L	-0.50	0.39	-0.07	997.36	-67.20
D	0.70	0.42	0.42	368.50	155.71
E	-0.30	0.42	0.00	368.50	0.00

Overall loading

Equiv leeward net force for overall section $F_l = F_{w,wE} =$ **0.0** kN

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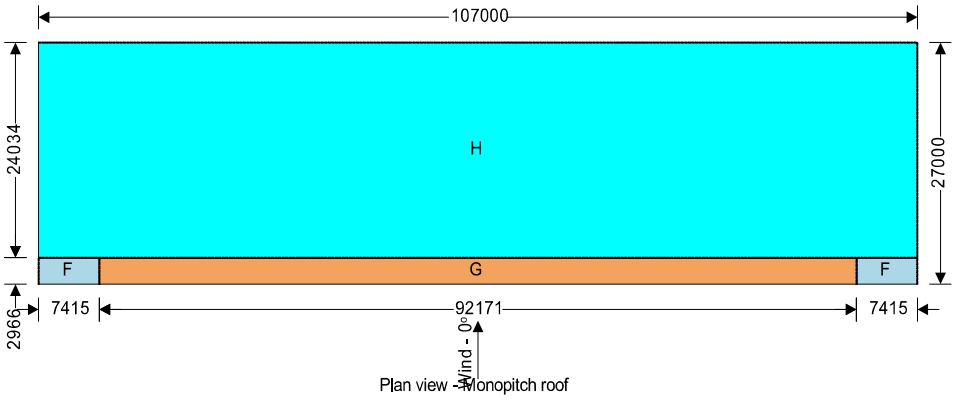
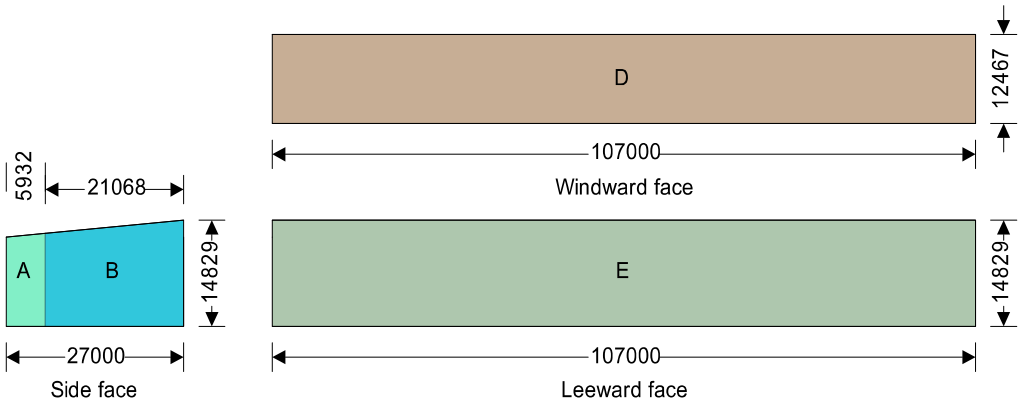
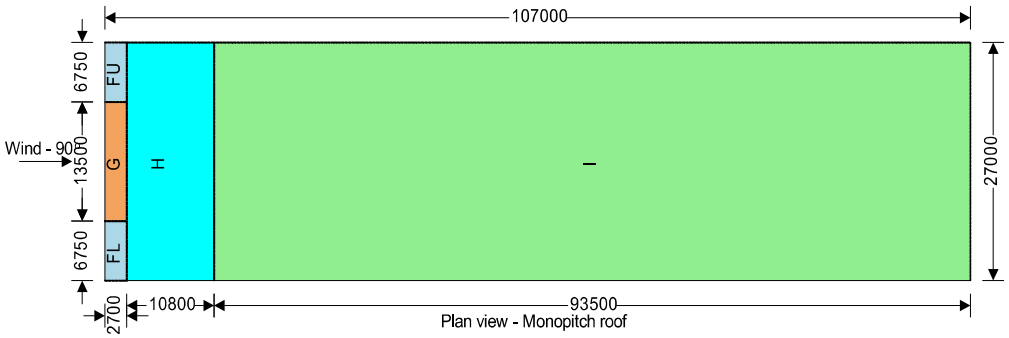
Net windward force for overall section — $F_w = F_{w,wD} =$ **155.7** kN

Lack of correlation (cl.7.2.2(3) – Note) — $f_{corr} =$ **0.85** as h/L is 0.139

Overall loading overall section — $F_{w,D} = f_{corr} \times (F_w - F_l) + F_{w,h} =$ **132.4** kN







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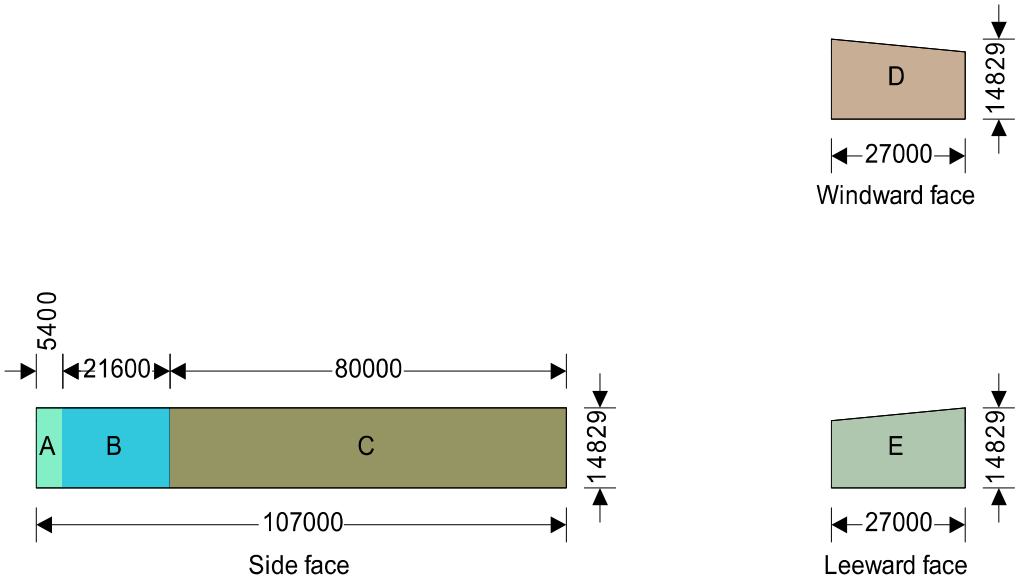
	Calc. by: NH	Date: 4/2/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025



SOLAR SURVEYS	Project: REDACTED FOR CONFIDENTIALITY uk				Job Ref.: LS24-1083	
	Section: SNOW LOADING (Roof 1)				Sheet no./rev.: 1	
	Calc. by: NH	Date: 4/1/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025

SNOW LOADING (EN1991-1-3)

In accordance with EN1991-1-3:2003+A1:2015 incorporating corrigenda dated December 2004 and March 2009 and the UK national annex NA+A1:2015 to BS EN 1991-1-3:2003+A1:2015 incorporating Corrigendum No.1

TEDDS calculation version 1.0.08

Characteristic ground snow load

Location	London
Site altitude above sea level (user modified value)	A = **7** m
Zone number	Z = **3.0**
Density of snow	γ = **2.00** kN/m^3
Characteristic ground snow load	s_k = ((0.15 + (0.1 × Z + 0.05)) + ((A - 100m) / 525m)) × 1kN/m^2 = **0.32** kN/m^2
Exposure coefficient (Normal)	C_e = **1.0**
Thermal coefficient	C_t = **1.0**

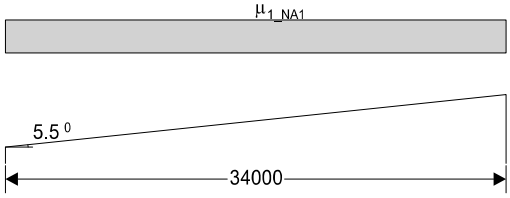
Building details

Roof type	Monopitch
Width of roof	b = **34.00** m
Slope of roof	α = **5.50** deg

Shape coefficients

Shape coefficient roof (Table UK NA.1) μ_{1_NA1} = **0.80**

Case (i)



Elevation on gable roof

Shape coef	Coef	Loading (kN/m^2)
μ_{1_NA1}	0.800	0.26

Loadcase 1 Table 5.2

Loading to roof 1 $s_{1\_1} = \mu_{1\_NA1} \times C_e \times C_t \times s_k$ = **0.26** kN/m^2

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	Section: SNOW LOADING (Roof 2)				Sheet no./rev.: 1	
	Calc. by: NH	Date: 4/1/2025	Chk'd by: SGR	Date: 4/1/2025	App'd by: HGR	Date: 4/1/2025

SNOW LOADING (EN1991-1-3)

In accordance with EN1991-1-3:2003+A1:2015 incorporating corrigenda dated December 2004 and March 2009 and the UK national annex NA+A1:2015 to BS EN 1991-1-3:2003+A1:2015 incorporating Corrigendum No.1

TEDDS calculation version 1.0.08

Characteristic ground snow load

Location	London
Site altitude above sea level (user modified value)	A = **7** m
Zone number	Z = **3.0**
Density of snow	γ = **2.00** kN/m^3
Characteristic ground snow load	s_k = ((0.15 + (0.1 × Z + 0.05)) + ((A - 100m) / 525m)) × 1kN/m^2 = **0.32** kN/m^2
Exposure coefficient (Normal)	C_e = **1.0**
Thermal coefficient	C_t = **1.0**

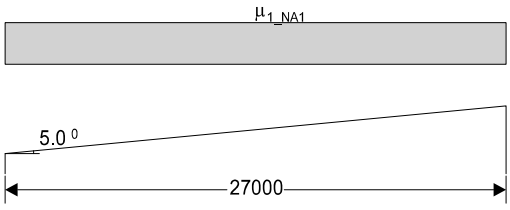
Building details

Roof type	Monopitch
Width of roof	b = **27.00** m
Slope of roof	α = **5.00** deg

Shape coefficients

Shape coefficient roof (Table UK NA.1) μ_{1_NA1} = **1.00**

Case (i)



Elevation on gable roof

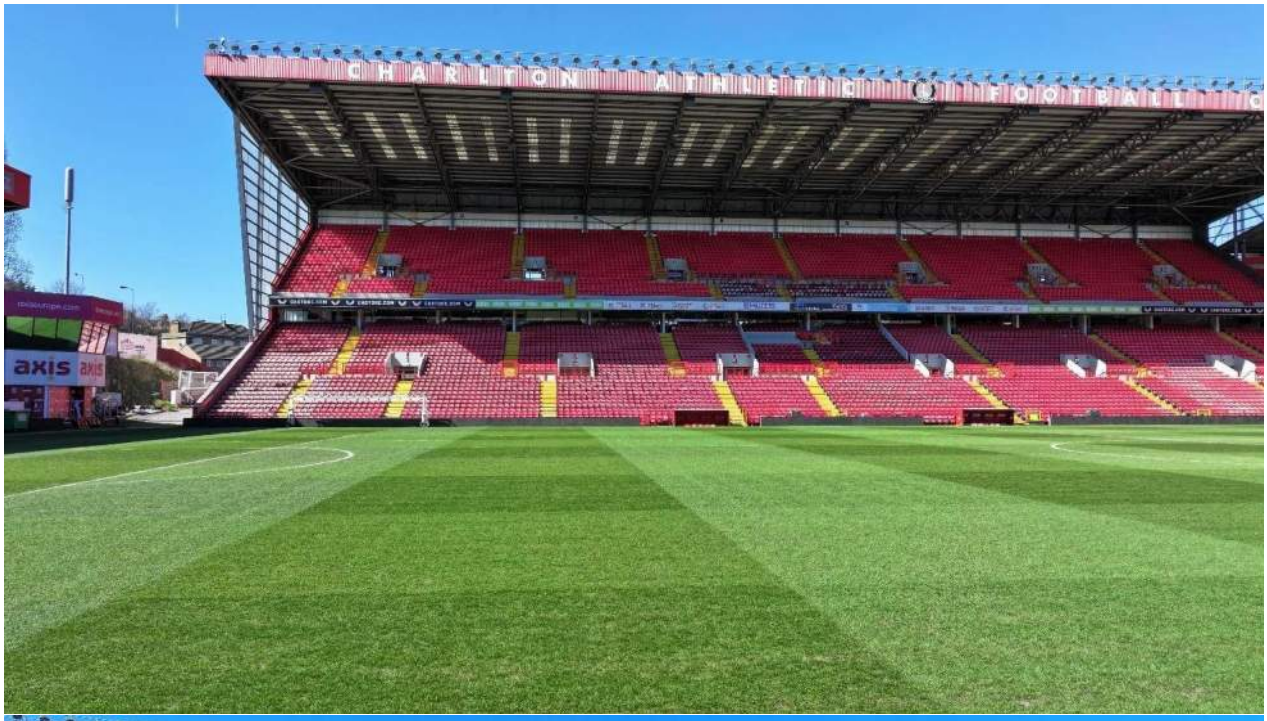
Shape coef	Coef	Loading (kN/m^2)
μ_{1_NA1}	1.000	0.32

Loading to roof 1 $s_{1\_1} = \mu_{1\_NA1} \times C_e \times C_t \times s_k$ = **0.32** kN/m^2

