

ANNEXE 1



Health and Safety Executive

TECHNOLOGY DIVISION

Summary sheet of FCG inspector's report

22 MAY 1989

FCG (*block caps*)

NORTH EAST

Name of firm(s) (*block caps*)

SHEFFIELD WEDNESDAY FOOTBALL CLUB

Address

Hillsborough Ground
Sheffie Id

Area no./PI group no.

Dr C E Nicholson - Deputy
Director, RLSD

Area (name)

South Yorkshire & Humberside

Copies to

Mr J B Hibbs - S1 NE/FCG

Subject of report

Condition of outer perimeter brick walls

FCG file no. NE/FCG/136/89

FCG job no. 14/C/5/89

Date of report 19 May 1989

Key words (*block caps*)

SPORTSGROUND STRUCTURES

Initiation

Request from Dr C E Nicholson

Date(s) of visit(s)

17/4/89 onwards

Visited by

C J Pertee
J B Hibbs

Relevant papers

Persons seen (names and positions)

Club and Police Officials

Summary

Following suggestions that the condition of the perimeter wall, adjacent to Gate 'C', may be relevant to the Hillsborough enquiry, a detailed examination of the wall and parapet walls over the Leppings Lane turnstiles was made. The survey was subsequently extended to cover the remainder of the perimeter walls. The wall in question was found to be distorted and lacking in lateral stability and could be made to sway when pushed by hand. The parapet walls over the turnstiles were found to be dilapidated with a loose pier, loose copings and loose/broken infill railings. Other than these parts of the perimeter the remainder was in a generally adequate condition, subject to minor repairs and pointing. Recommendations are made regarding the remedial works considered necessary to ensure the integrity, safety and effectiveness of the wall and parapets over the turnstiles at the Leppings Lane entrance to the ground.

Author's name

C J PERTEE

Principal Specialist Inspector (Construction Engineering)

1. WALL BETWEEN GATE 'C' AND SOUTH STAND AT SOUTH WEST CORNER OF GROUND

1.1 The wall is approximately 71 m (233 ft) long, stretching from Gate 'C' to the brick building housing turnstile 19 adjacent to Gate 'D'. The wall is not perfectly straight but has a slight curve-on plan, being concave when viewed from outside the ground, and having an oblique corner at a distance of 46.8 m from Gate 'C'.

1.2 It is constructed from 230 mm (9 inches) brickwork, laid in black mortar, to a type of Flemish garden wall **bond** with alternate header/stretchers in every sixth course. The rear, or inner, face of the wall is reinforced with 700 mm x 115 mm (27½ inches x 4½ inches) buttresses at approximately 7 m (23 ft) centres. The wall is capped with a precast concrete coping approximately 75 mm (3 inches) high and the height to the underside of the coping varies from 2.36 m (7 ft 9 inches) to 2.98 m (9 ft 9 inches). It is constructed on sloping ground and the height varies in steps along its length.

1.3 Mild steel angle brackets, curved outwards and carrying three strands of barbed wire, are bolted to the top external face of the wall. Some of these were loose and all were rusty and dilapidated.

1.4 The wall is distorted and bowed along its length and is also out of plumb, leaning inwards over parts of its length and outwards over other parts (see Table 1, Photographs 1-4). The **maximum** deflection out of plumb is 100 mm (4 inches) leaning outwards. No damp-proof course appears to have been provided when the wall was constructed and the mortar near the base has eroded and weathered due to damp and frost action. Both faces have been repointed in cement mortar in the past but the original black mortar can be seen where the pointing has deteriorated. It is not known upon what type of foundation the wall is constructed. However, the base of the stretch between the corner and Gate 'D' shows stepped brickwork at the base and it is possible that this is the top of a stepped brick foundation.

1.5 There was some diagonal cracking in the wall at a distance of 40 m from Gate 'C' and again at 50 m, the latter extending for the full height of the wall. In addition there were areas of loose brickwork at the top of the wall, and in places the concrete coping was weathered and cracked, particularly where the top of the wall was stepped (see Photographs 5-8).

1.6 It was found that the wall could be made to sway and oscillate when pushed. For example, when pushed near the corner, some 40 m from Gate 'C', the wall swayed and a wave travelled to the end such that the lamp pillar bolted to the wall near Gate 'C' could be seen to sway and shake. Similarly, if Gate 'C' was pushed the adjacent wall was found to shake due to the bolted connections between the gatepost and the end of the wall.

1.7 Advice was given that the wall was significantly distorted, had failed **as** a structure and was unsafe. It was considered to **be** liable to topple during high winds, or if set oscillating by crowd pressure. Consequently it was considered that it should **be** either taken down and reconstructed or stabilized by buttressing or other equally effective means.

