## Summary sheet of FCG inspector's report

<table>
<thead>
<tr>
<th>Name of firm(s) (block caps)</th>
<th>SHEFFIELD WEDNESDAY FOOTBALL CLUB</th>
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<tbody>
<tr>
<td>Address</td>
<td>Hillsborough Sheffield</td>
</tr>
<tr>
<td>Subject of report</td>
<td>Examination of Turnstiles A-G</td>
</tr>
<tr>
<td>Initiation</td>
<td>Verbal via RLSD</td>
</tr>
<tr>
<td>Visited by</td>
<td>Mr J B Hibbs (NE FCG)</td>
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<td></td>
<td>Mr C J Pertee (NE FCG)</td>
</tr>
<tr>
<td>Persons seen (names and positions)</td>
<td>Club Secretary and Police Officers at Engineering Control Room</td>
</tr>
<tr>
<td>Summary</td>
<td>Examination of turnstiles A-G confirmed that although old, somewhat worn and in many cases in need of lubrication/routine maintenance etc all were working satisfactorily and would each allow at least 20 persons per minute throughput. Data on load/pedal release pressure tests, throughput and computer count tests are the subject of a separate RLSD report.</td>
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<table>
<thead>
<tr>
<th>Author's name</th>
<th>J B HIBBS</th>
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<tbody>
<tr>
<td>Special. Inspector</td>
<td>Specialist Inspector (Mechanical Engineering)</td>
</tr>
<tr>
<td>FCG (block caps)</td>
<td>NORTH EAST</td>
</tr>
<tr>
<td>Area (name)</td>
<td>South Yorkshire &amp; Humberside</td>
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<tr>
<td>Copies to</td>
<td>MR C J Pertee, PSI, NE FCG</td>
</tr>
<tr>
<td>FCG file no.</td>
<td>NE/FCG/131/89</td>
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<td>FCG job no.</td>
<td>14/M/19/89</td>
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<td>Date of report</td>
<td>16 May 1989</td>
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<tr>
<td>Key words (block caps)</td>
<td>FOOTBALL GROUNDS (RUNSTILES)</td>
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<tr>
<td>Date(s) of visit(s)</td>
<td>24-28 April 1989 (Except 27th)</td>
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<tr>
<td>Relevant papers</td>
<td>Makers Leaflets - copies attached.</td>
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I visited the Sheffield Wednesday Football Club ground during the week commencing the 24th of April 1989 to continue investigations at your request and in accordance with the wishes of the judicial enquiry team headed by Justice Taylor.

I was present on site between the 24th and 28th of April with the exception of Thursday the 27th of April and on each occasion I was accompanied by Mr C J Pertee, Principal Specialist Inspector, Construction Engineering, North East FCG. During the week I examined turnstiles 17-23 (A-G) and this report contains the results of this examination.

**TURNSTILES**

The general layout of the 7 turnstiles A-G which feed the west terrace at the football ground is shown in Fig. 1 of my earlier report NE/FCG 14/M/18/89 and details are confirmed in Messrs Ralph Braid & Associates drawing no. 1340/04.
A general view of the turnstiles from the approach side is shown in Fig. 2 and from the egress side in Fig. 3.

All the turnstiles were of considerable age and were noted to have been manufactured by Messrs W D Ellison & Co Ltd, Irlam, Manchester. Details of the turnstiles and their method of operation are shown in the makers trade literature at Appendix 1.

All the turnstiles were of the low pattern type and turnstiles A, C, D, E, F and G were fitted with convex arms. Turnstile B was fitted with straight arms.

I took detailed dimensions in all the turnstile enclosures and assisted with initial functional tests of each unit.

All the turnstile ratchets were working satisfactorily and although worn, all the foot pedals and footstep motion cams were working correctly. Some of the lower mechanisms were in need of lubrication, however, this did not prevent the mechanisms from operating satisfactorily and allowing at least 20 persons per minute to pass through each turnstile.

I noted the patent numbers on the turnstiles which were shown as 658191 and 658226 and were marked on several of the mechanical counter cover plates. The serial numbers were also marked in this area but were only present on turnstile C (serial no. 14038), turnstile D (serial no. 13263) and turnstile G (serial no. 14039).

I noted that all the doors at the front of the turnstile enclosure were approximately 0.63 m (25 inches) wide and the opening widths were between 465 mm and 555 mm (18.3 inches and 21.8 inches). The heights of the openings were approximately 2 m (79 inches).
The passageways through each turnstile were approximately 2 m (6 ft 9 inches) long and 0.5 m (20 inches) wide. The ceiling height in each passageway was approximately 2.25 m (7 ft 5 inches).

The height of the turnstile tables was approximately 1.04 m (3 ft 5 inches). The heights of the turnstile arms and their lower skirt plates etc and the gaps between the ends of the arms and adjacent walls in individual passageways are shown in Table 1.