APPENDIX C – AERIAL DRONE FOOTAGE ROOF 1


CHARLTON ATHLETIC FOOTBALL CLUB

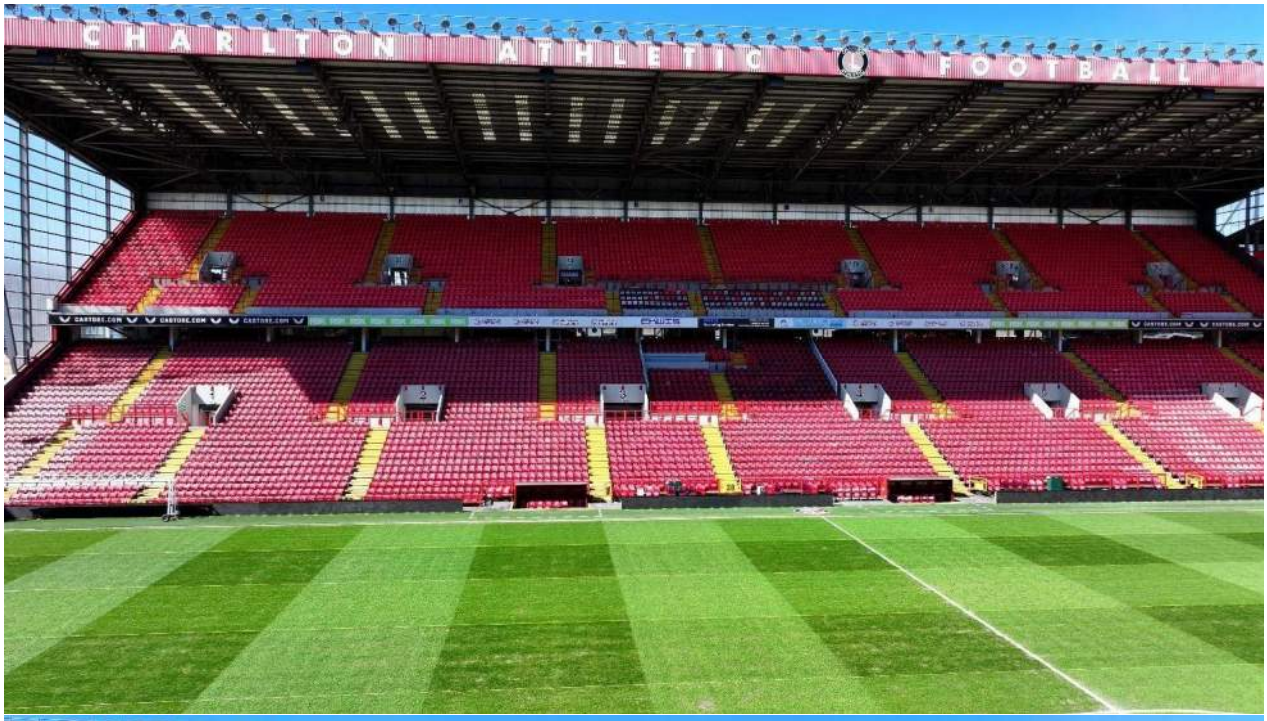

CHARLTON ATHLETIC FOOTBALL CLUB


CHARLTON ATHLETIC FOOTBALL
axis


CHARLTON ATHLETIC FOOTBALL


CHARLTON ATHLETIC
axis axis


CHARLTON ATHLETIC

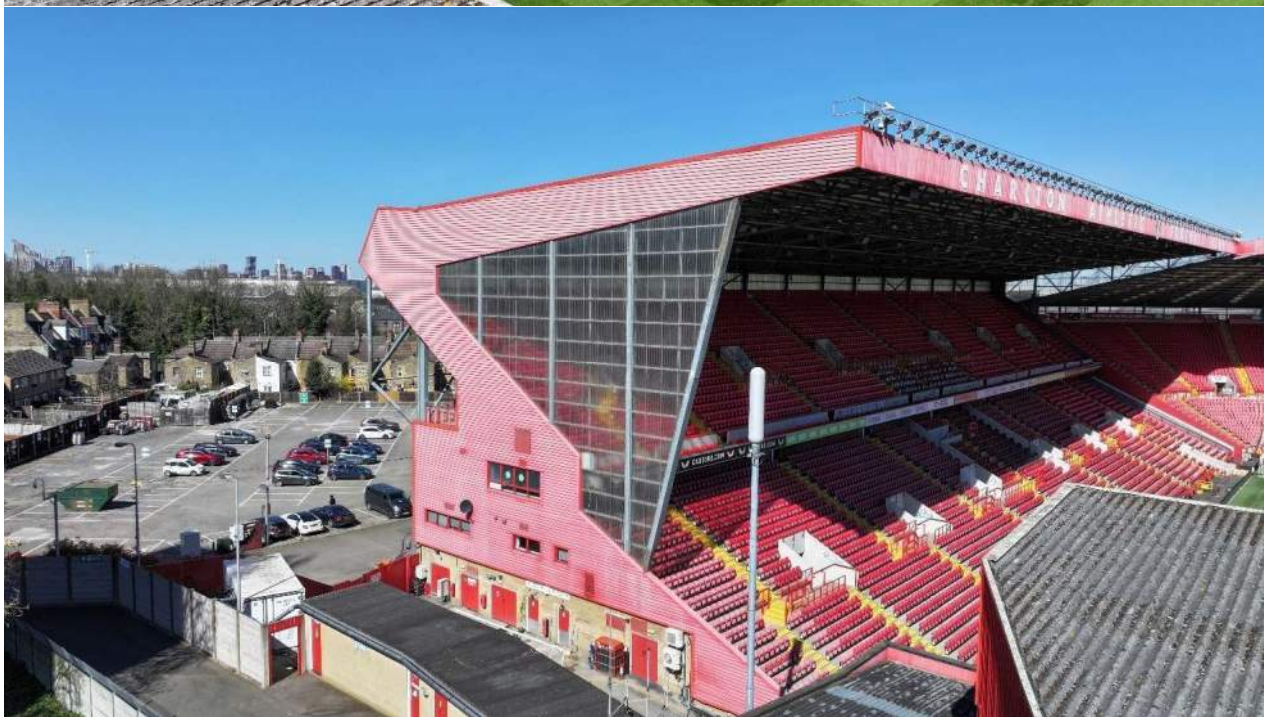

CHARLTON ATHLETIC FOOTBALL


ATHLETIC FOOTBALL CLUB


FOOTBALL CLUB
MEANTIME


ATHLETIC
FOOTBALL CLUB


CHARLTON ATHLETIC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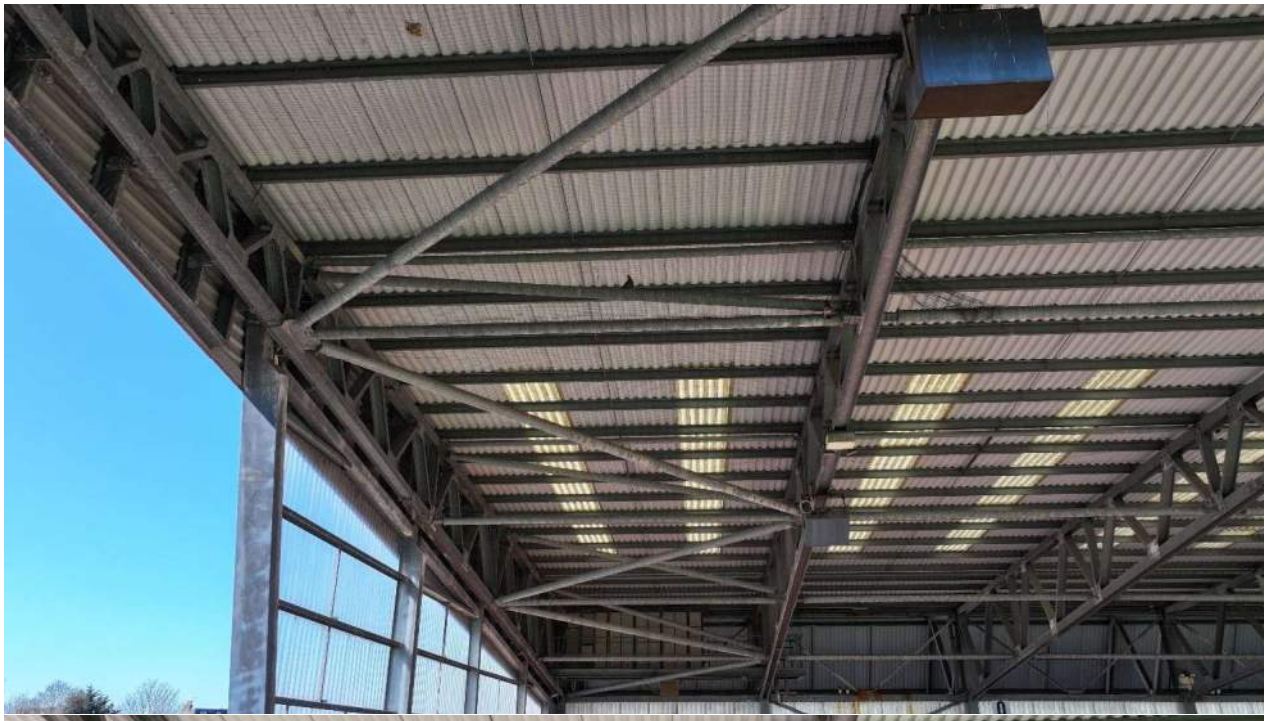

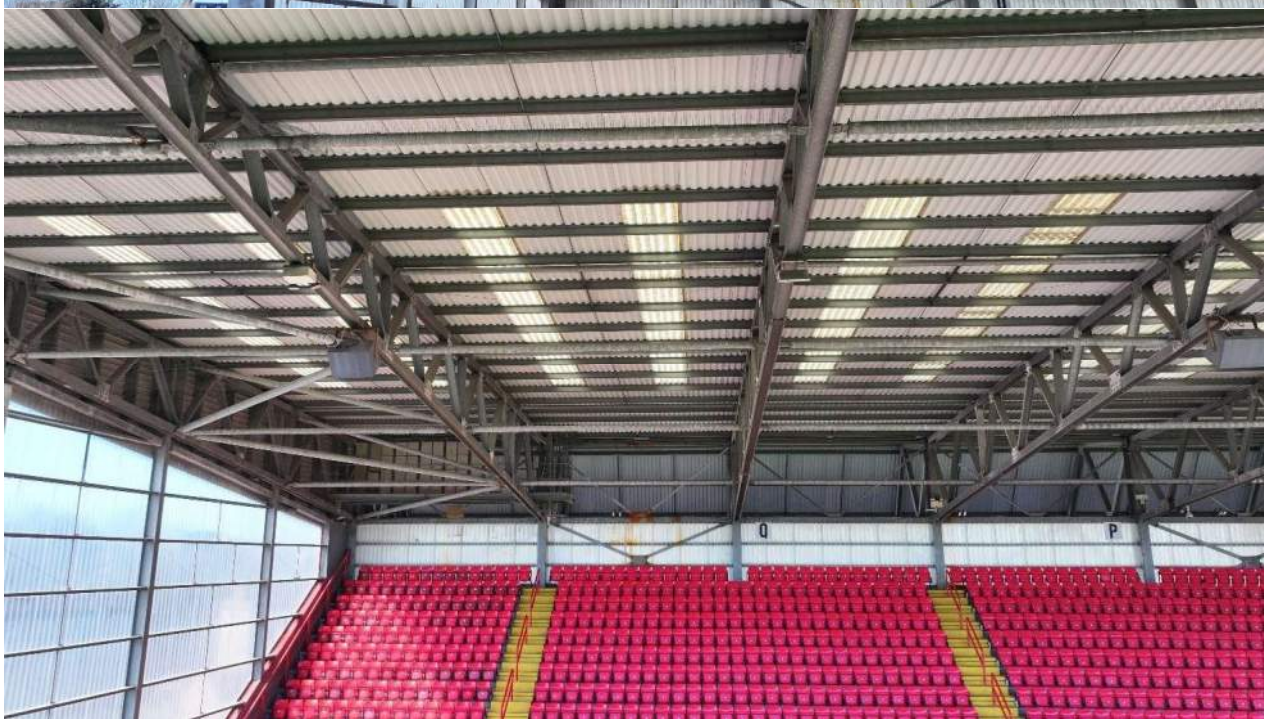
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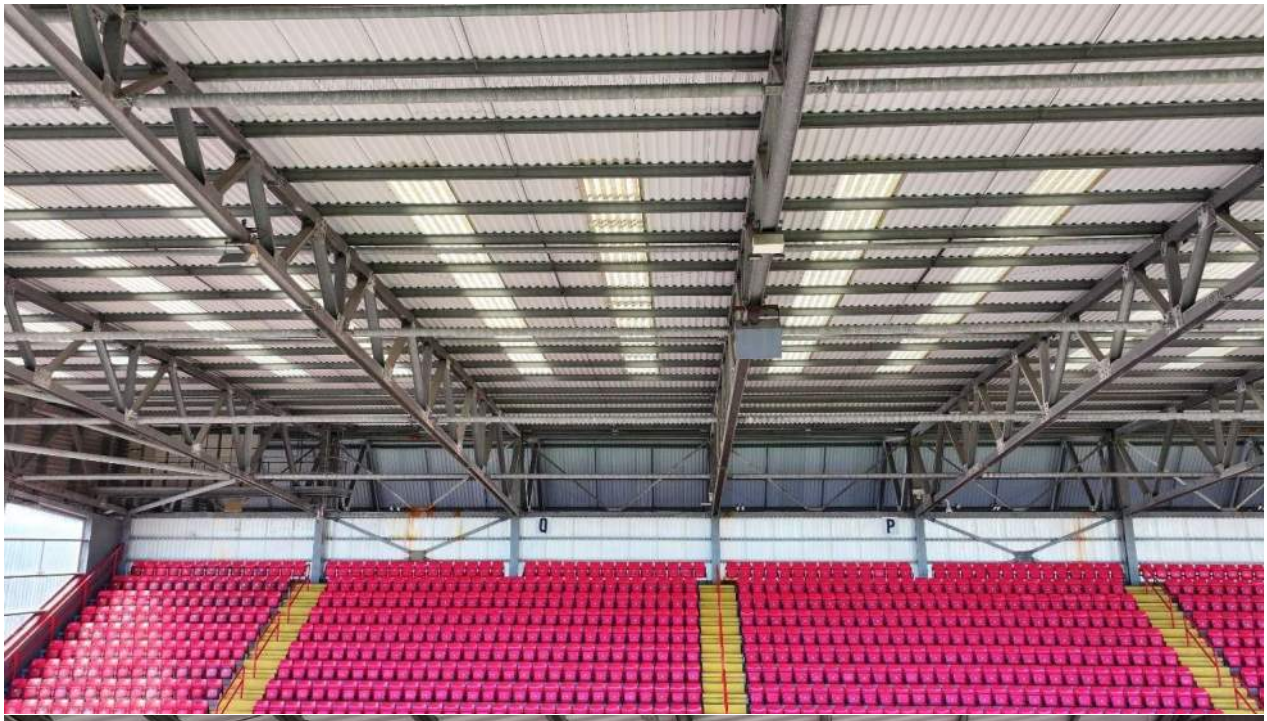
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P


N
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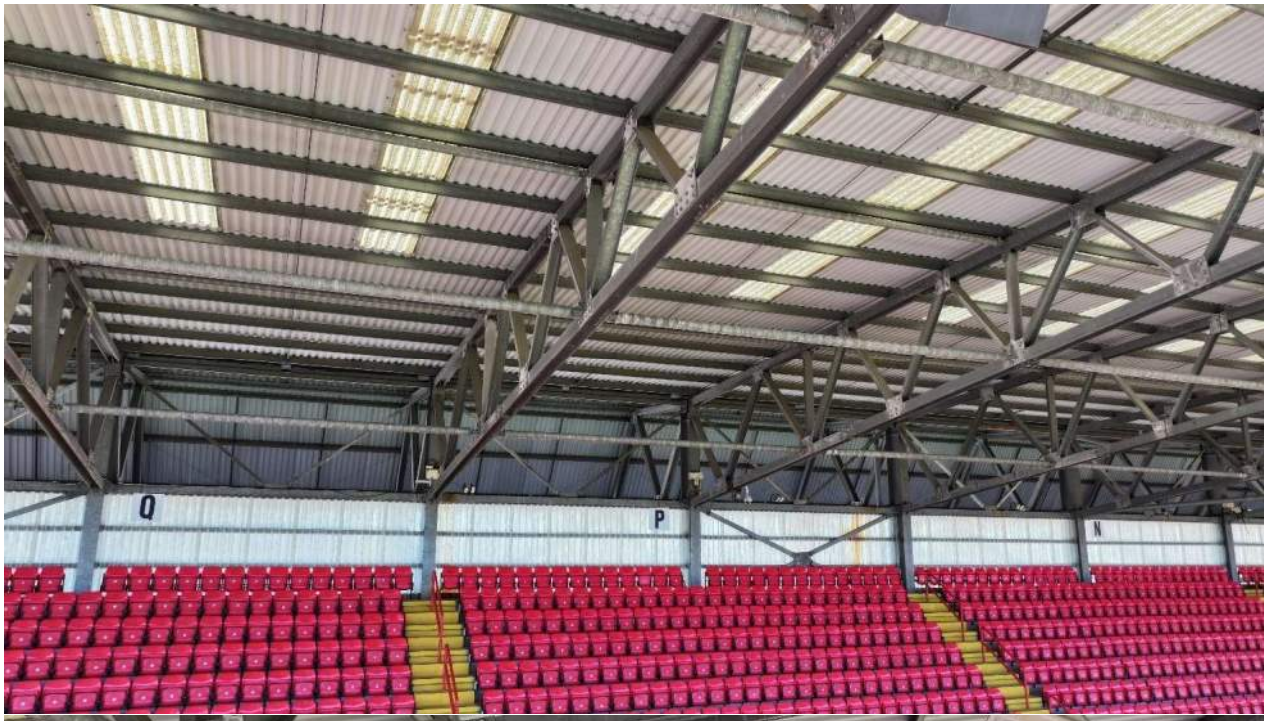
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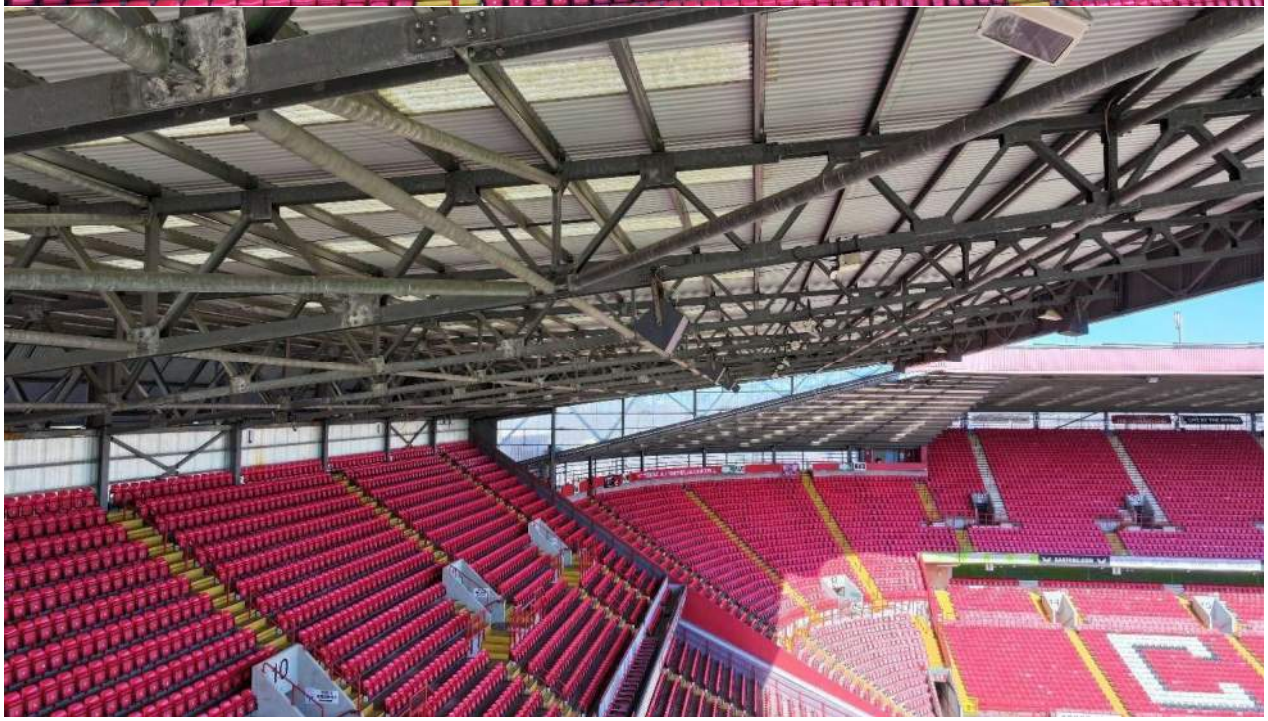