2. BRICK PARAPET WALLS AND INFILL RAILINGS OVER TURNSTILE BUILDINGS AT LEPPINGS LANE ENTRANCE

2.1 The perimeter of the ground between gates A-C at the Leppings Lane end is enclosed by single-storey buildings housing turnstiles 1-16 and AG. The outer face of the buildings has a 230 mm (9 inches) brick parapet wall surmounted by brick piers with an infill of ornamental cast iron railings (see Photographs 17-20). As the railings do not present a barrier to climbing, but rather the reverse as they provide hand-holds, the effective height of the wall is 3.43 m (11ft 3 inches) ie to the bottom of the railings.

2.2 The parapet walls, piers and railings are generally dilapidated with loose and spalling brickwork in places, loose and broken sections of railing and loose coping stones on top of the brick piers (see Photographs 10-16). The 230 mm x 345 mm (9 inches x 13 1/2 inches) brick pier adjacent to Gate 'C' has become detached from the wall and is displaced (Photographs 9 and 10). The end of the infill railing is fixed to the pier but the opposite end of the railing is only loosely held by the next pier (Photograph 11). As a result the pier and attached railing are loose and can easily be rocked by hand. They are held in position by the wooden post of a large notice board which is positioned diagonally across the corner of the turnstile building (see Photograph 9). However, the effect of a number of people using the railing as a hand-hold to climb over the wall could be sufficient to pull the railings and pier over onto the crowd below. The coping belonging to the brick pier above turnstile 16, adjacent to Gate 'B' was lying on the ground adjacent to the exit from the turnstiles (Photograph 20).

2.3 As can be seen from the Photographs, the front of the turnstile building does not provide an effective barrier against determined assault. The fixed guide barrier adjacent to Turnstile 'G' provides a convenient foothold and the parapet railings a hand-hold (Photographs 17 and 19). Similarly, the panelled gate adjacent to Turnstile 16, together with its stay and wall brackets, provided convenient means of scaling the wall (Photographs 17 and 18). The cast iron railings are, in fact, broken in two at this point (Photograph 18).

2.4 In view of the general condition of the parapet wall, brick piers and railings, and their failure to provide an effective barrier, it is recommended that consideration be given to dismantling and reconstruction of the parapet as a solid barrier of sufficient height to deter climbers.

3. NORTHERN PERIMETER WALL

3.1 The northern perimeter comprises a 230 mm (9 inches) thick brick wall, approximately 2 m high, surmounted by a mesh fence to a total height of 4.3 m. The perimeter forms the rear boundary of the houses fronting Vere Road and thus has no access by the general public. It is generally in satisfactory condition and is not considered likely to give rise to any hazards.

4. REMAINDER OF PERIMETER WALLING

4.1 The remainder of the perimeter walling is generally provided by the outer walls of buildings, such as turnstiles, the south stand etc and there are no other substantial lengths of freestanding wall.

4.2 There were some relatively minor defects noted that required remedial action and these are listed below.

(i) The brickwork above turnstiles 35/36 and the return wall behind the turnstile building required inspection and repointing.

(ii) The screen wall to the toilets behind turnstile 43 requires repairs to the brickwork at the top of the wall.

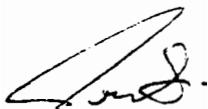
(iii) The parapet wall above turnstiles 82-88 requires repointing.

5. CONCLUSIONS

5.1 The North, South **and** East perimeter walls of the ground appear to be adequate apart from the relatively minor defects noted above.

5.2 The freestanding wall at the South West corner, between Gate 'C' and turnstiles 19-22 is distorted, has inadequate lateral stability for its height and is unsafe and liable to topple if subjected to wind or crowd pressure. As recommended earlier it should be taken down and reconstructed, suitably buttressed or stabilized by other equally effective measures. Whatever course is adopted the wall should be upgraded to meet modern design loading criteria for sportsgrounds.

5.3 The parapet walls and infill railings surmounting the turnstile building 1-16 and A-G, between Gates A-C at the Leppings Lane end of the ground are generally dilapidated and in poor condition. In addition, the adjacent barrier and gate and the infill railings provide hand and foot-holds facilitating climbing and unauthorised entry to the ground. I consider that this parapet walling should be taken down to sound brickwork and reconstructed as a solid barrier to a height that will effectively prevent unauthorised access.