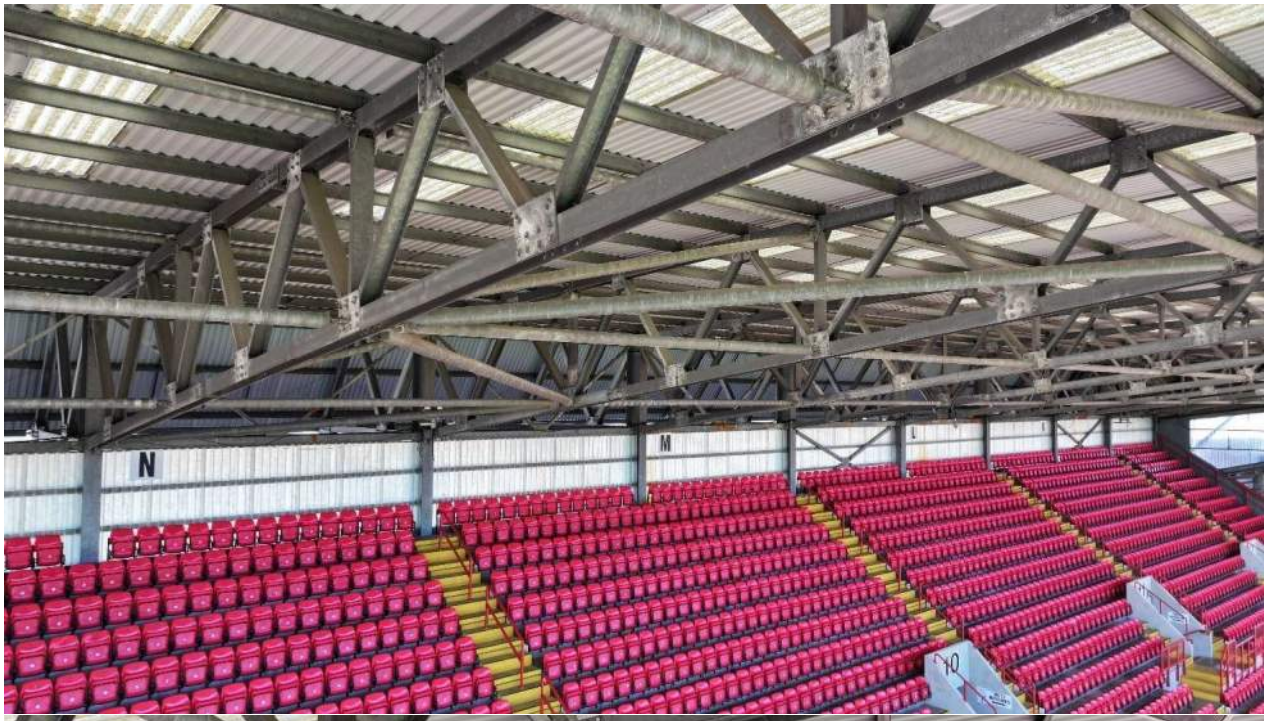
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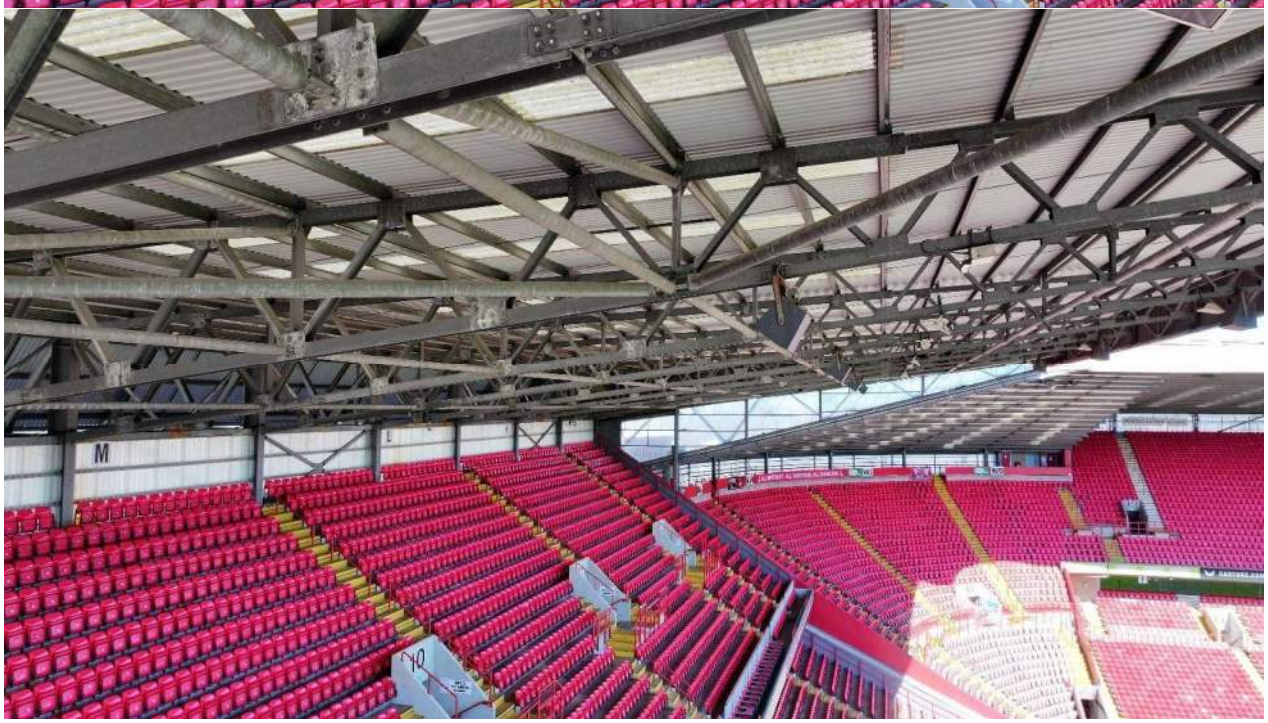
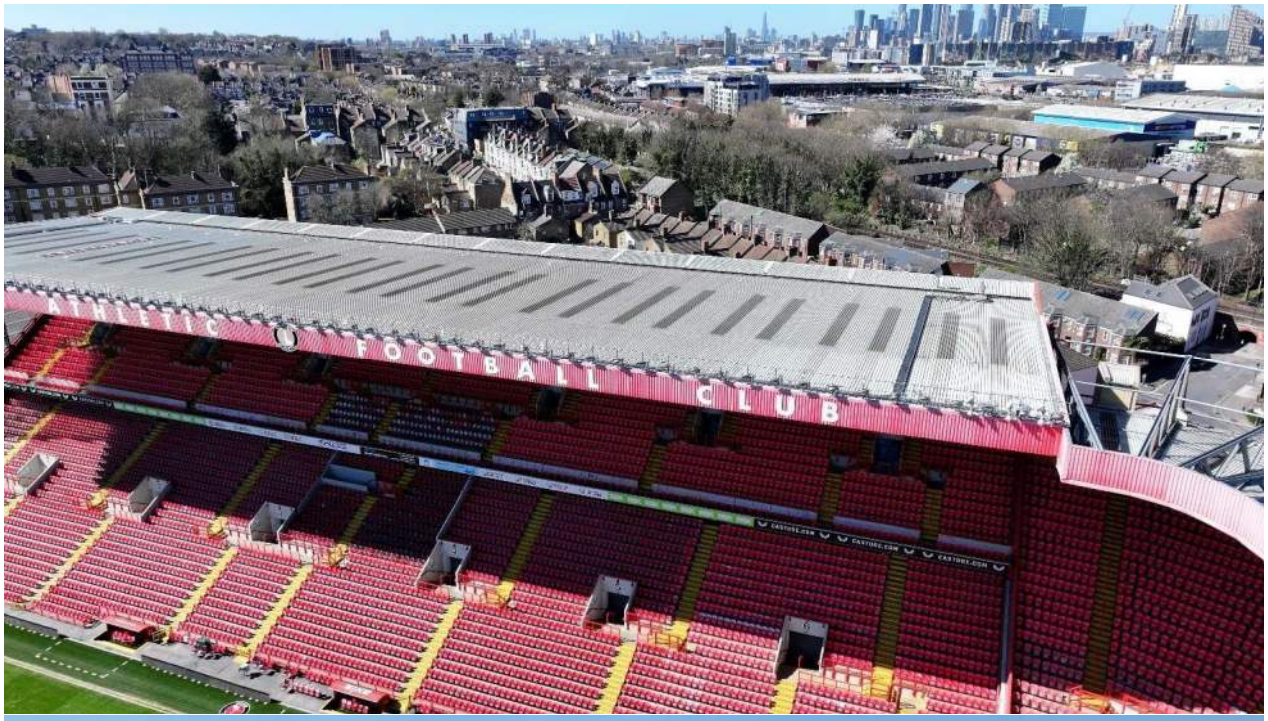
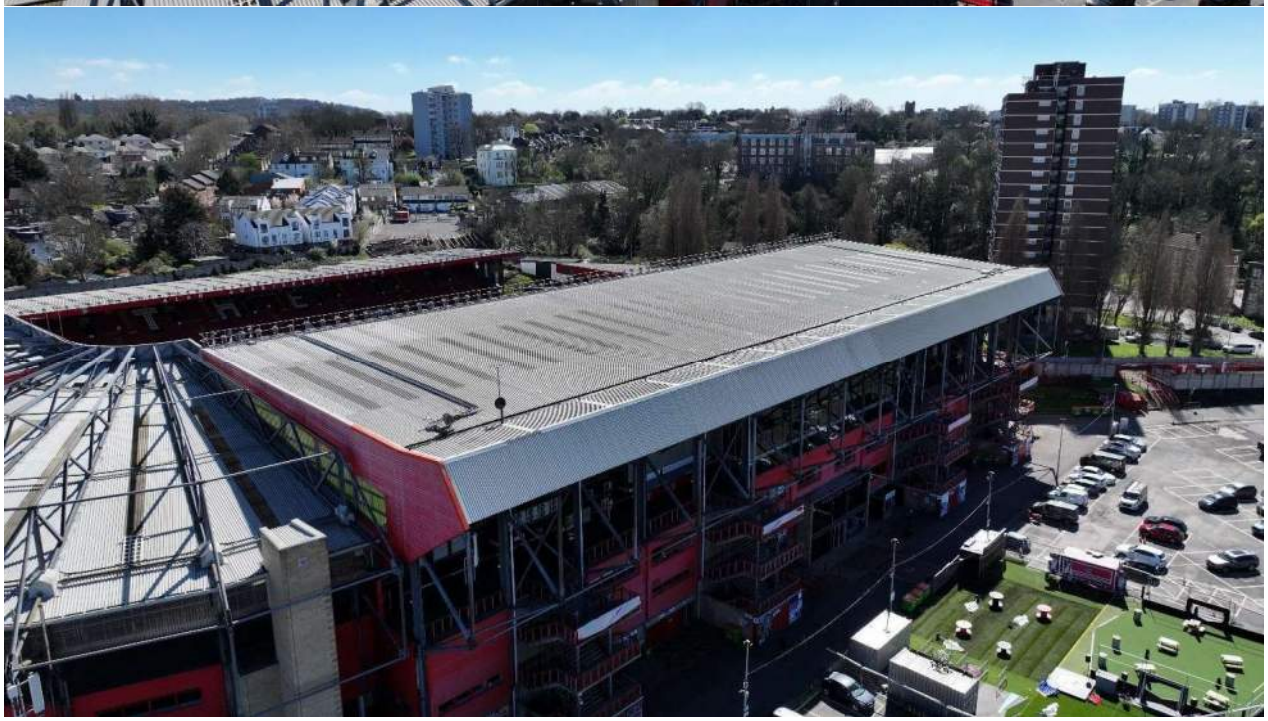

M

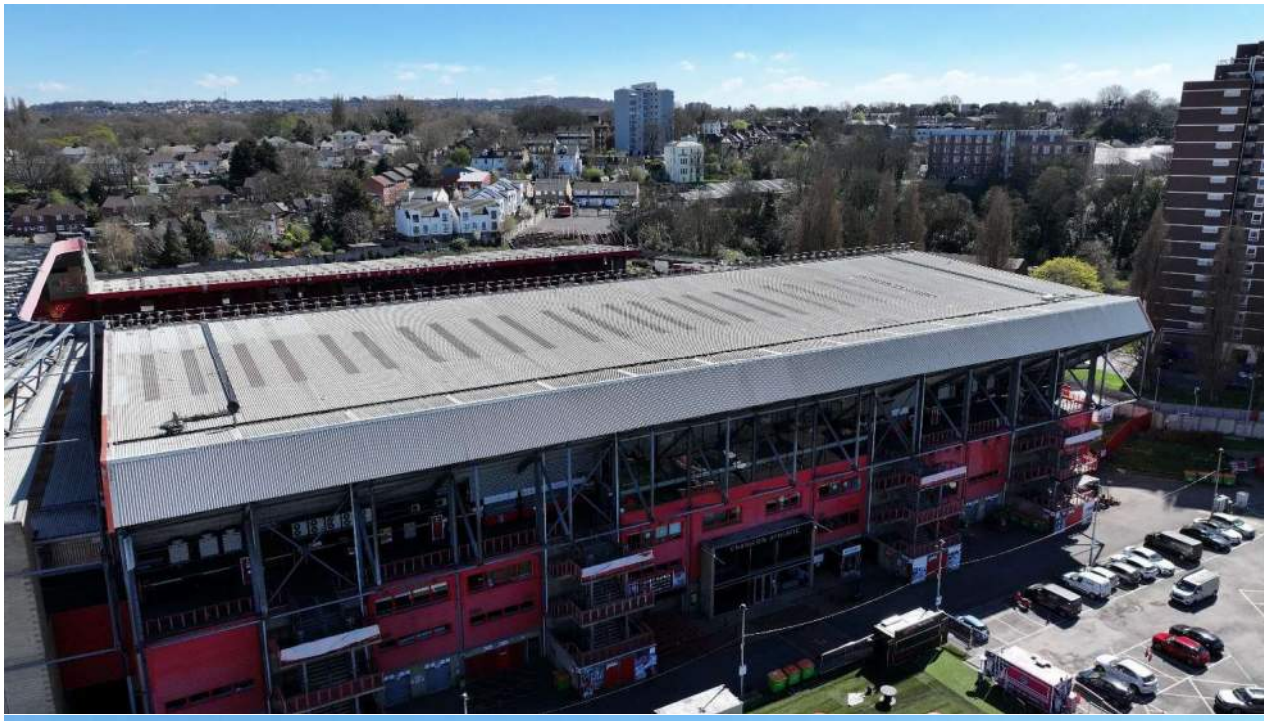

CAFC


THLETIC FOOTBALL CLUB

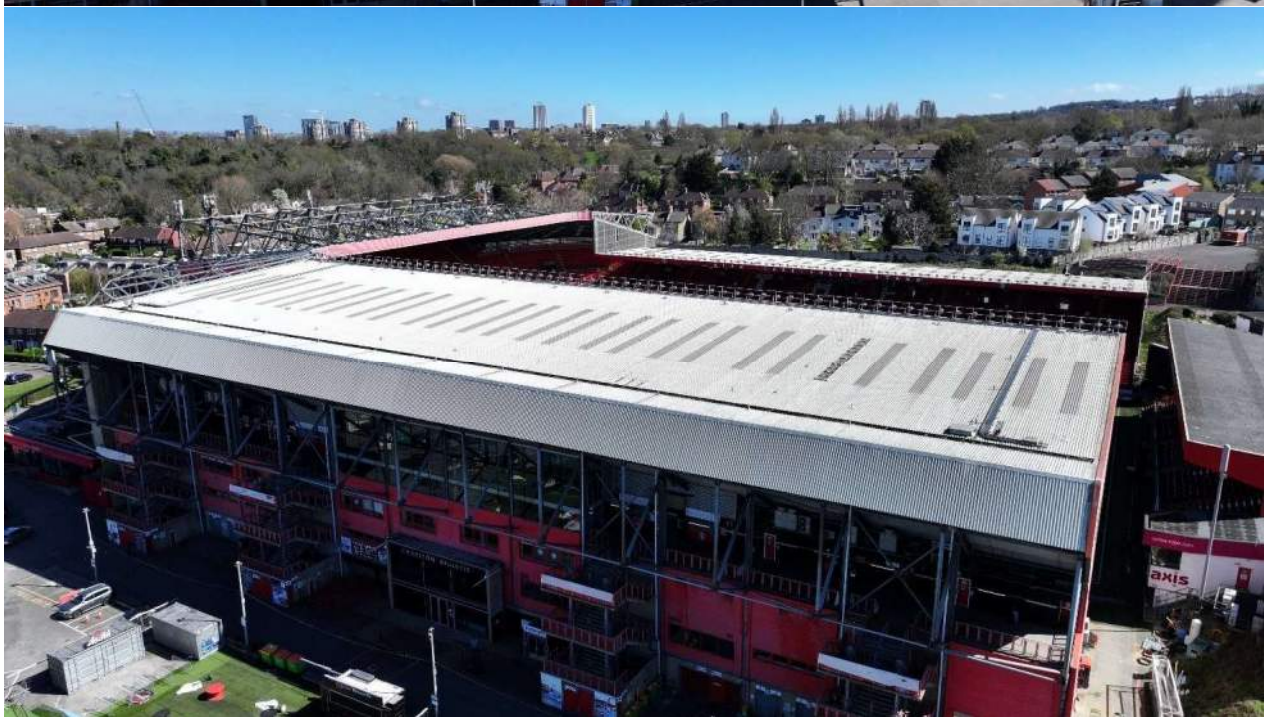

ATHLETIC FOOTBALL CLUB


CAFC



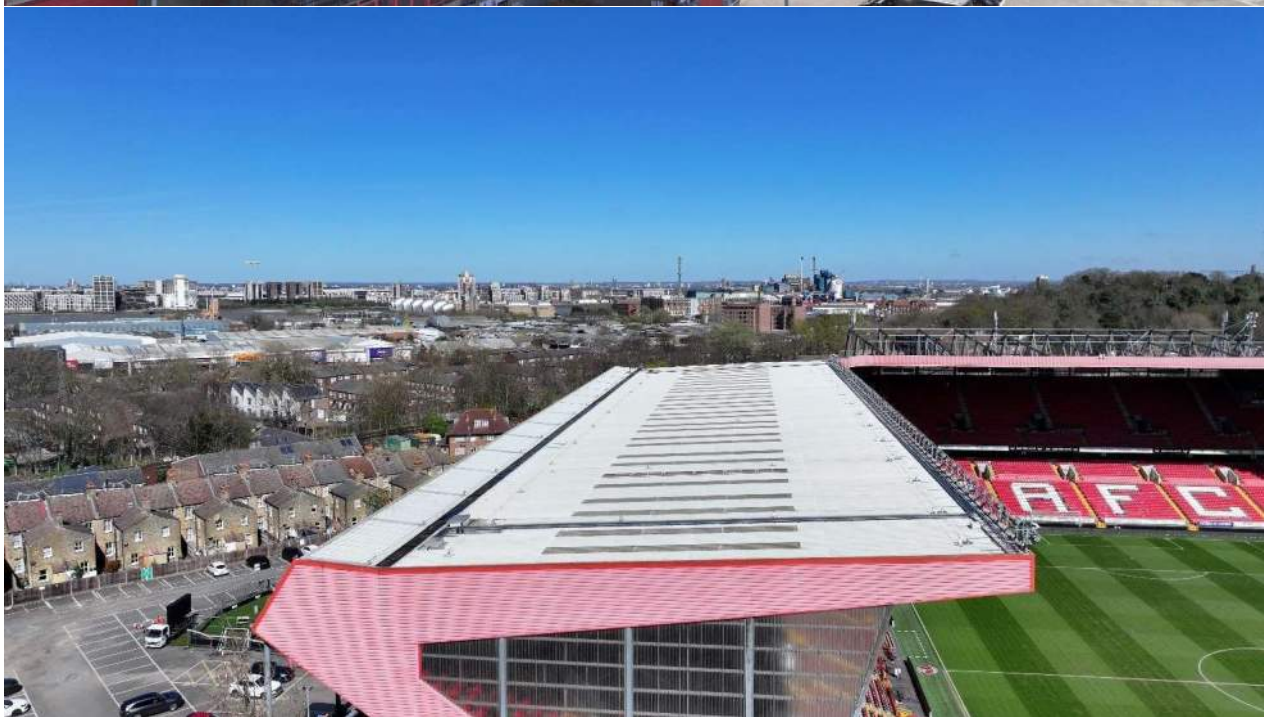



CHARLTON ATHLETIC


axis


CHARLTON ATHLETIC


CHARLTON ATHLETIC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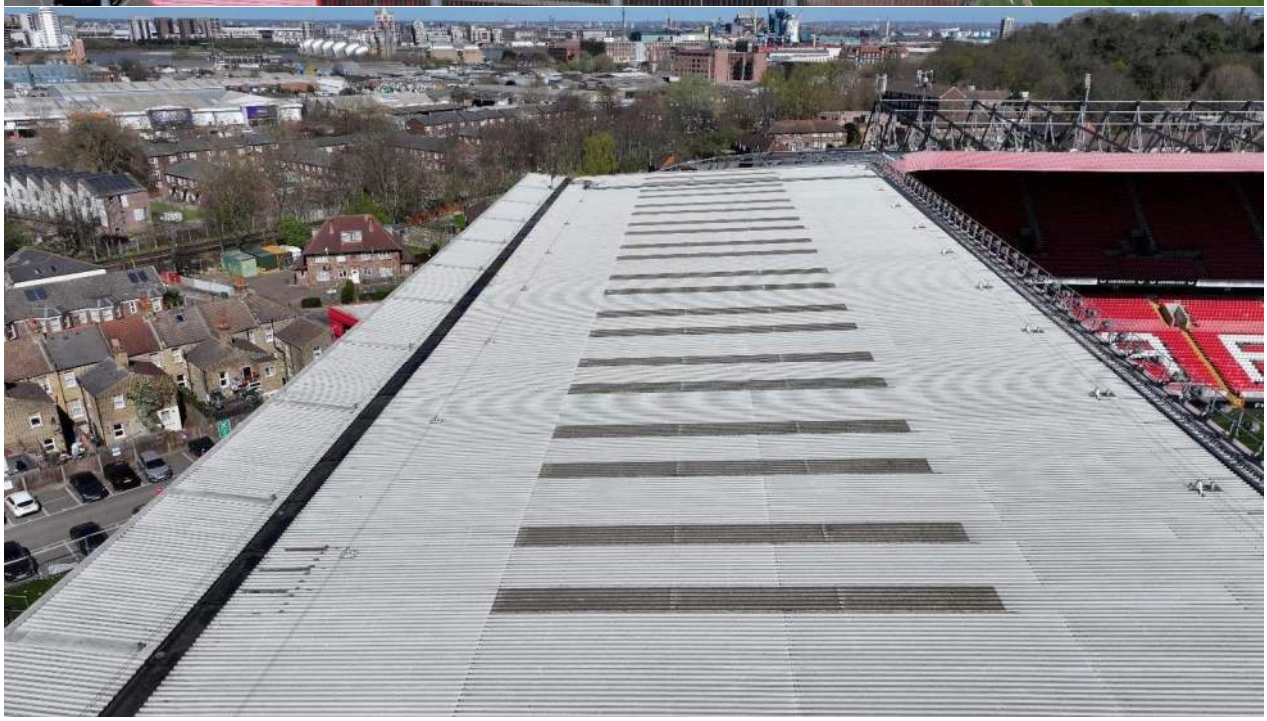
AFC




JIMMY SIRD STAND
CAF

APPENDIX D – AERIAL DRONE FOOTAGE ROOF 2


ALAN CURBISHLEY STAND
VALLEY

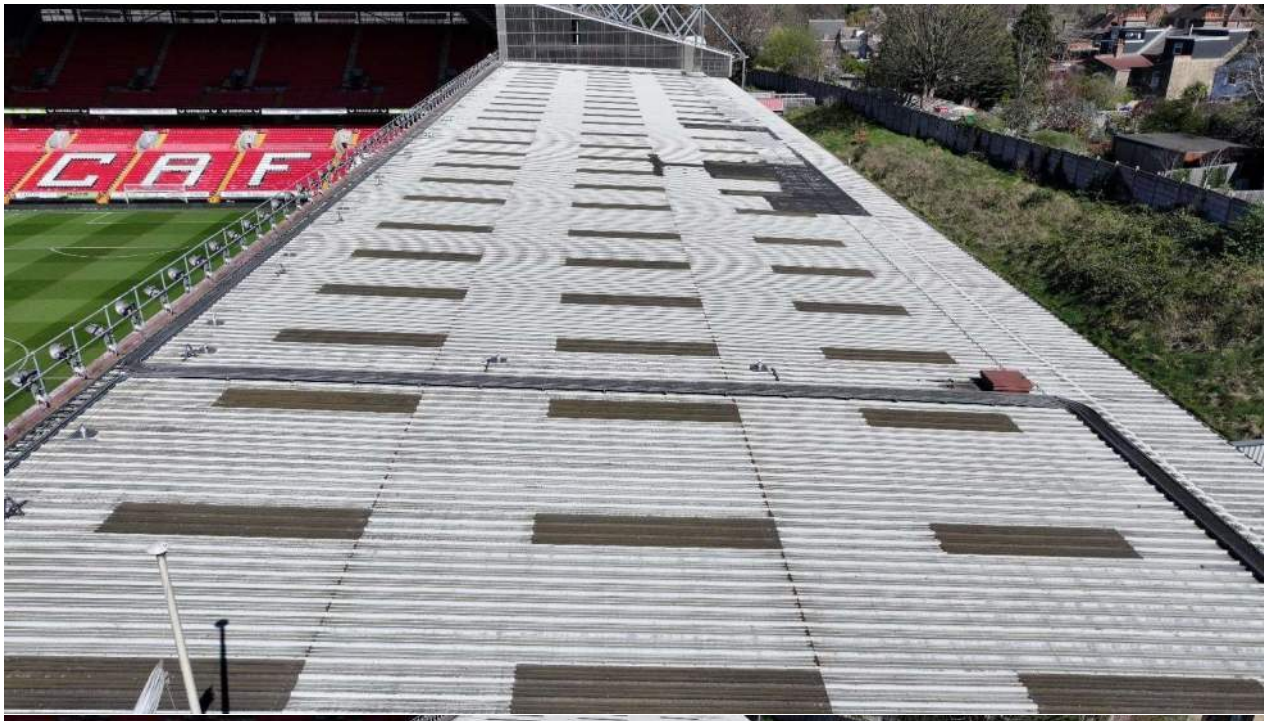

ALAN CURBISHLEY STAND
VALLEY


ALAN CURBISHL
PILON
PILON
DPS
DPS


ALAN CURBISHLEY STAND
VALLEY


CAFC


CAF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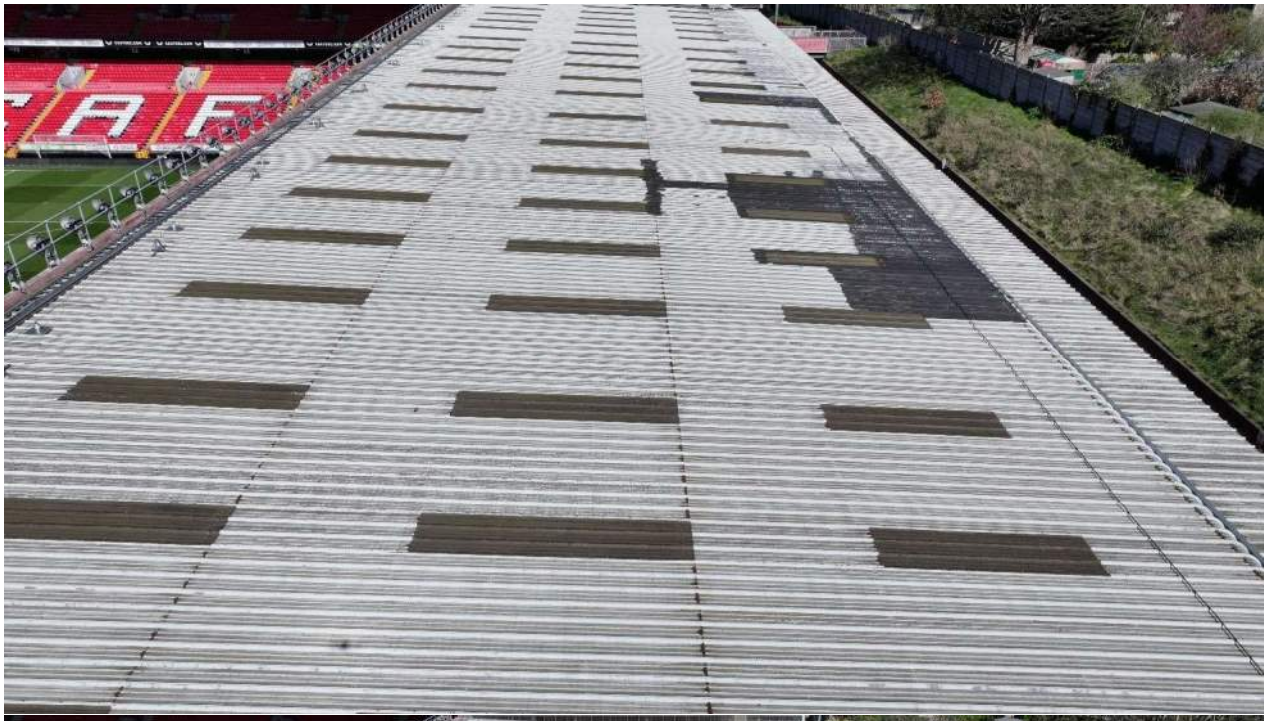
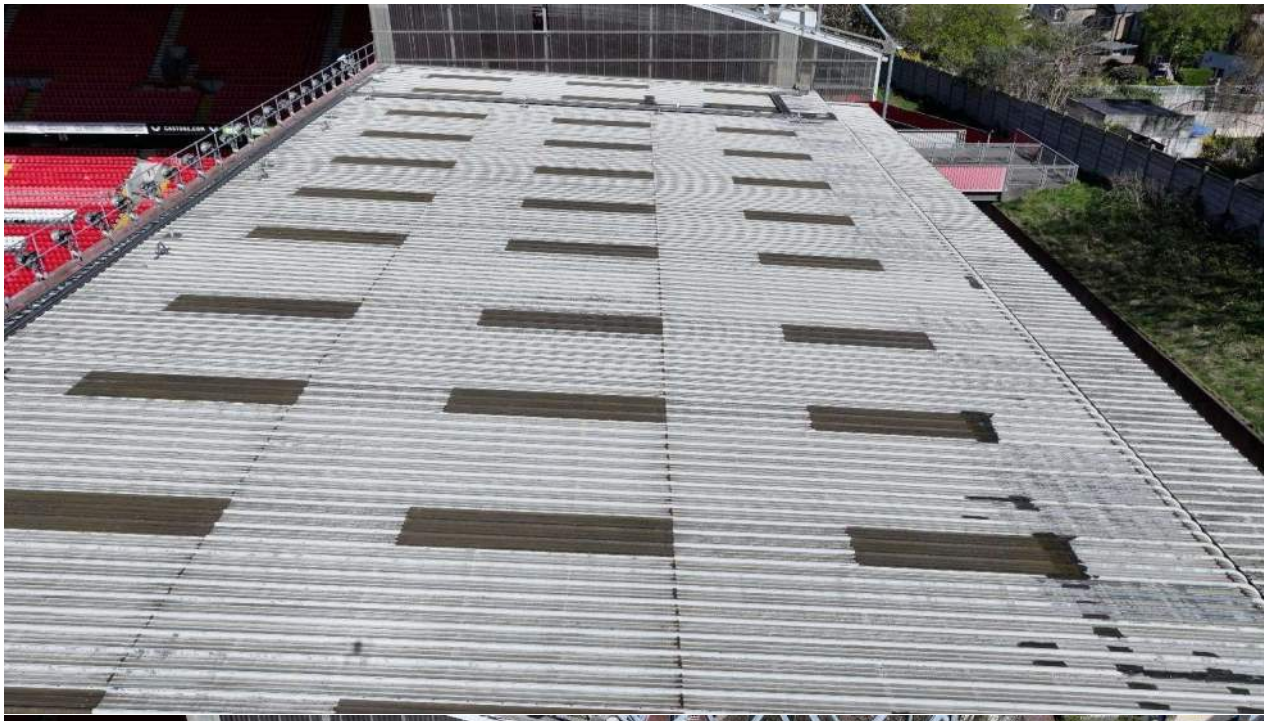





JIMMY SEED STAND

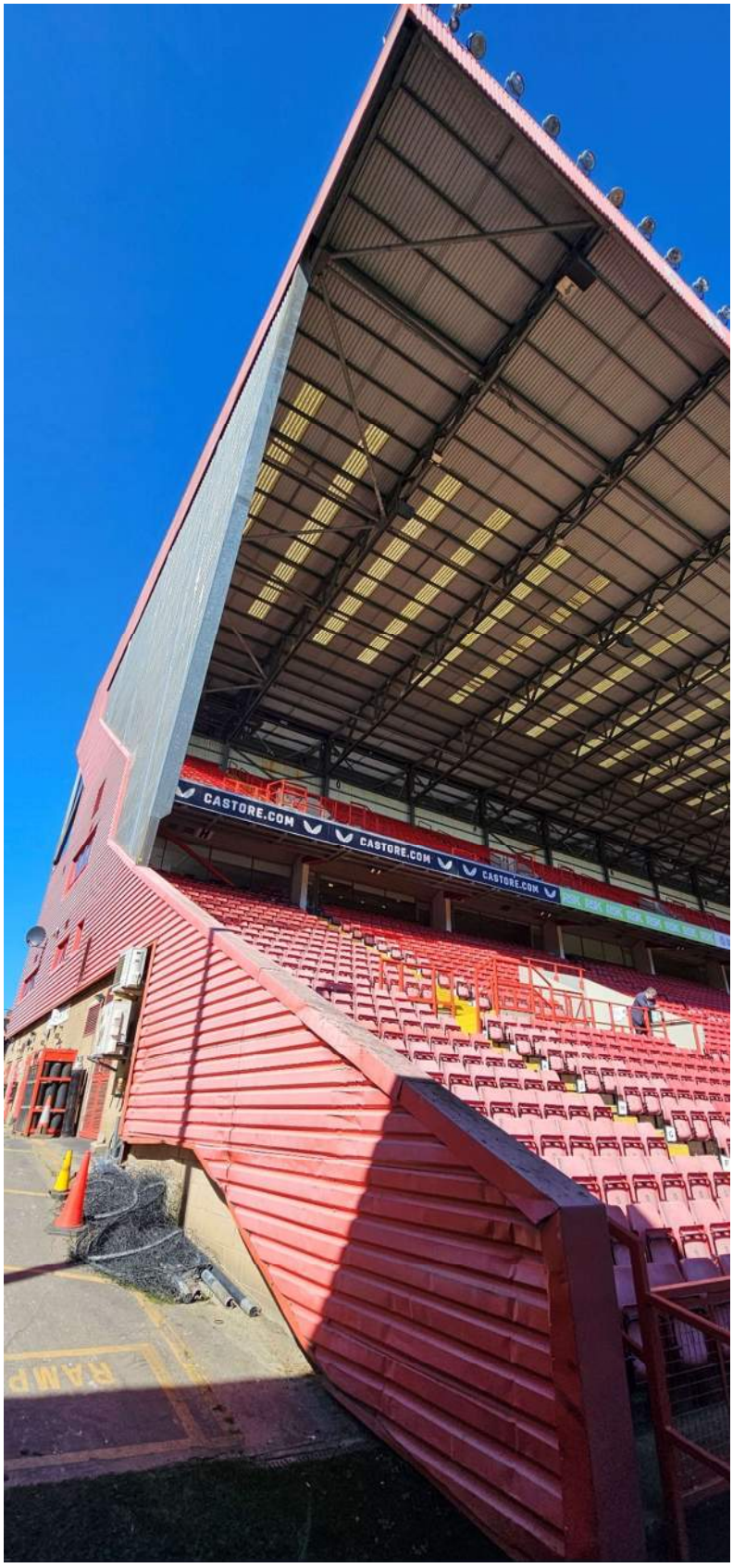

JIMMY SEED STA

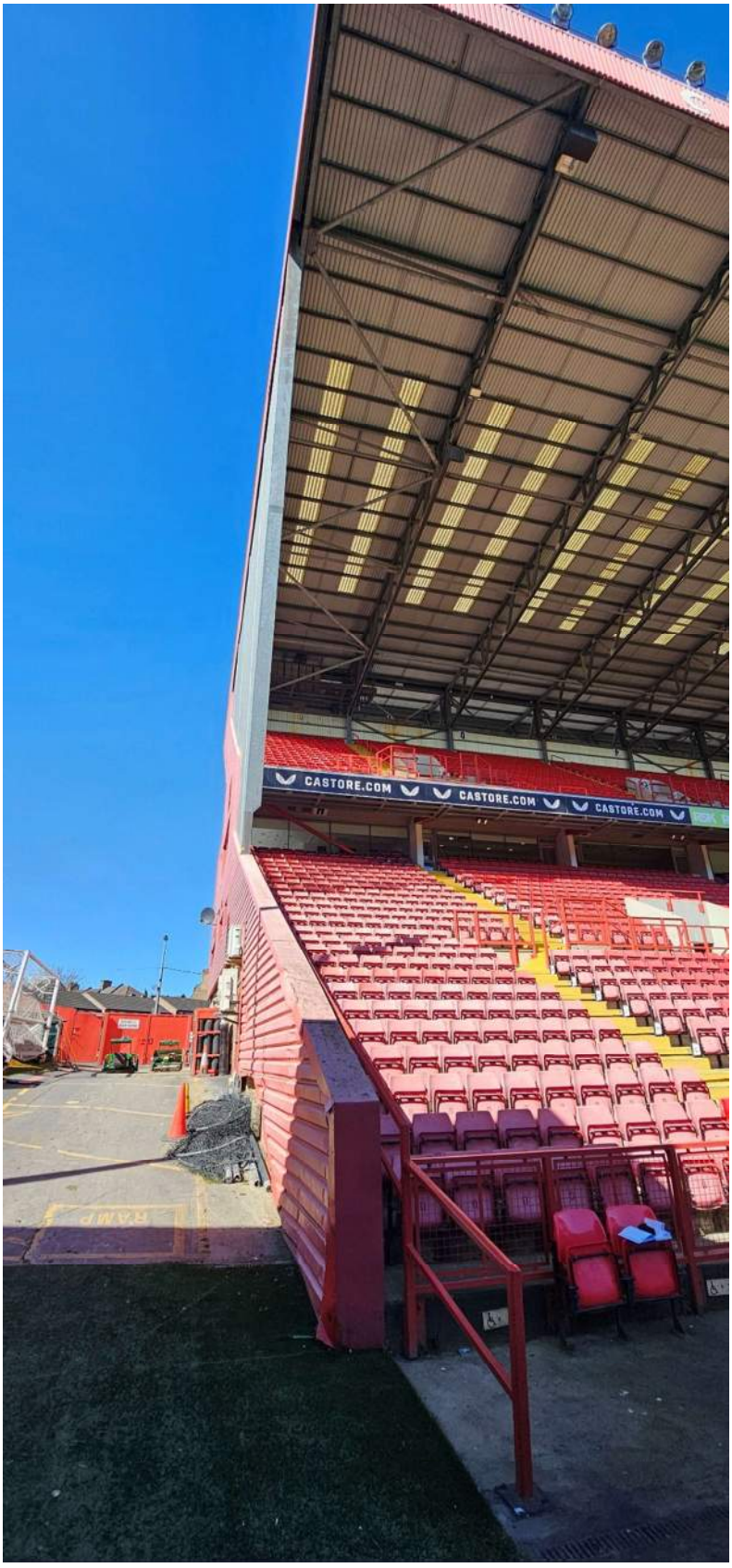

changingproperty.com


ALAN CURBISHLEY STAND
THE VALLEY


ALAN CURBISHLEY STAND
THE VALLEY

APPENDIX E – INTERNAL PHOTOS OF ASSET (ROOF 1)