C J PERTEE

Principal Specialist Inspector (Construction Engineering)

TABLE 1

CONDITION OF 9 INCH BRICK PERIMETER WALL
AT SW CORNER OF GROUND BETWEEN GATE 'C'
AND SOUTH STAND GATE 'D'

Distance from Gate C in Metres	Height Metres to underside of capping slab	Deflection mm relative to base (+ve towards ground)		Comments
		Top	Mid-Height	
0 Gatepost 'C'	2.85	- 42	- 25	Adjacent to Gatepost
2	2.70	- 50	- 20	Leaning outwards
4	2.72	- 55	- 22	" "
6	2.71	- 14	- 14	" "
8	2.70	0	0	Vertical
10	2.91	+ 14	+ 10	Leaning inwards
12	2.87	+ 6	+ 5	" "
14	2.82	+ 22	+ 12	" "
16	2.70	+ 31	+ 19	" "
18	2.74	+ 23	+ 11	" "
20	2.76	+ 9	+ 7	" "
22	2.98	+ 32	+ 14	" "
24	2.880	+ 53	+ 24	" "
26	2.78	+ 74	+ 36	" "
28	2.72	+ 77	+ 37	" "
30	2.66	+ 77	+ 36	" "
32	2.58	+ 71	+ 32	" "
34	2.55	+ 72	+ 21	" "
36	2.81	+ 71	+ 31	" "
38	2.8	+ 52	+ 26	" "
40	2.79	+ 26	+ 7	" "
42	2.79	- 20	- 7	Leaning outwards
44	2.76	- 72	- 38	" "
45.8 at buttress	2.77	- 88	- 47	" "
46.8 corner	2.76	- 68	- 43	" "
48.8	2.75	- 100	- 70	" "
50.8	2.78	- 64	- 53	" "
52.8	2.78	- 34	- 27	" "
54.8	2.36	+ 2	- 9	(Near vertical but)
56.8	2.43	+ 4	- 8	(bulging outwards)
58.8	2.51	+ 10	- 11	(at centre)
60.8	2.65	+ 21	+ 13	Leaning inwards
62.8	2.26	+ 14	0	" "
64.8	2.46	+ 5	- 13	Bulging outwards
66.8	2.63	+ 4	- 10	" "
68.8	2.76	- 3	- 13	Leaning outwards
70.8 turnstile building	2.510	- 16	- 17	" "



PHOTOGRAPH 1

(NEG 23P21)

VIEW OF SW PERIMETER WALL FROM GATE 'C' TO CORNER



PHOTOGRAPH 2

(NEG 89 04 138/25)

INTERNAL VIEW OF SW PERIMETER WALL FROM GATE 'C' TO CORNER



(NEG 89 04 138/3)

PHOTOGRAPH 3

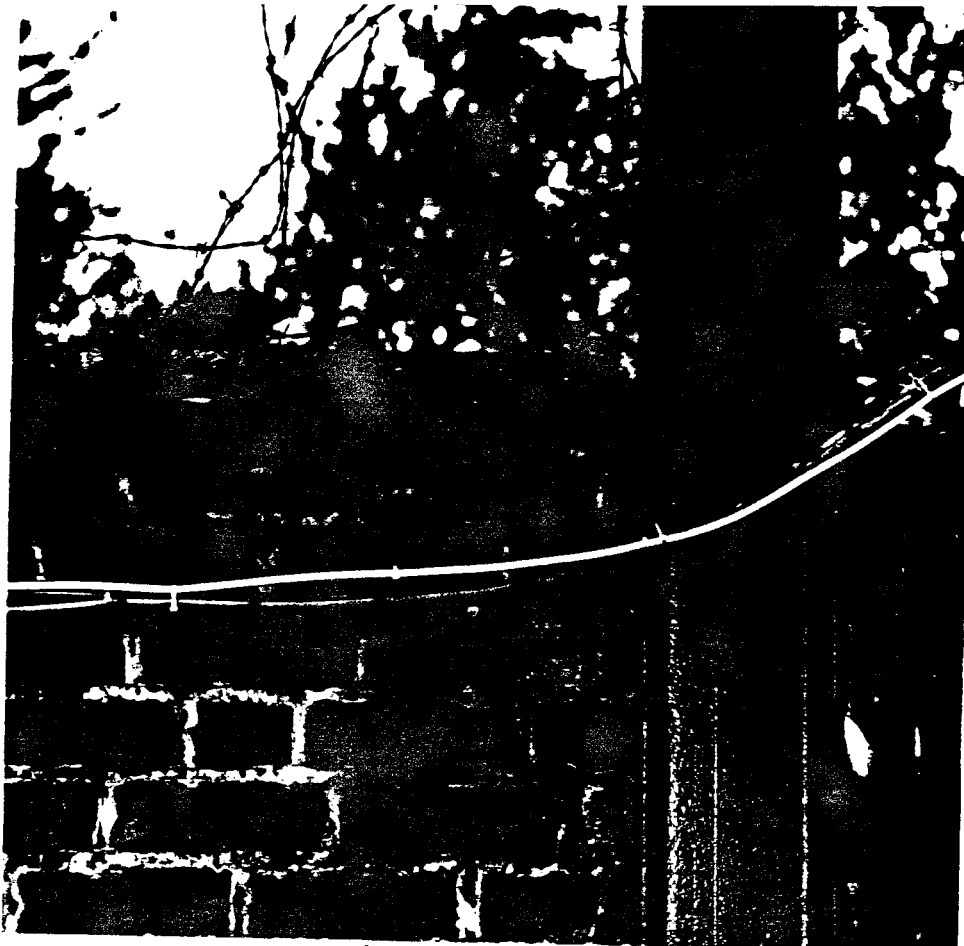
SW PERIMETER WALL FROM CORNER TO GATE 'C'