CASTORE.COM
CASTORE.COM
CASTORE.COM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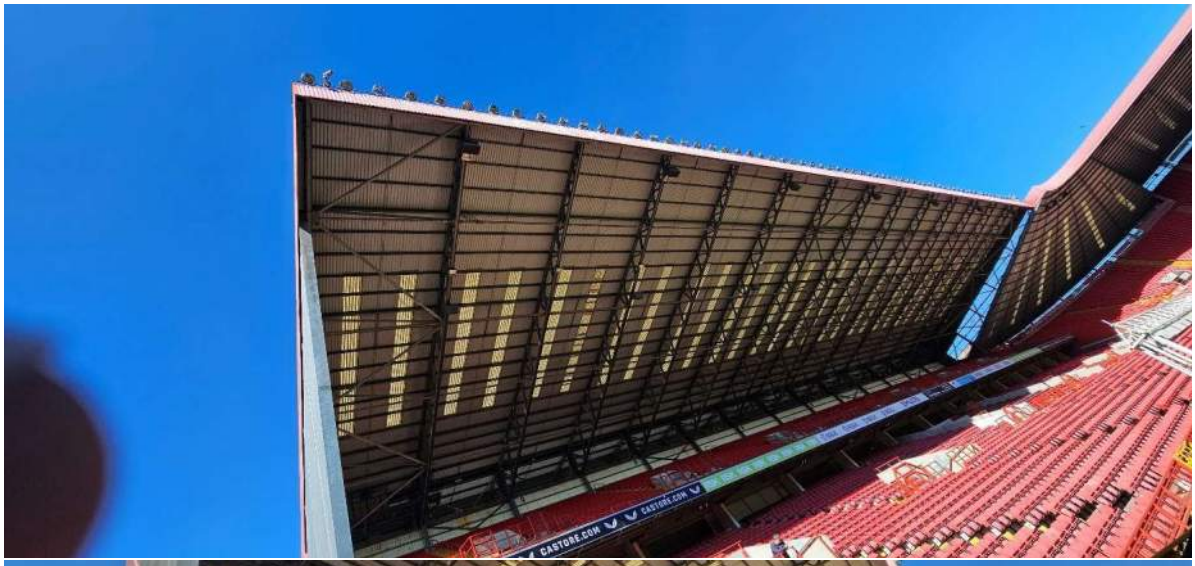
CASTORE.COM
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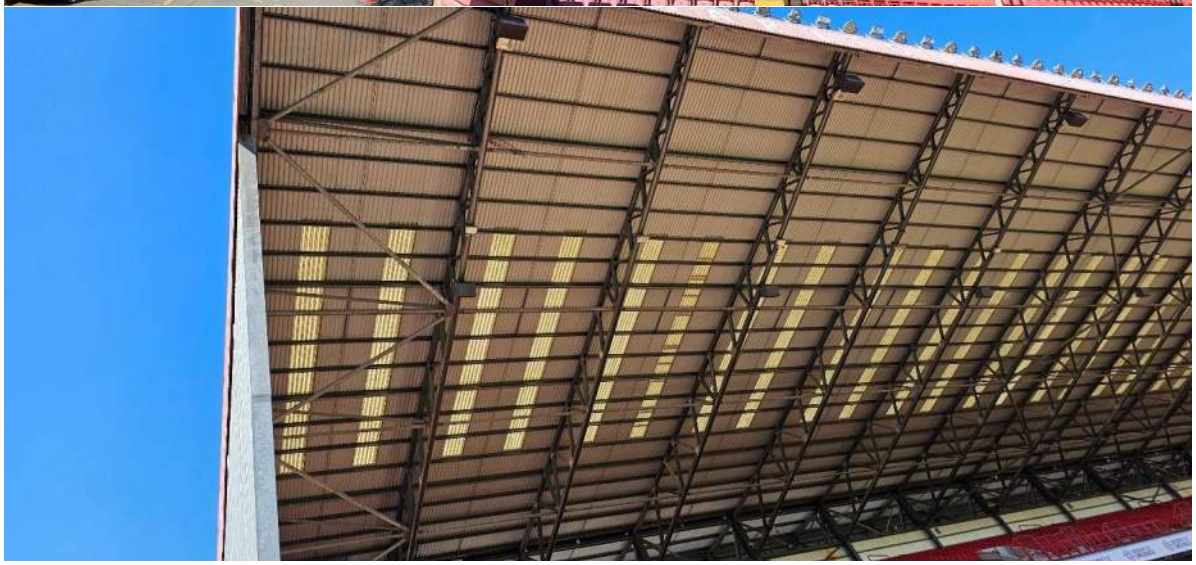
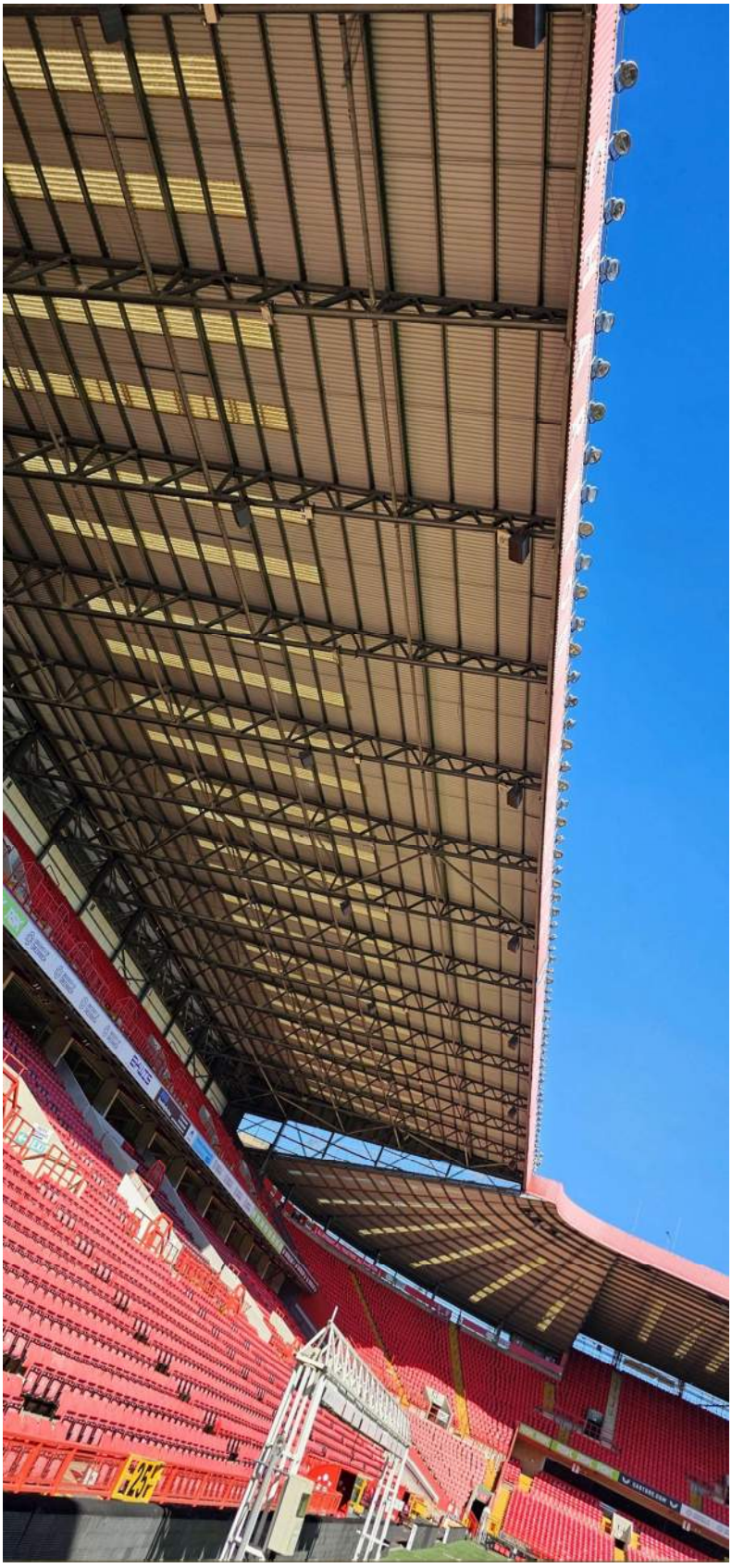
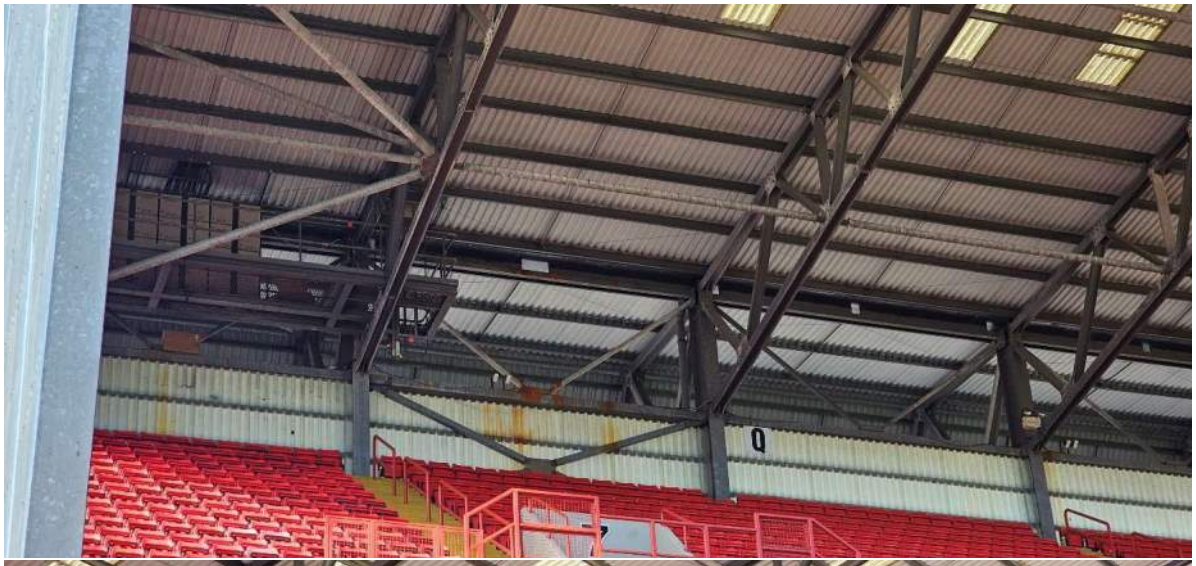
WISE






Q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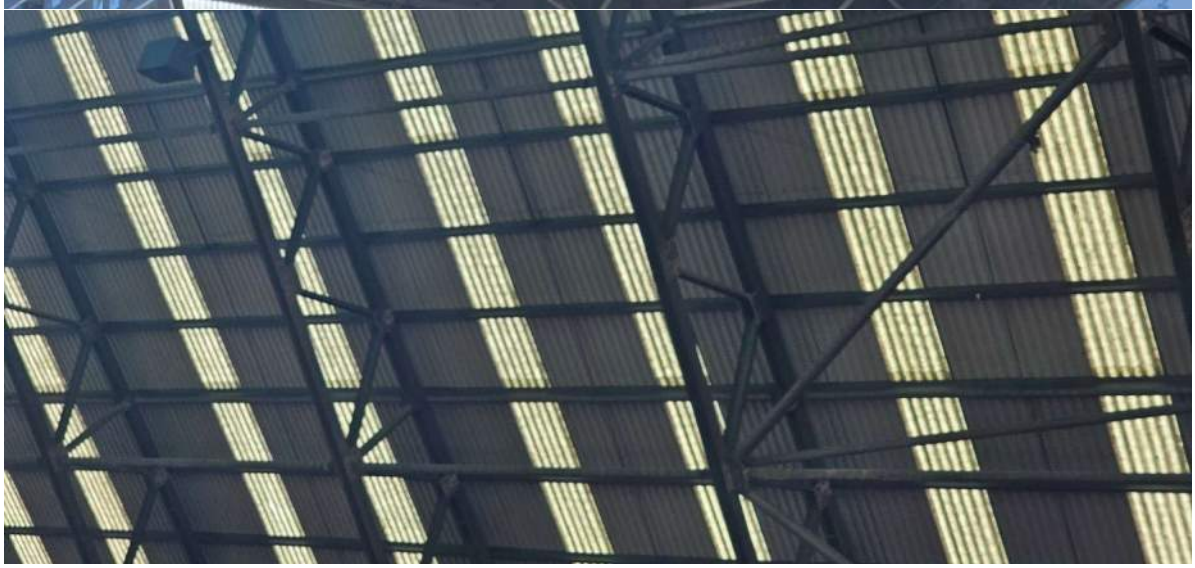
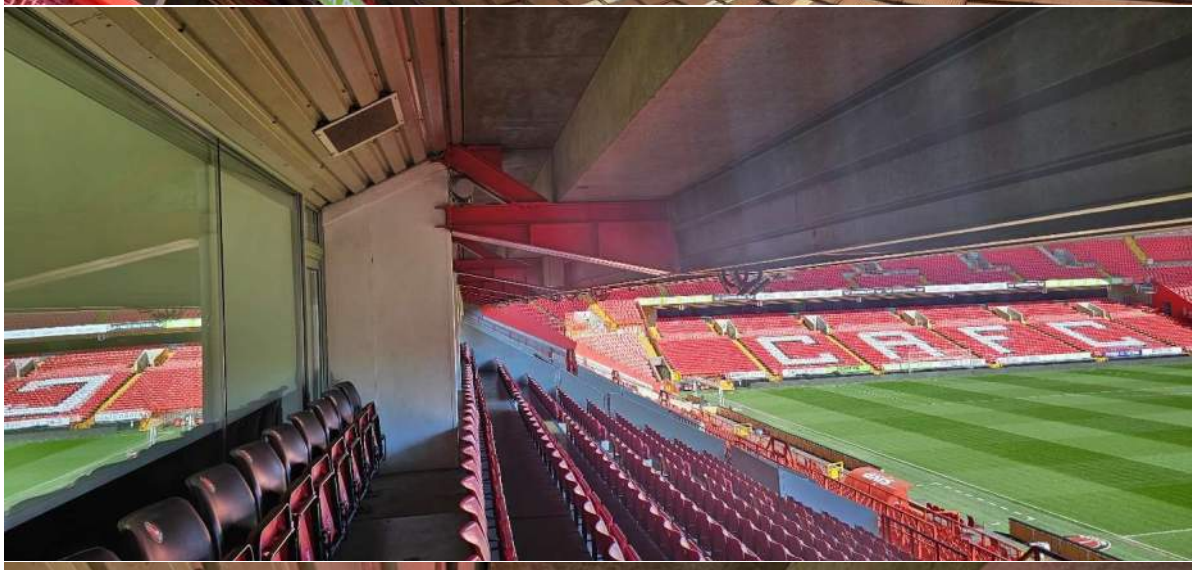
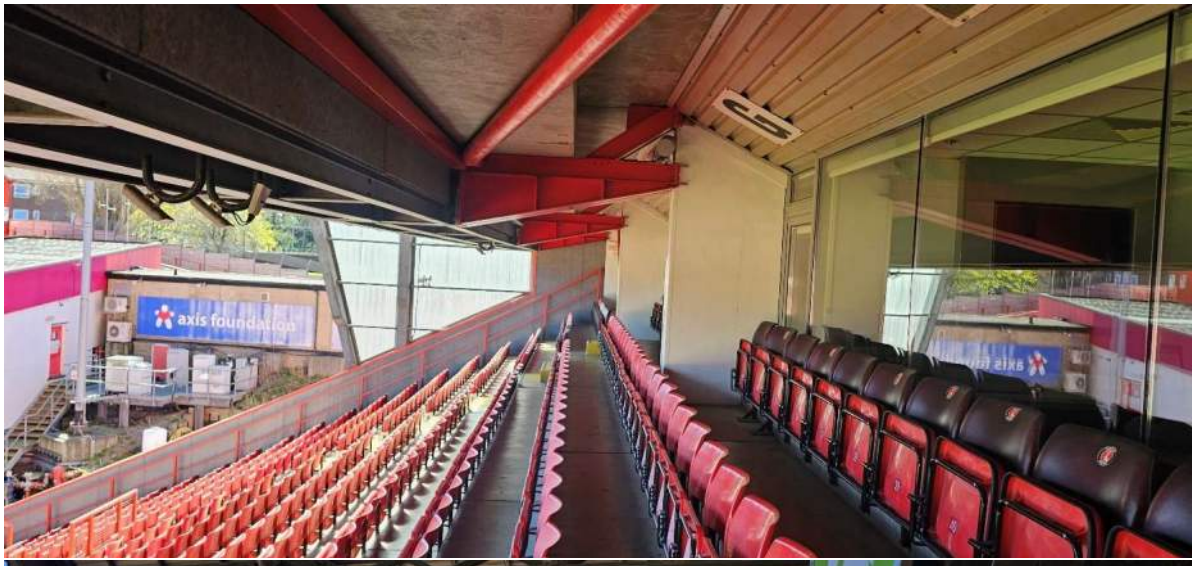
N
N




UNIVERSITY OF GREENWICH
RSK


CAFC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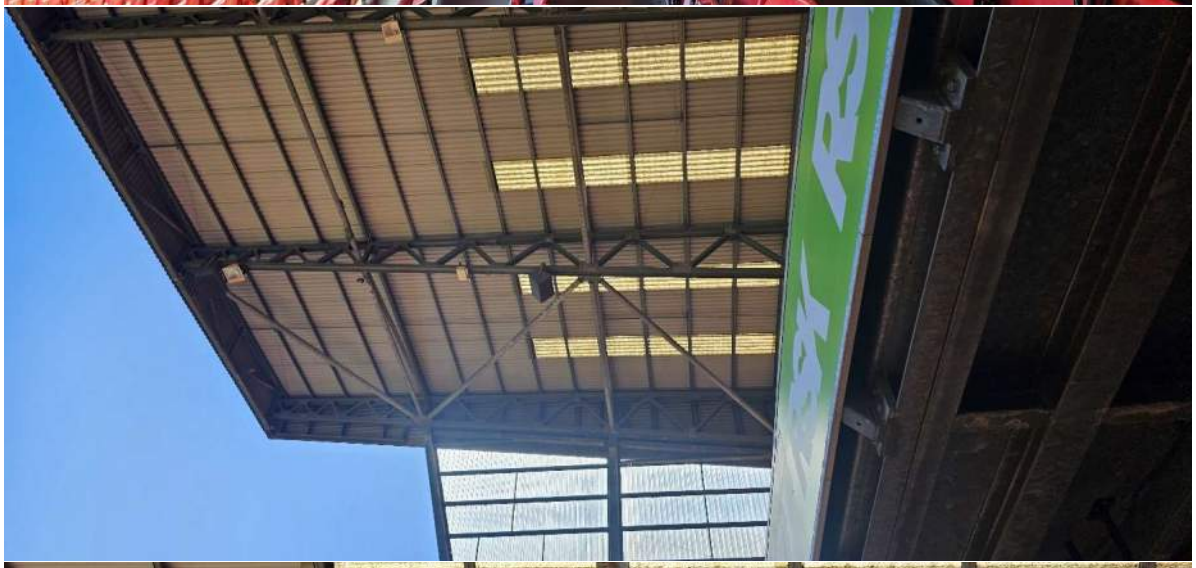