(NEG 89 04 138/3)

PHOTOGRAPH 4

SW PERIMETER WALL FROM CORNER TO SOUTH STAND



(NEG 87 04 138/1)

PHOTOGRAPH 5

SW PERIMETER WALL ADJACENT TO GATE 'C'
LOOSE BRICKWORK AT TOP OF WALL ~ INNER FACE



(NEG 89 04 138/3)

PHOTOGRAPH 6

SW PERIMETER WALL LOOSE & DISPLACED AT
STEP IN WALL HEIGHT ~ INNER FACE



(NEG 89 04 138/2)

PHOTOGRAPH 7

DETERIORATION OF BRICKWORK AT STEP IN
WALL HEIGHT ~ OUTSIDE FACE OF WALL



(NEG 89 04 131/39)

PHOTOGRAPH 8

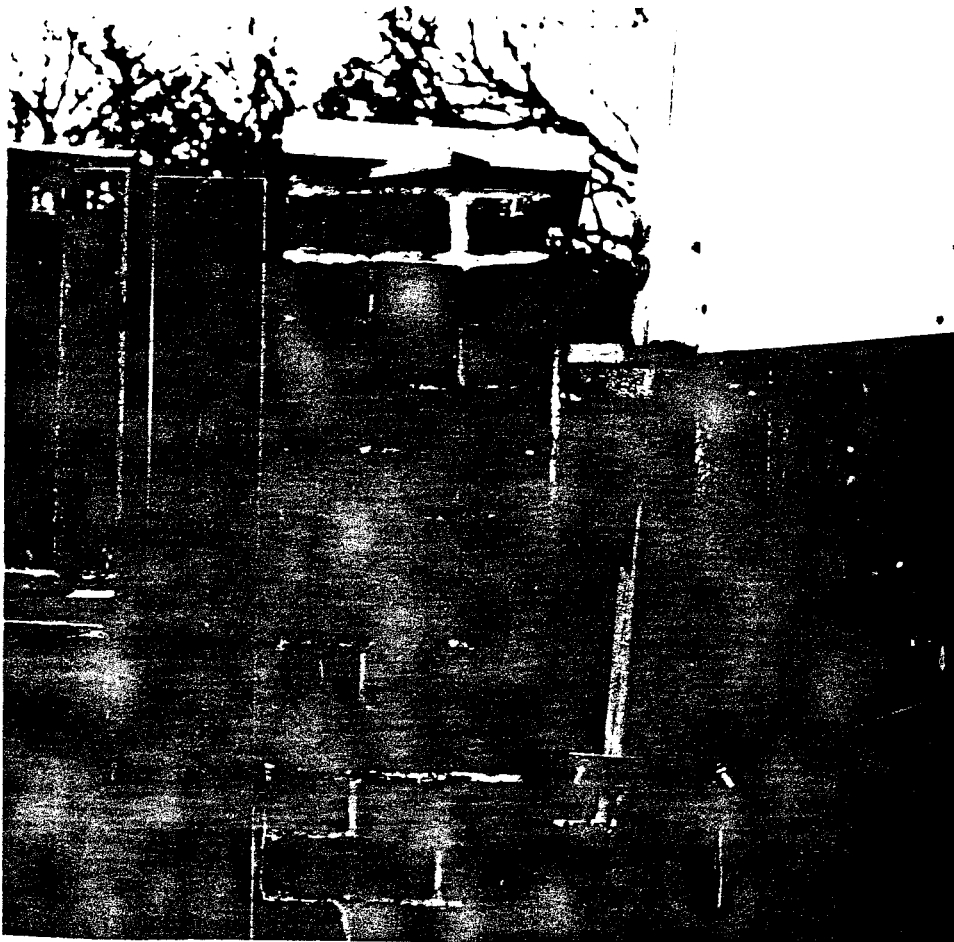
SKY PERIMETER WALL LOOSE BRICKWORK AT STEP IN
WALL HEIGHT ~ INTERNAL FACE



PHOTOGRAPH 9

(NEG C3P 11)

PARAPET WALL ABOVE TURNSTILE BUILDING A-G ADJACENT TO GATE 'C'



PHOTOGRAPH 10

(NEG B9 04 135/46)

• LOOSE BRICK PIER AND
• LOOSE COPING
• PARAPET WALL OVER
TURNSTILE'S' ADJACENT
TO GATE C



(NEG 89 04 138/14)

PHOTOGRAPH 11

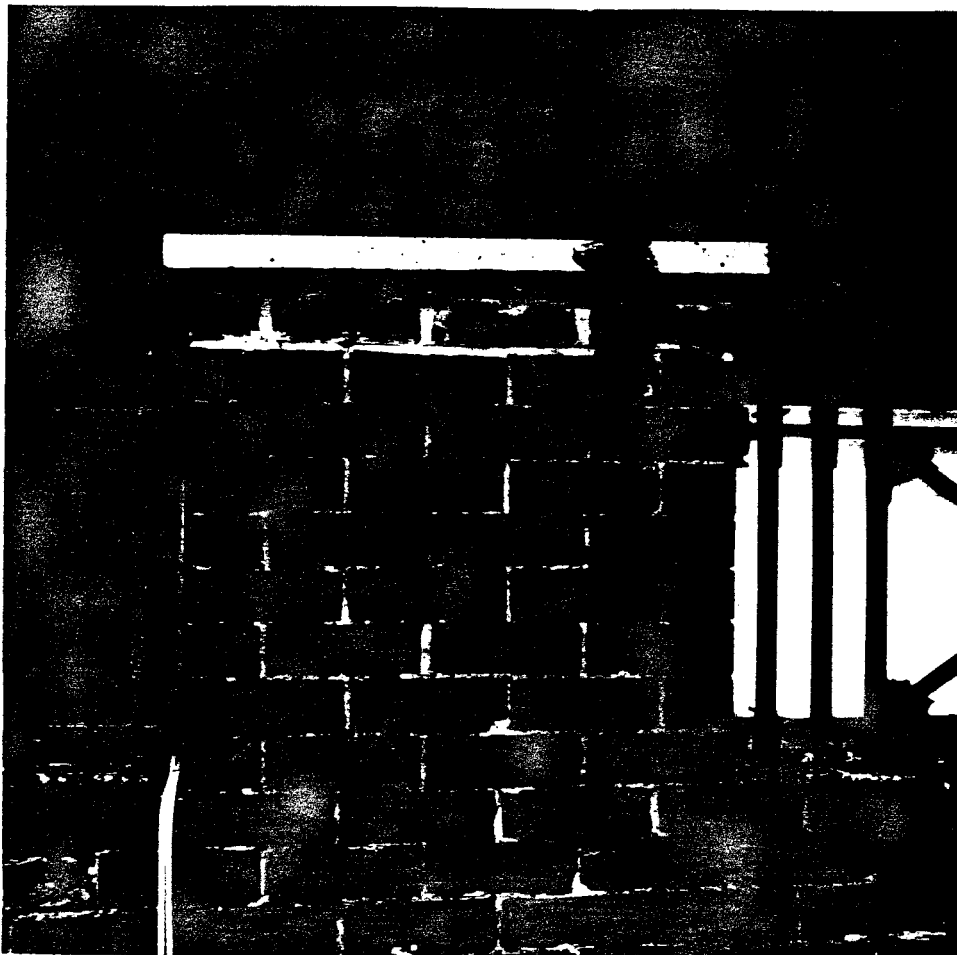
INFILL RAILING ABOVE TURNSTILE'S' END OPPOSITE
LOOSE BRICK PIER SHOWN IN PHOTOGRAPH 10



(NEG 89 04 138/15)