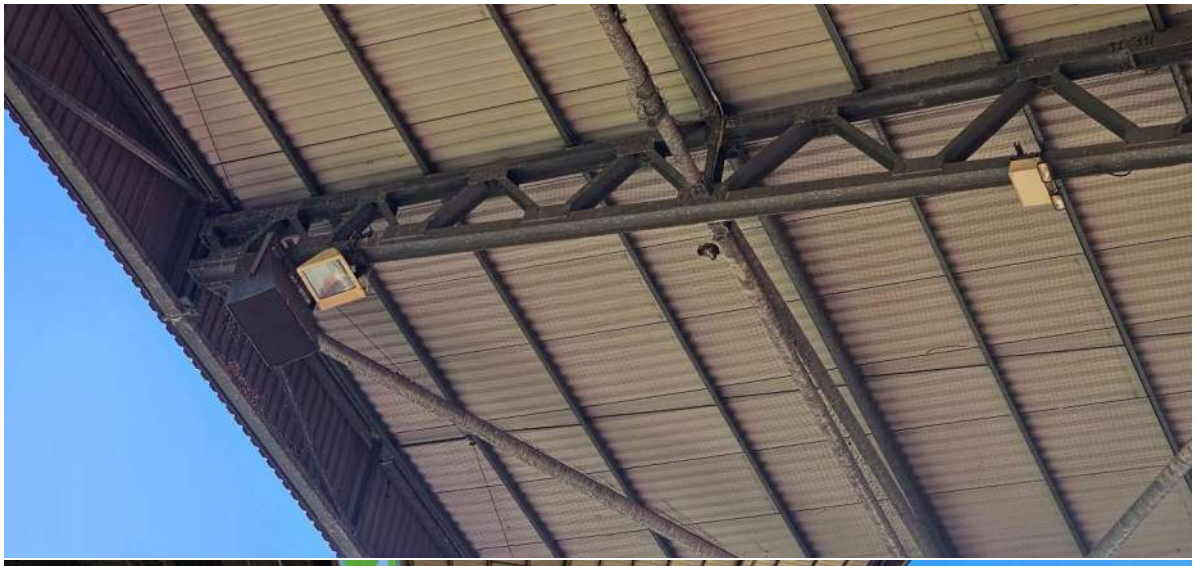

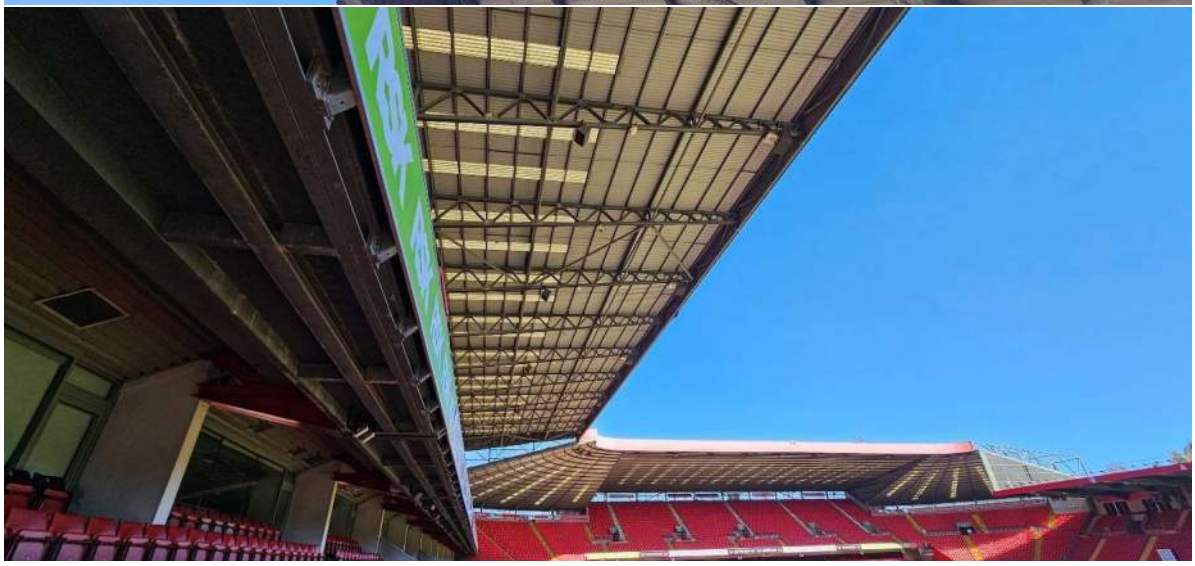

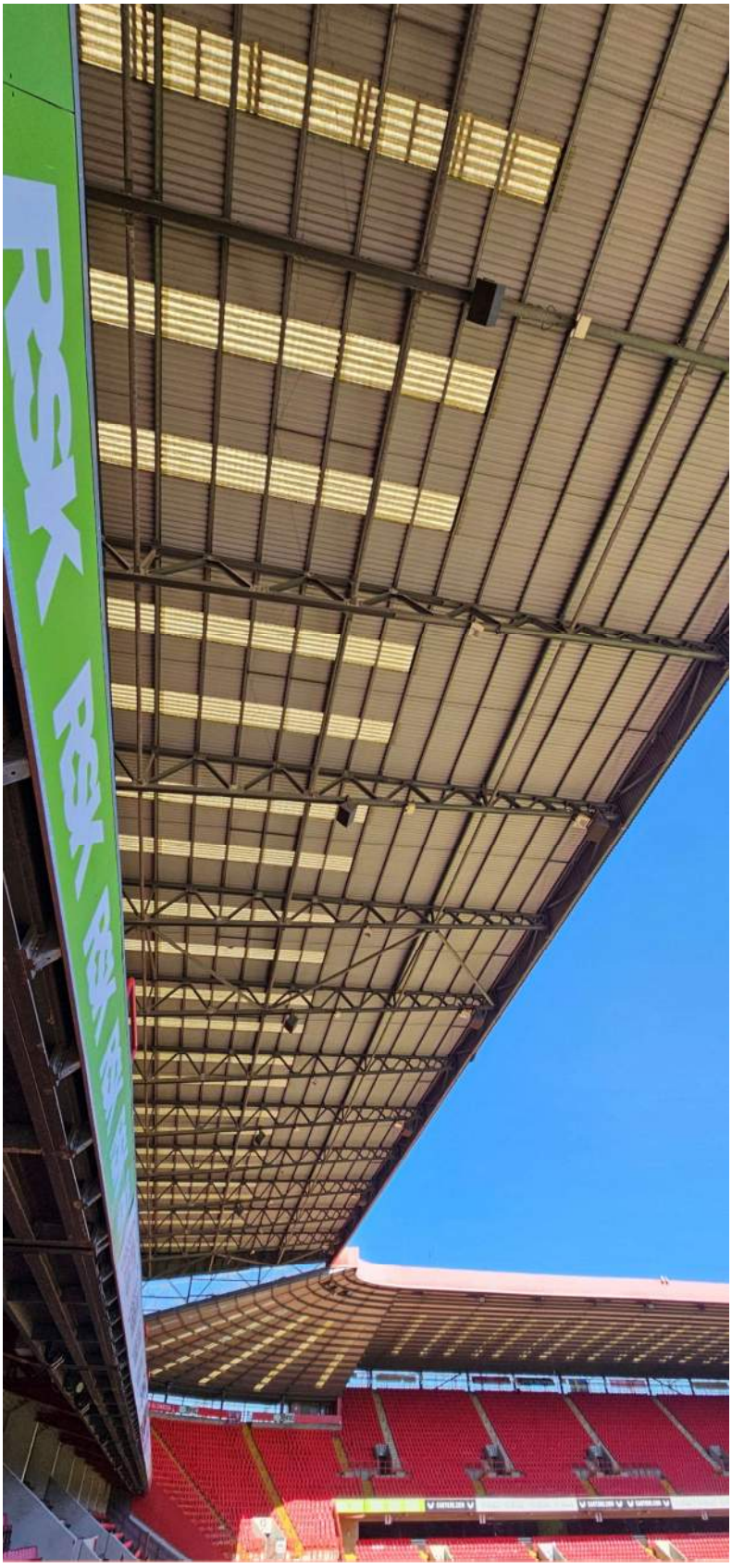
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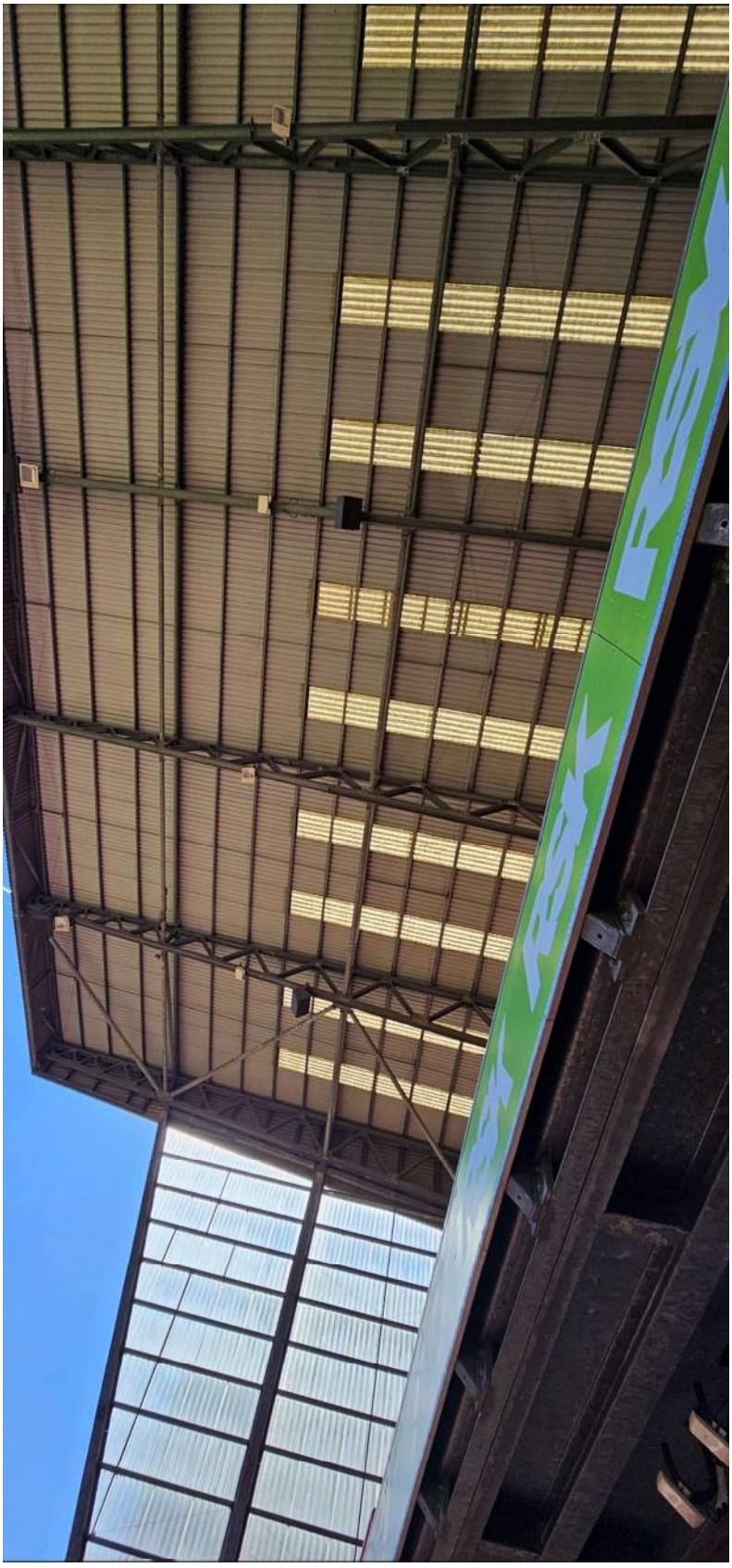
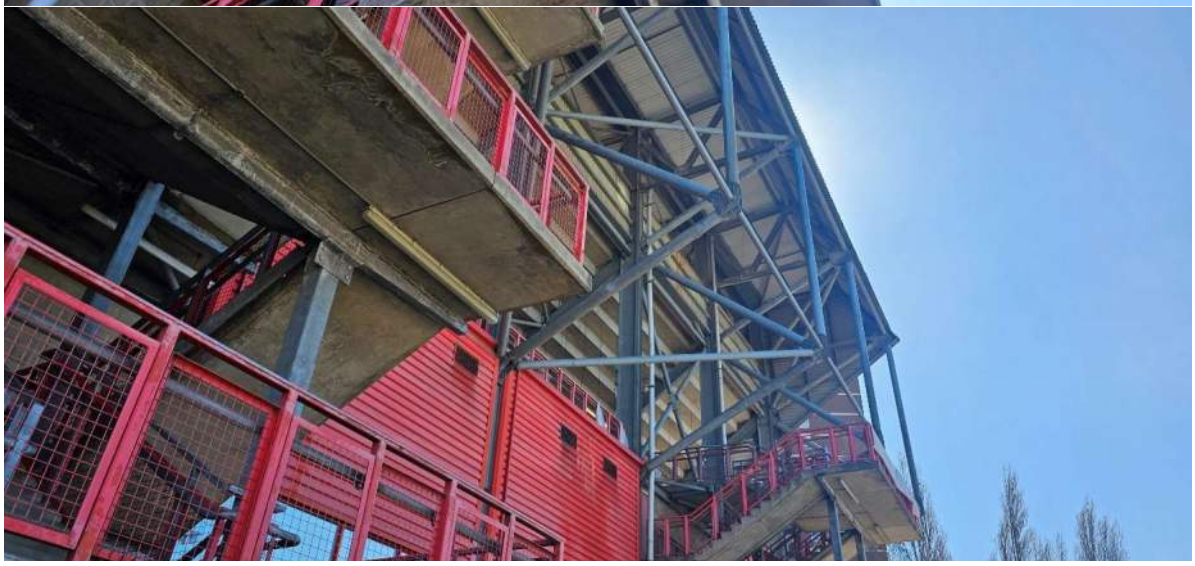
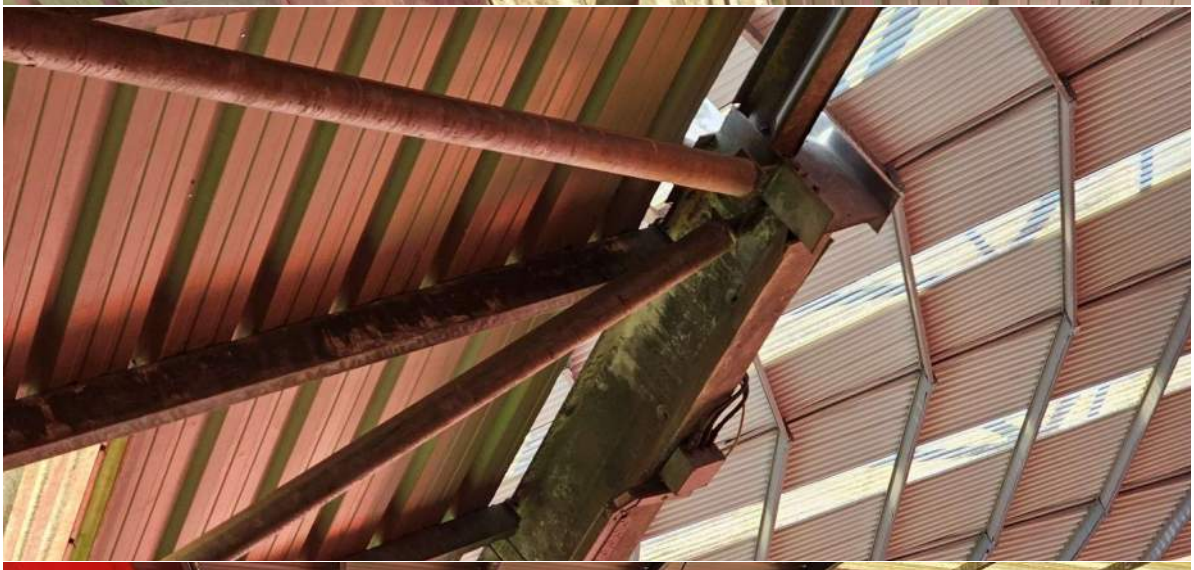
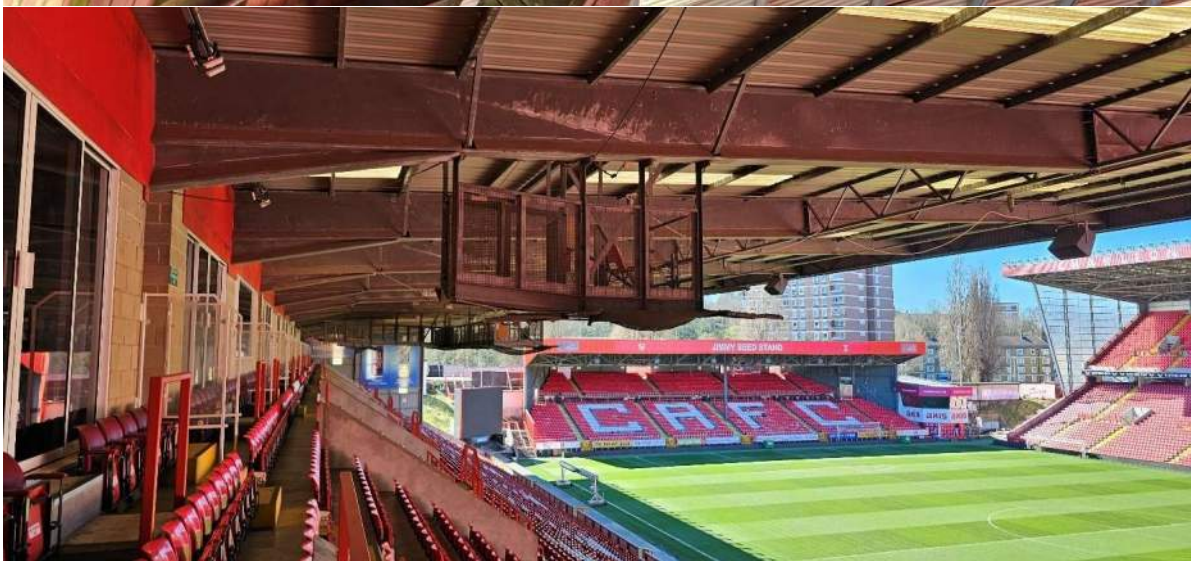


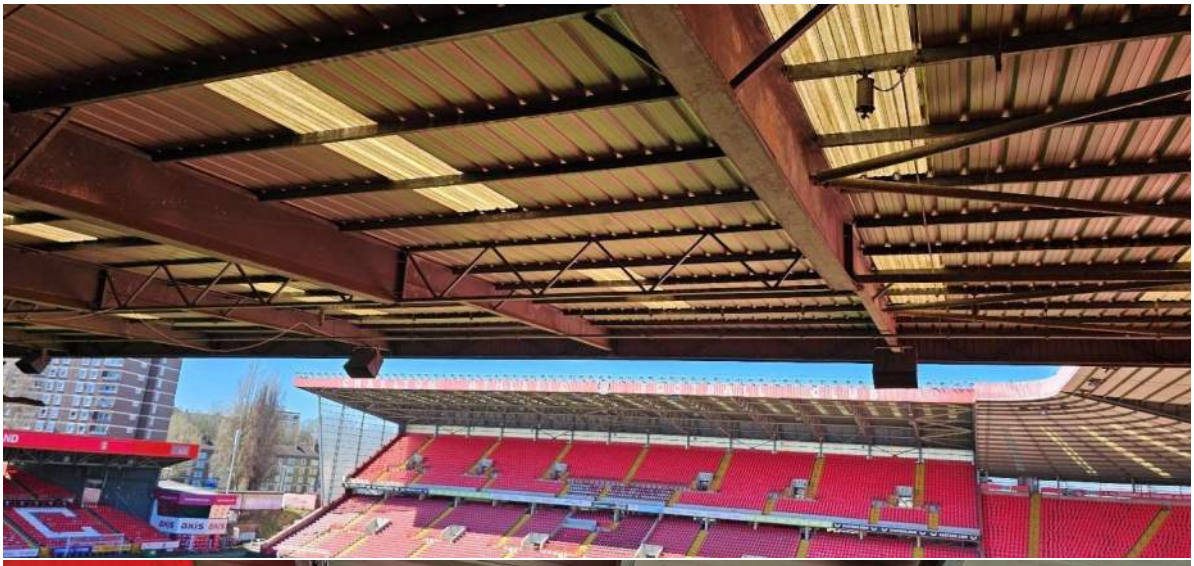

axis foundation



APPENDIX F – INTERNAL PHOTOS OF ASSET (ROOF 2)