PHOTOGRAPH 12

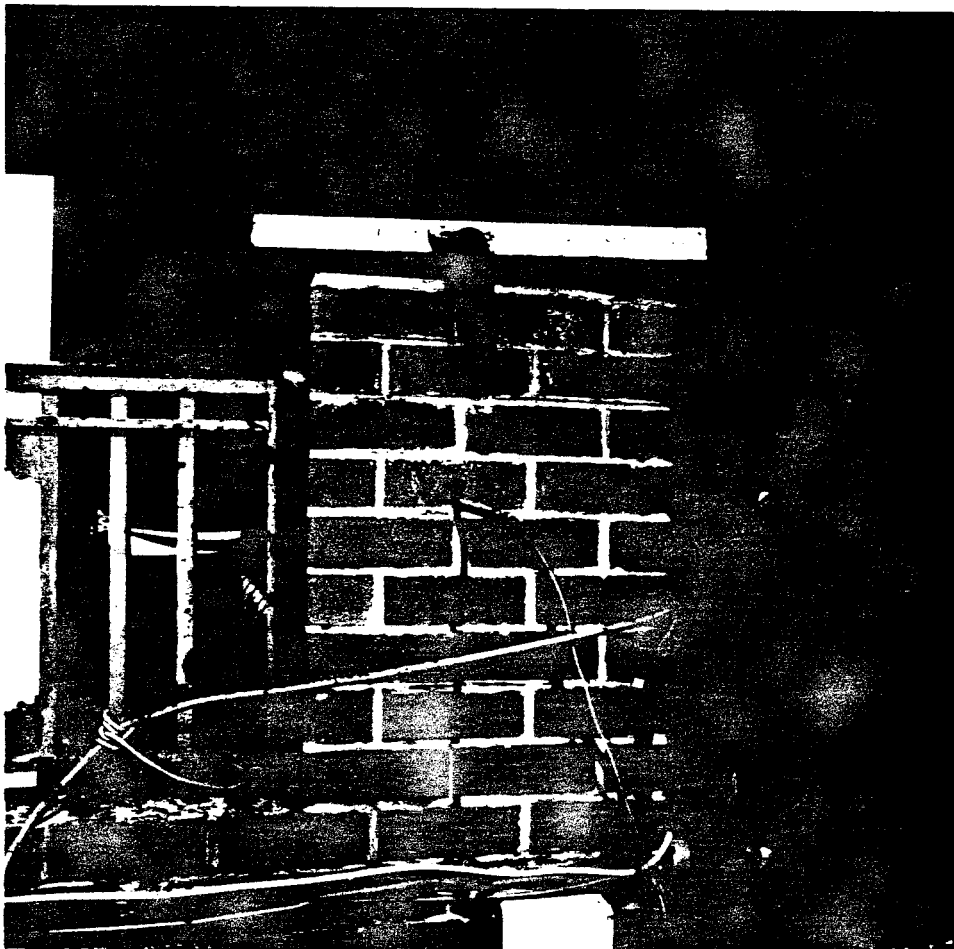
TOP OF ABOVE BRICK PIER OVER TURNSTILE'S'
SHOWING LOOSE COPING



(NEG 89 04 138/17)

PHOTOGRAPH 13

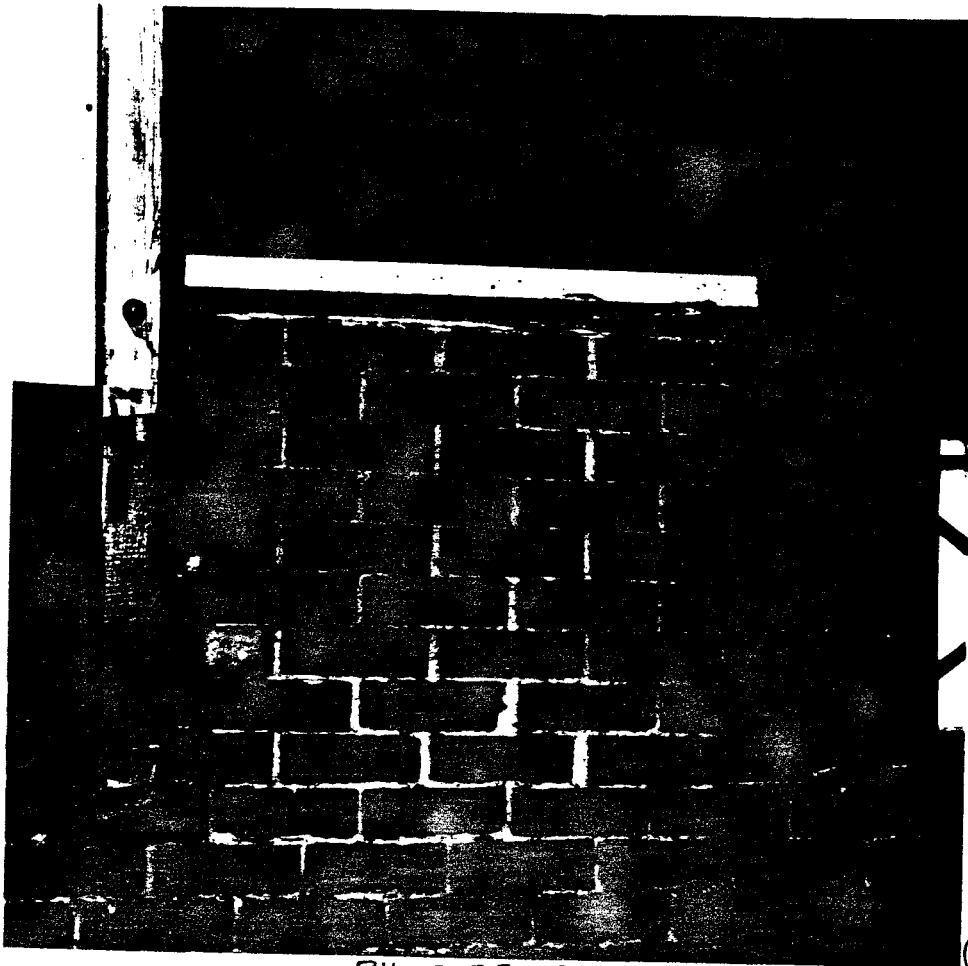
BRICK PIER IN PARAPET OVER TURNSTILES A-G
SHOWING LOOSE COPING



(NEG 89 04 138/20)

PHOTOGRAPH 14

AS ABOVE



(NEG 89 04 138/16)

PHOTOGRAPH 15

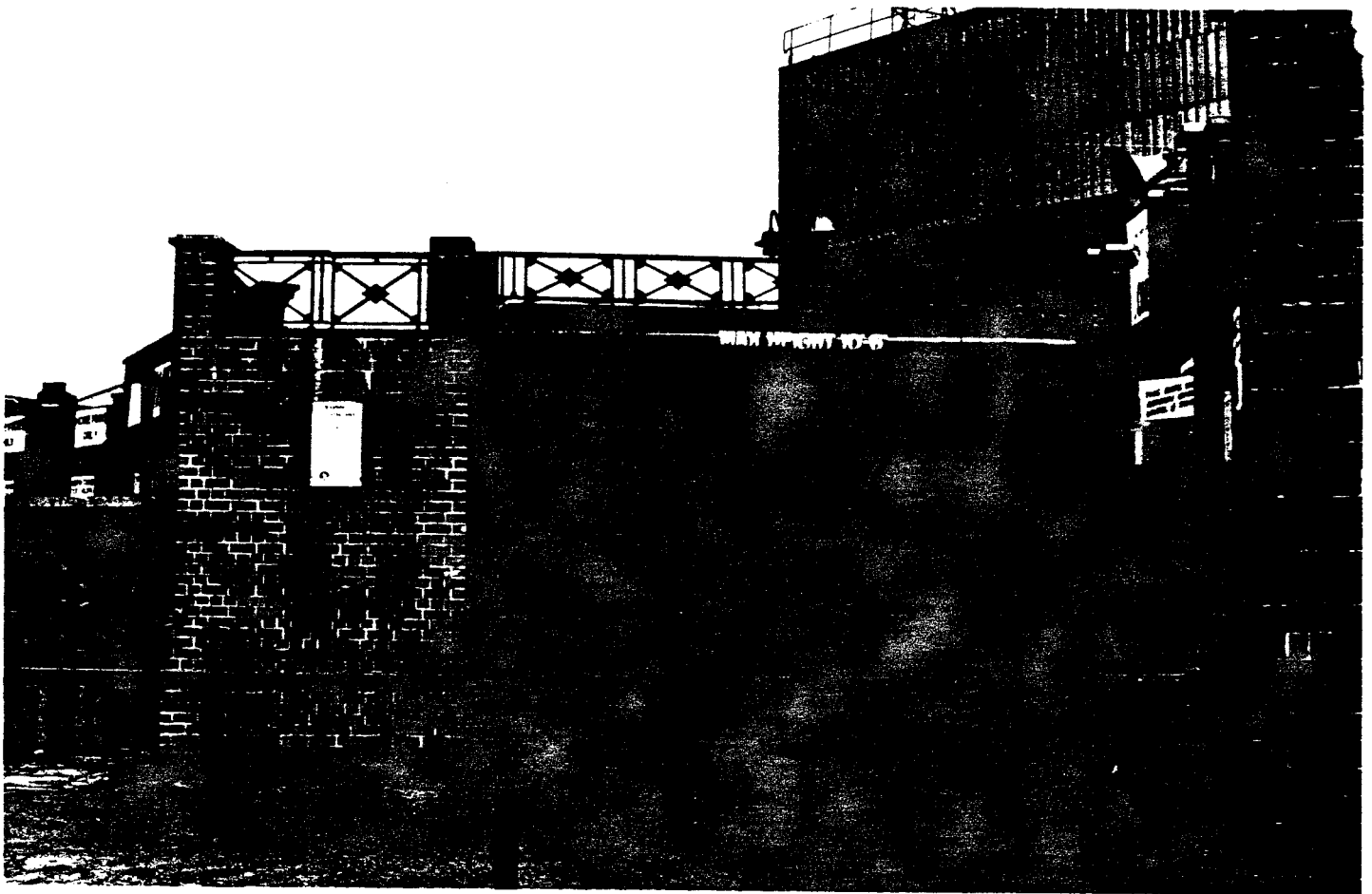
BRICK PIER IN PARAPET OVER TURNSTILES A-G'
SHOWING LOOSE COPING



(NEG 89 04 138/22)

PHOTOGRAPH 16

PARAPET OVER TURNSTILES A-G LOOSE AND
SPALLING BRICKWORK ON INNER FACE OF WALL



PHOTOGRAPH 17

(NEG CSP 17)