JIMMY REED STAND



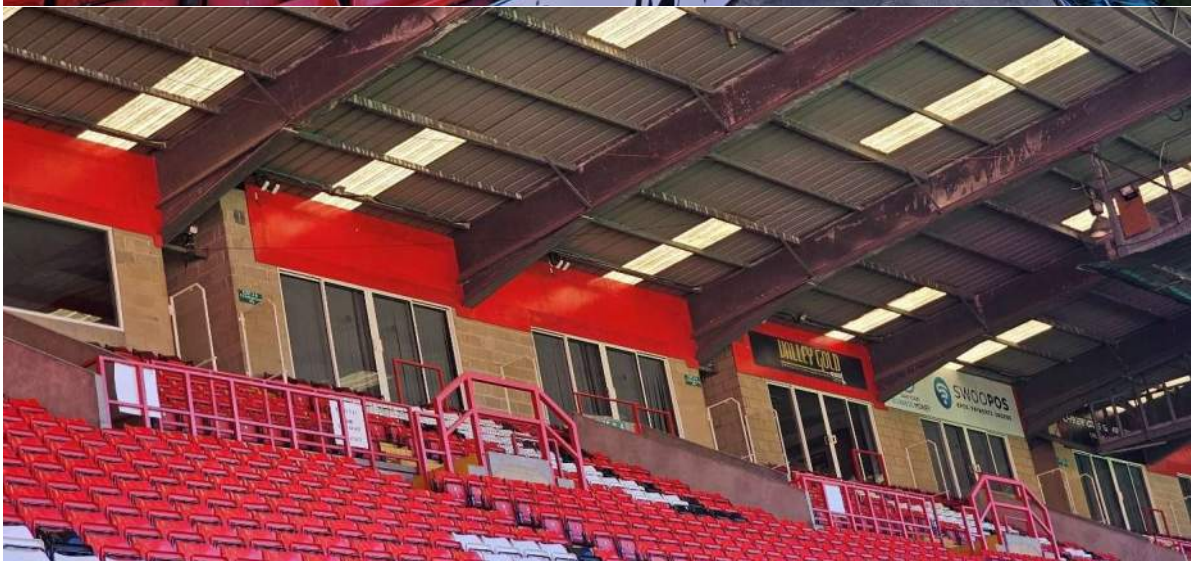

JIMMY SEED STAND

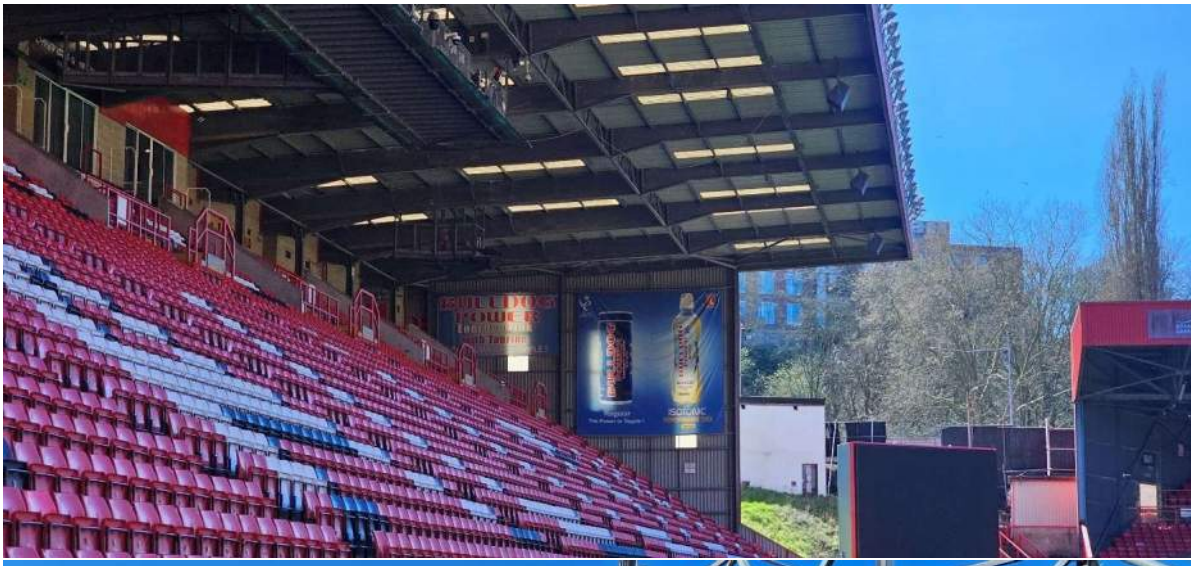

JIMMY SEED STAND

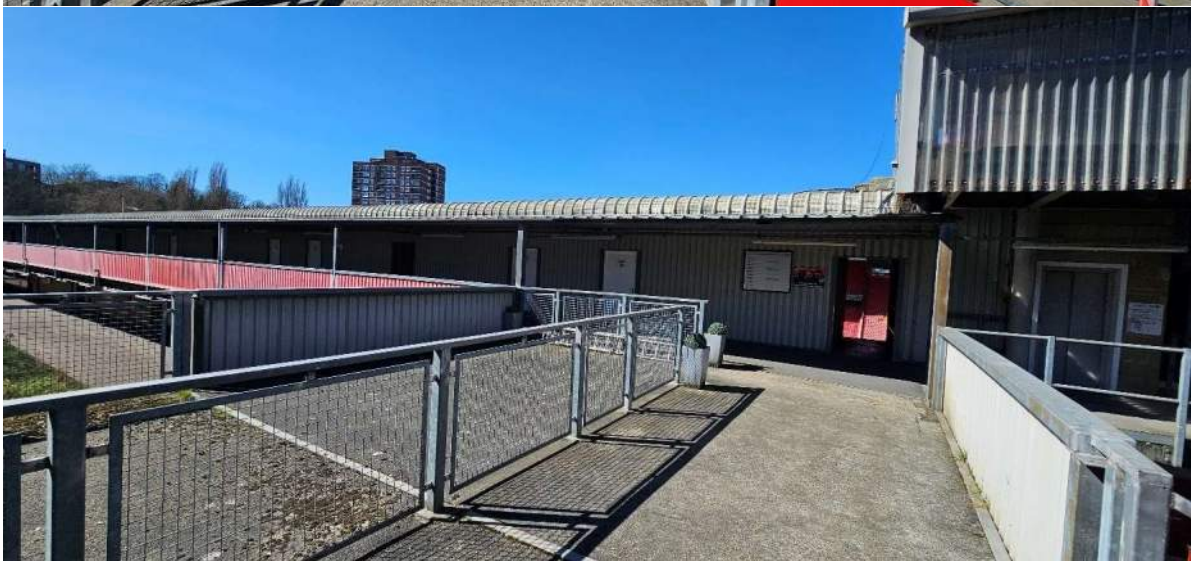

LOYD ROAD
FSB
FSE

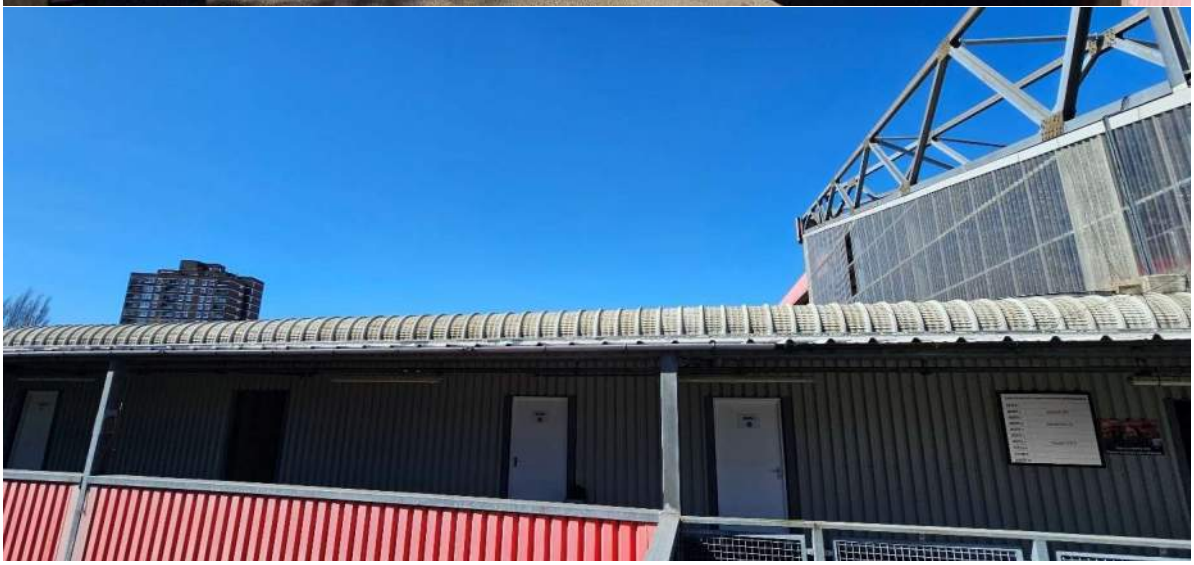

VALLEY FLOYD ROAD
FSB
FSD
FSE

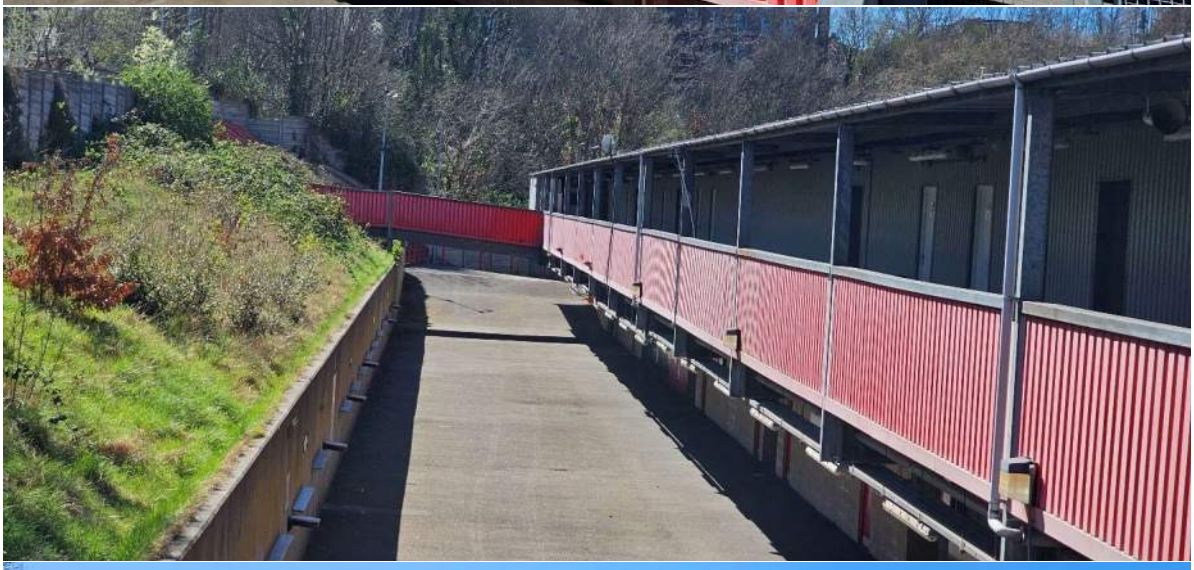

Official CAFC
Print Partner


VALLEY END
SWOOPOS

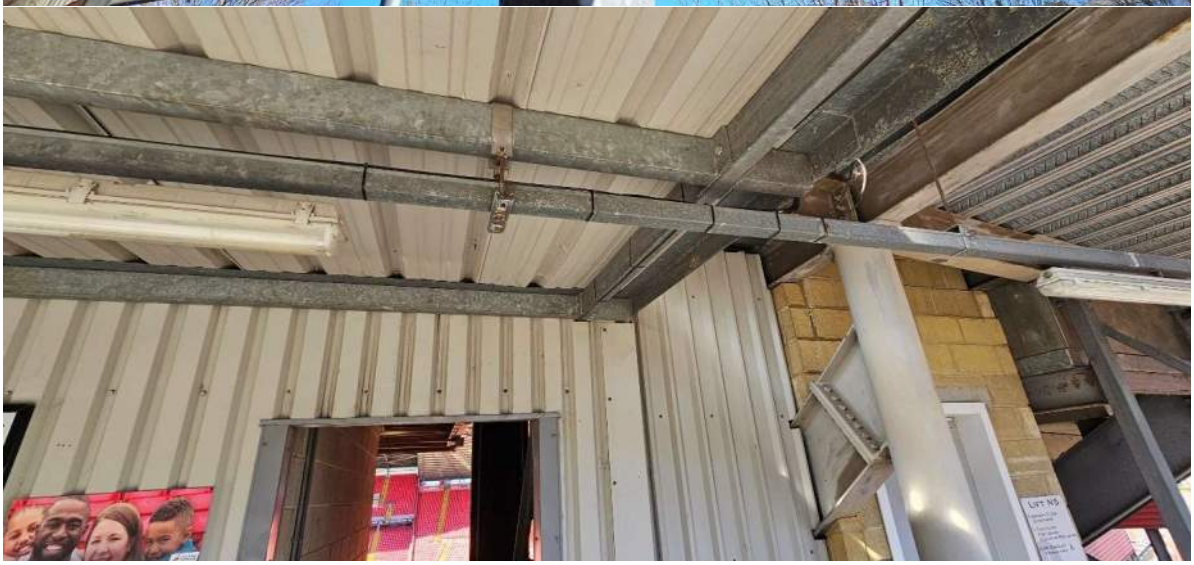




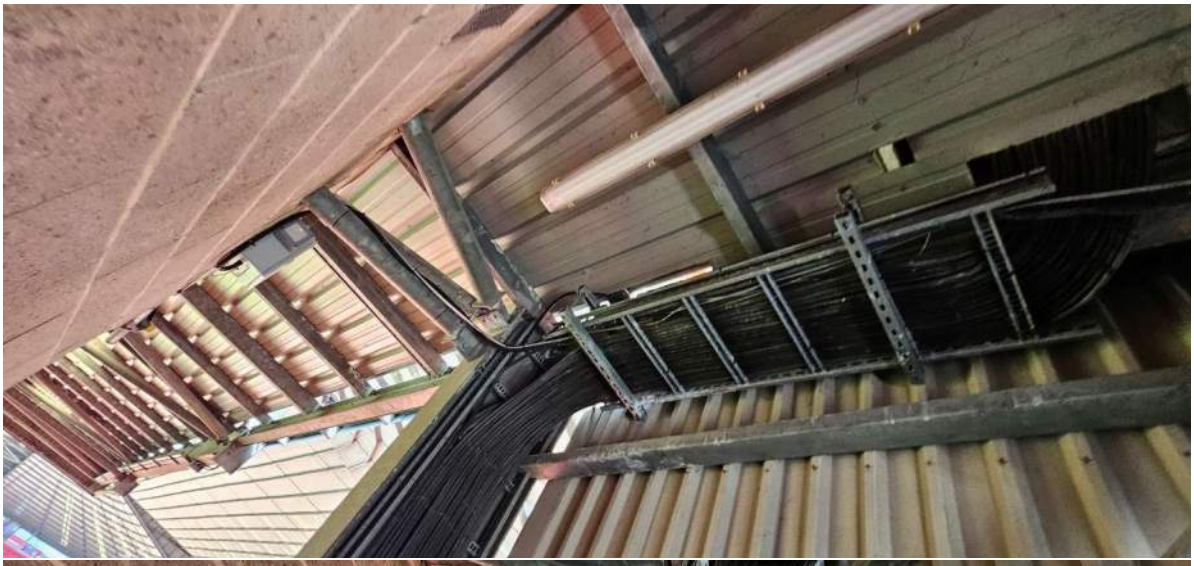


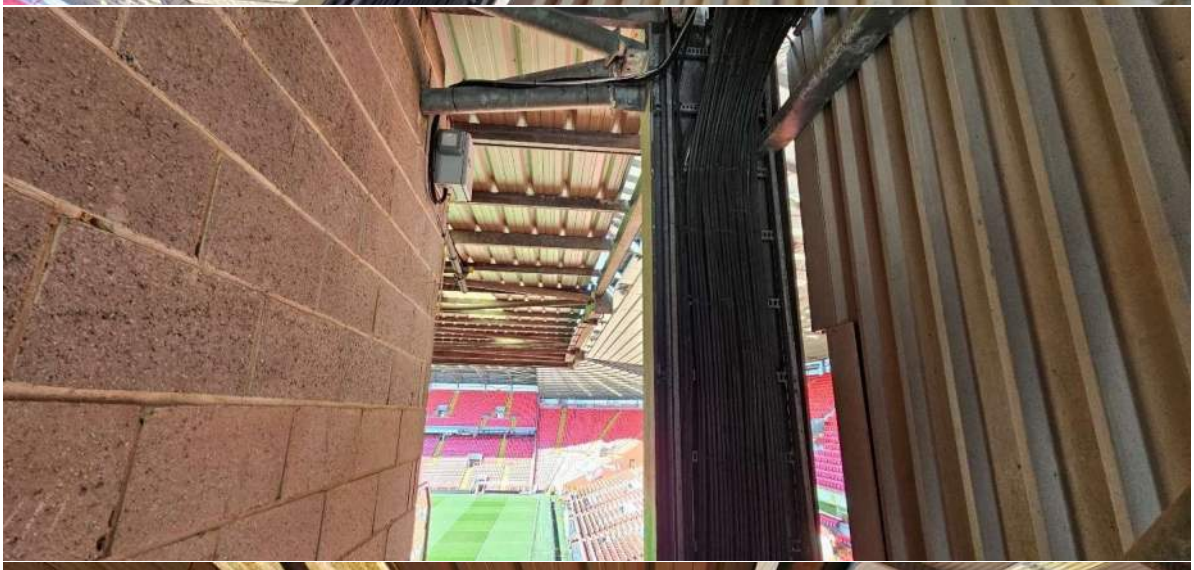


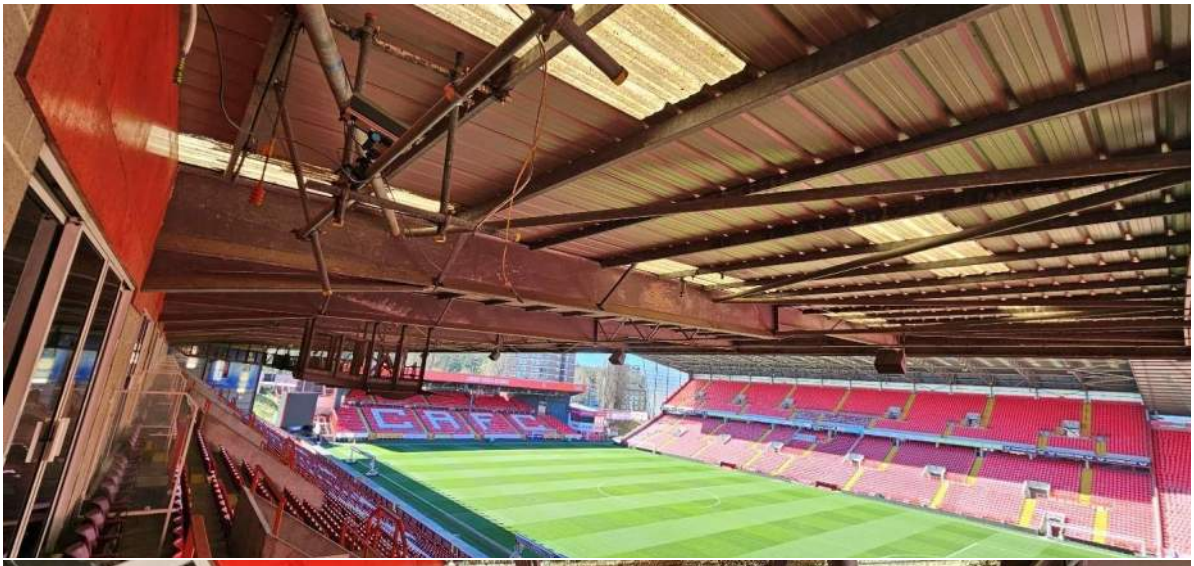