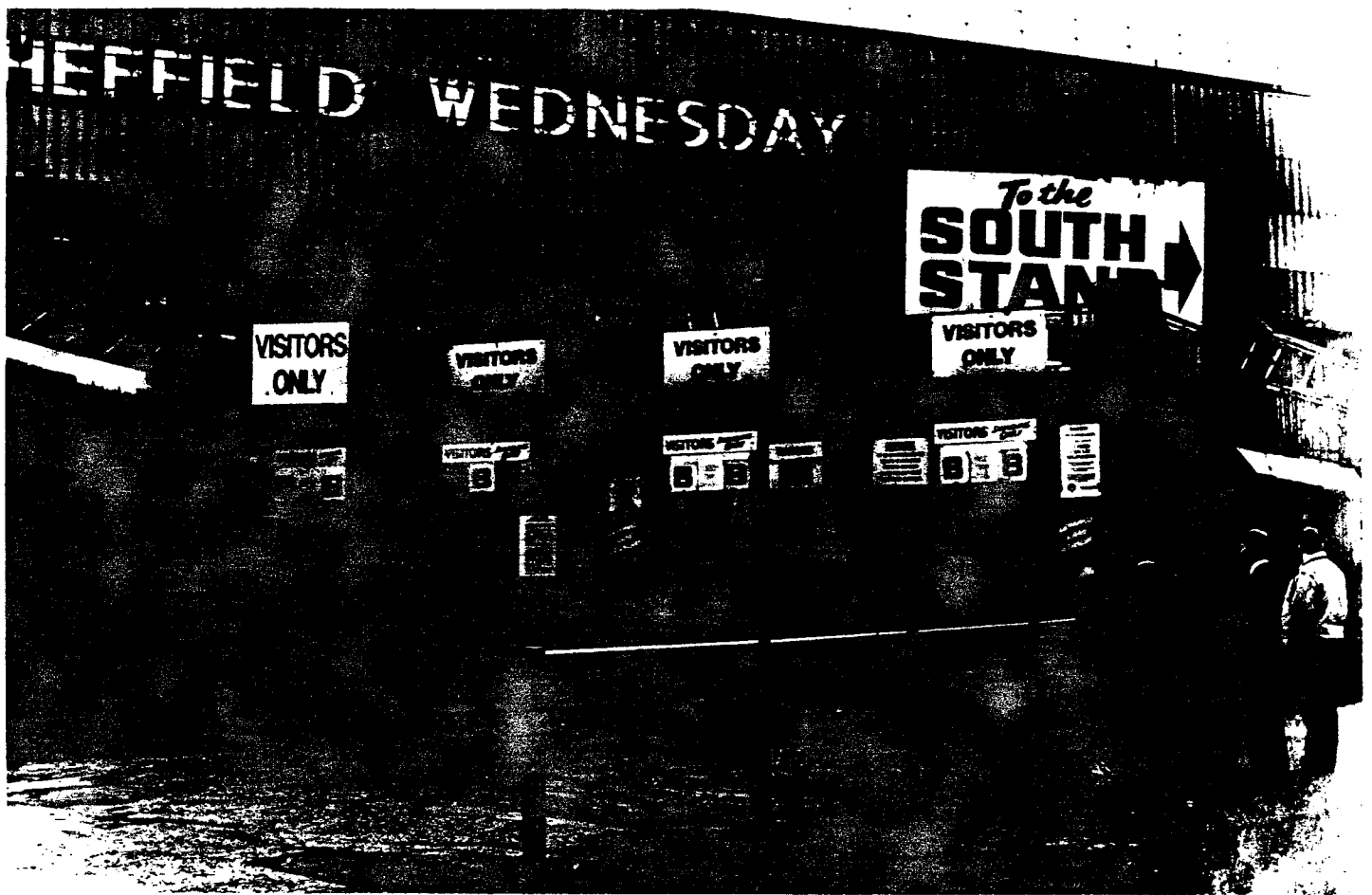
EXTERNAL VIEW OF GATE 'B' NOTE MISSING COPING TO BRICK PIER ADJACENT TO LA GATEPOST AND 'CLIMBING AIDS' PROVIDED BY PANDELLED GATE TO LEFT AND BARRIER IN FOREGROUND



PHOTOGRAPH 18

(NEG CSP 18)

PARAPET WALL AS ABOVE SHOWING BROKEN RAIL INFILL



PHOTOGRAPH 19

(NEG C3P15)

EXTERNAL VIEW OF TURNSTILES A-G NOTE AID TO CLIMBING WALL PROVIDED BY BARRIER IN FOREGROUND



PHOTOGRAPH 20

(NEG C3P19)

INTERNAL VIEW OF GATE B SHOWING CONCRETE COPING DISPLACED FROM BRICK PIER OVER TURNSTILE 16 ADJACENT TO GATEPOST