ALAN CURBISHLEY STAND EXECUTIVE SUITE HOLDERS
SUITE 1
SUITE 2
COBALT LTD
SUITE 3
CHARLTON TV

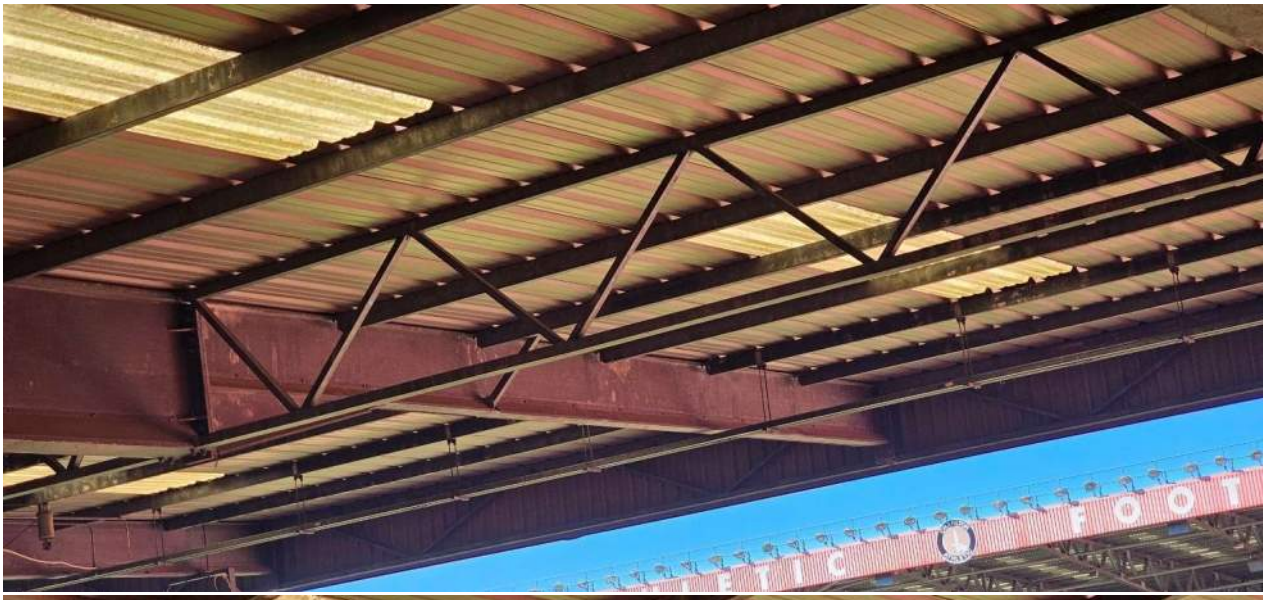

LIFT NO

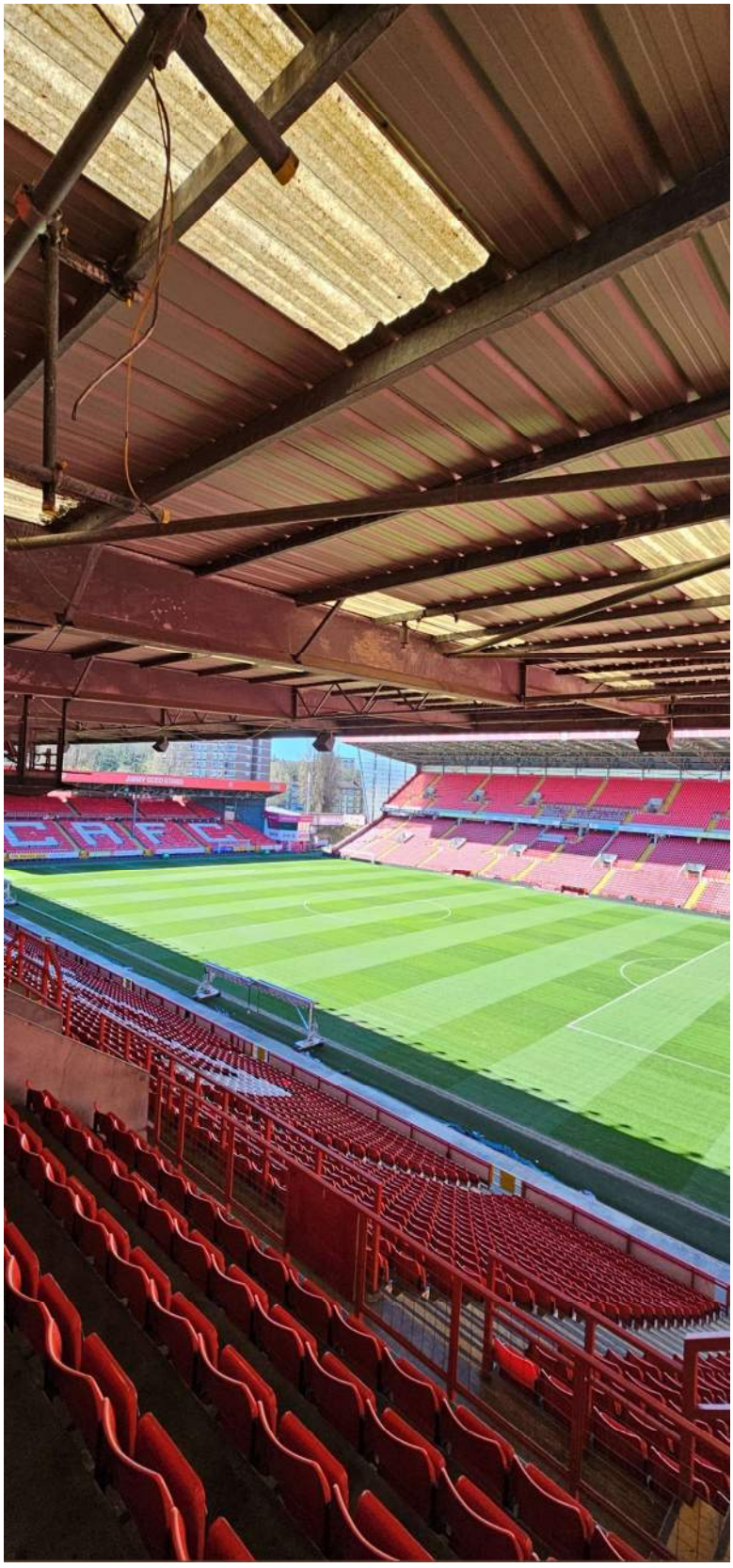

MAIN CHEMSHELF STAND EXECUTIVE SUITE HOLDERS
SUITE 1
COBALT LTD
SUITE 2
SUITE 3
CHARLTON TV
SUITE 4
SUITE 5
SUITE 6
SUITE 7
VALLEY GOLD
SUITE 8
SUITE 9
SUITE 10

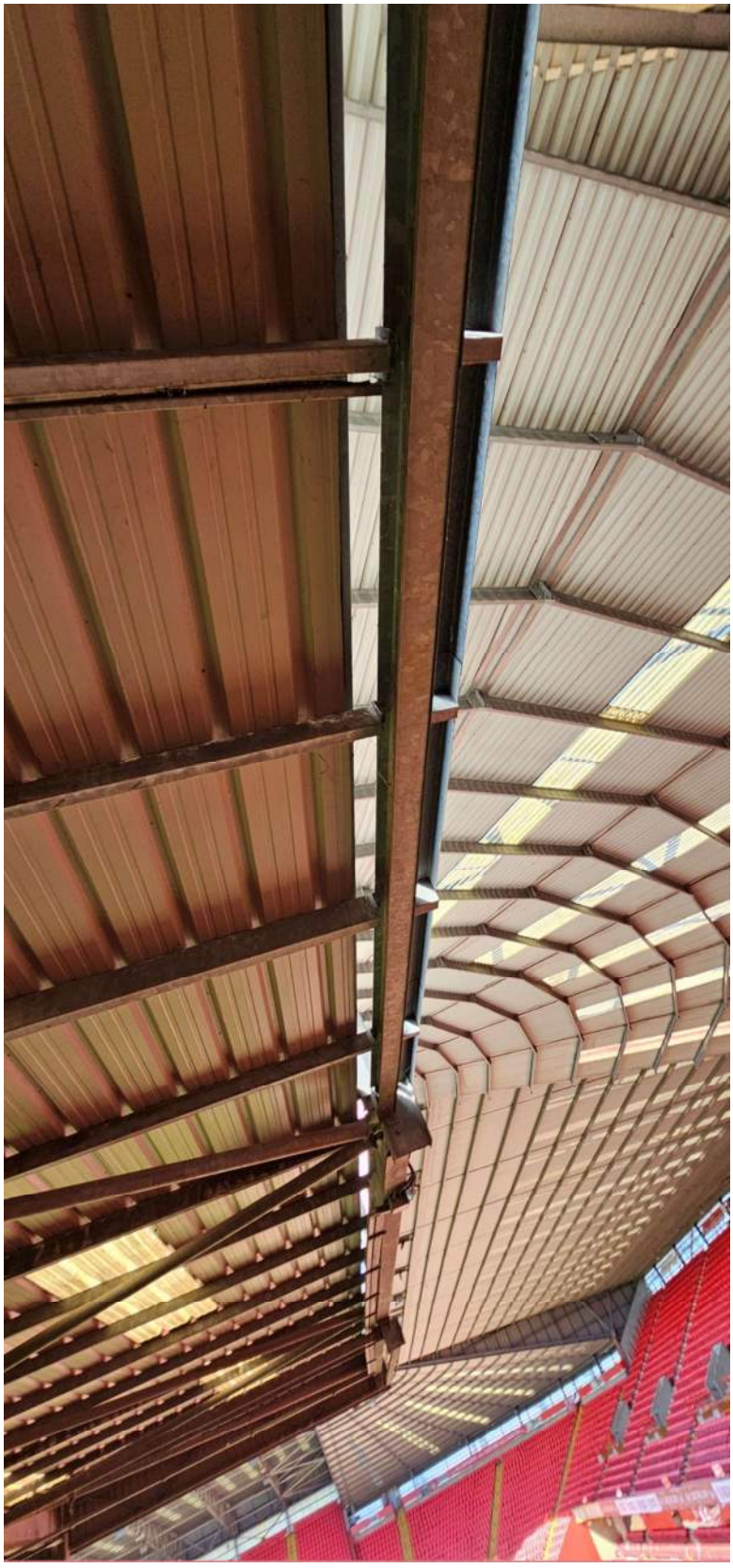


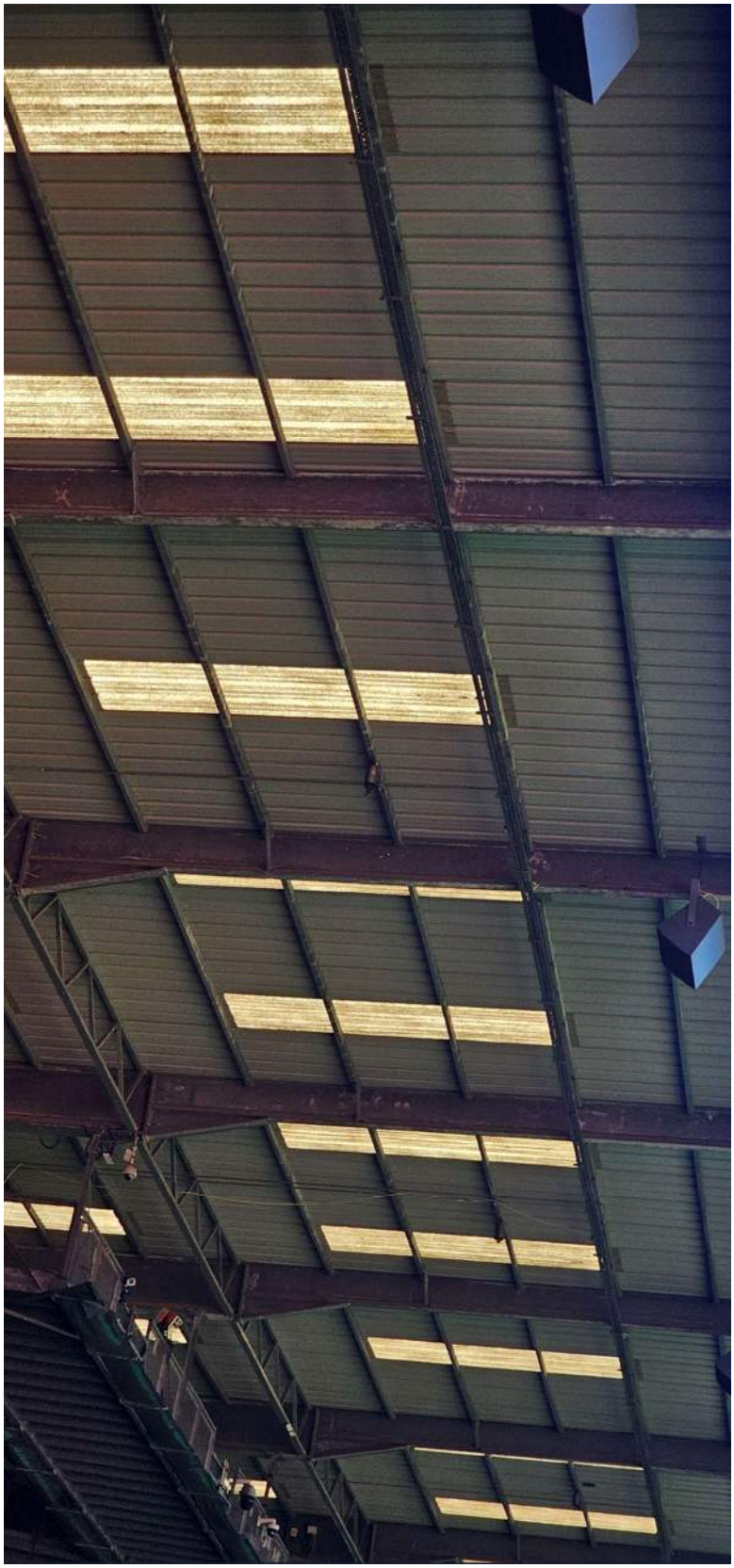




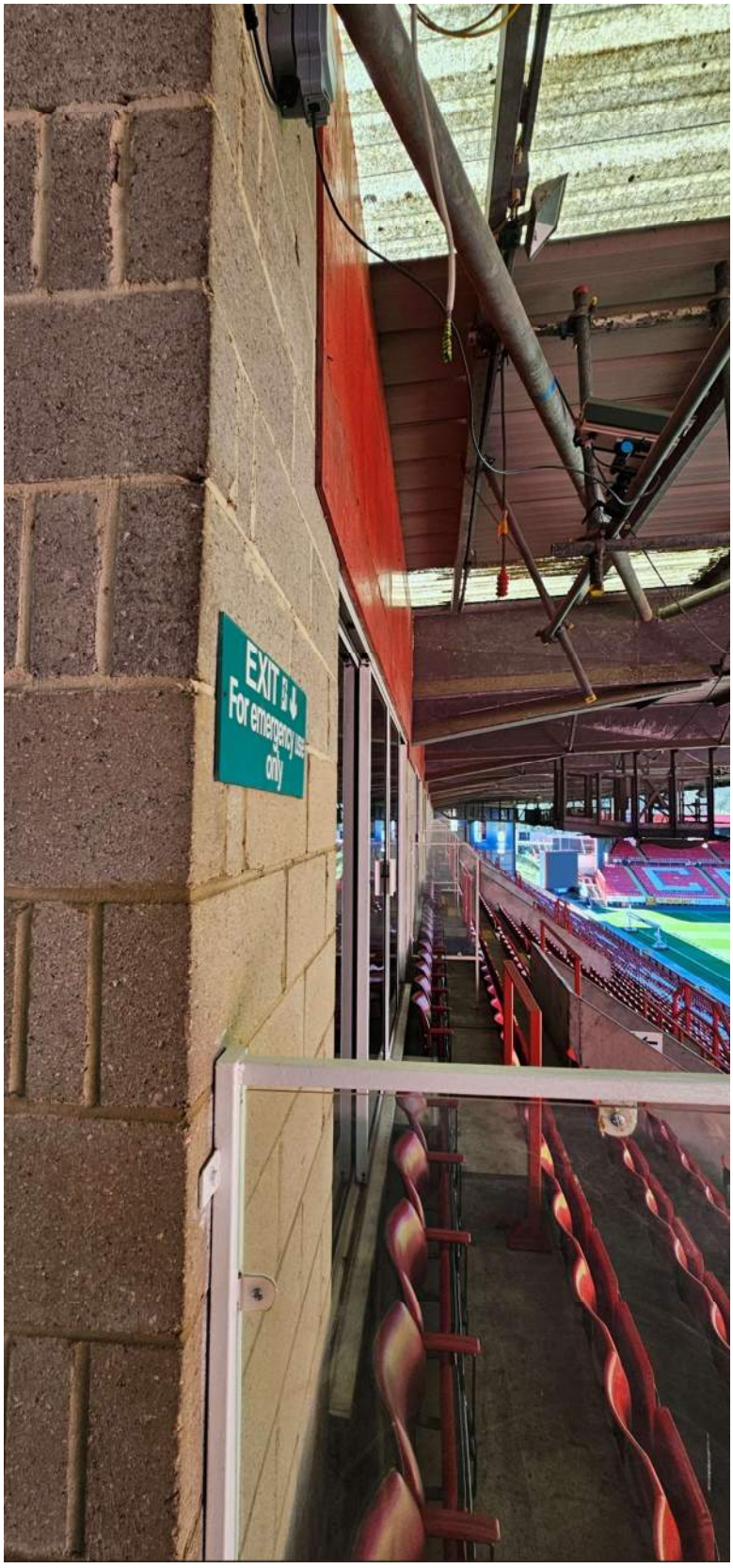









VALLEY
BREWERY


EXIT
For emergency use
only