Vertical blocks of wood were secured to the walls at the entry side of the turnstiles in all except passageway C where a box had been constructed on the wall opposite the centre of the turnstile spindle. All blocks of wood in turnstiles except C were approximately 14 cm x 14 cm x 61 cm long (5.5 inches x 5.5 inches x 2 ft long) which were positioned with their lower ends approximately 38 cm (15 inches) above floor level and their central axis approximately 30 cm (one foot) forward of the turnstile axis.

The box mounted on the wall opposite the rotating arms of turnstile C was 46 cm (18 inches) long on its front face and 61 cm (2 ft) long on its rear face. The box was 24 cm (9.5 inches) deep and projected from the wall by approximately 10 cm (4 inches). The top face of this box was approximately level with the top face of the turnstile arm. (See Fig. 6).

Additional wooden blocks were also fitted on the walls opposite the turnstile arms in passageways A and B only. These blocks were mounted on the turnstile side of the aforementioned vertical wooden blocks and had curved form varying from 7.5 cm (3 inches) thickness at the ingress end to 9.5 cm (3.75 inches) thickness at a point opposite the turnstile axis centre. These blocks were approximately 49 cm (19.25 inches) long and 14 cm (5.5 inches) deep and reduced the gap at the end of
the turnstile arm to approximately 2.5 cm (one inch).

Photographs of turnstiles A to G taken from the egress side show the aforementioned features together with the respective footstep cams and pedal counterweights etc. (See Figures 4-10),

I removed several of the foot pedals from the turnstiles and two of these from units B and C are shown in Figs. 11 and 12 respectively.

Pedal return action was achieved by a counterweight mounted on the respective ann, these weights can be seen in Figs. 11 and 12.

**OTHER OBSERVATIONS**

During my examination of the turnstiles I noted that an electronic counting system had been installed and that duplicate switching arrangements were present on the majority of the units.

Small roller type limit switches were noted in positions immediately above the central boss carrying the turnstile arm adjacent to the main rotating shaft. These switches were arranged such that they would be actuated at each quarter turn of the turnstile. The central switches at units C, D and E were the only ones connected.

Additional rat-tail switches were seen to have been positioned on the wooden frames at the egress side of the turnstile block and were actuated at each indexing motion by the respective turnstile arm. However these switches were disconnected and had broken tails at turnstiles C, D and E, they appeared to be connected and
functioning correctly at the other turnstiles A, B, F and G.

Load/pedal resistance testing and throughput rate testing of the turnstiles together with checks on the mechanical and computer counting systems are the subject of a separate RLSD report.

It was also noted that photoelectric emitters and sensors had been arranged in pairs across each turnstile passageway at positions above the turnstile arms as well as at table level at the egress side. Examination of these devices indicated that many had been either removed or disconnected and in some cases the wiring had been cut. The latter was noted on the over/turnstile sensors at units C and F.

CONCLUSIONS

Examinations of turnstiles A-G confirmed that although old, somewhat worn and in many cases in need of lubrication/routine maintenance etc. all were working satisfactorily and would each allow at least 20 persons per minute throughput.

Data and load/pedal release pressure tests, throughput and computer count tests are the subject of a separate RLSD report.

RECOMMENDATIONS

It is recommended that the gaps between turnstile arms and adjacent walls should be reduced to the minimum practicable safe dimension in order to prevent persons gaining access without actuating the turnstile mechanism.

In my opinion the over/turnstile photoelectric devices should be reinstated to detect persons climbing over without actuating the mechanism, alternatively, full height
turnstiles (floor to ceiling) should be installed.

Where necessary, individual turnstiles should be repaired at their broken table supporting pillars in order to improve rigidity and several of the units required re-levelling.

End float in all the turnstile spindles should be checked and adjusted accordingly as many exhibited approximately 4 mm lift.

All ratchets, pedal mechanisms and cams should be suitably lubricated at appropriate intervals.

J B HIBBS
Specialist Inspector (Mechanical Engineering)
### Table 1

**Turnstile Data**

<table>
<thead>
<tr>
<th>Turnstile No.</th>
<th>Arm - Wall</th>
<th>Arm Heights (CM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approx. Gap (CM)</td>
<td>Skirt</td>
</tr>
<tr>
<td>A</td>
<td>2.5°</td>
<td>28*</td>
</tr>
<tr>
<td>B</td>
<td>2.5°</td>
<td>58</td>
</tr>
<tr>
<td>C</td>
<td>11.0</td>
<td>25</td>
</tr>
<tr>
<td>D</td>
<td>9.0</td>
<td>23</td>
</tr>
<tr>
<td>E</td>
<td>8.5</td>
<td>21</td>
</tr>
<tr>
<td>F</td>
<td>6.5</td>
<td>21</td>
</tr>
<tr>
<td>G</td>
<td>10</td>
<td>24</td>
</tr>
</tbody>
</table>

*φ To curved wooden block

* To c/l of rail
Fig. 1 - Gates and Turnstiles. Layout West Side
NEFCG 131/89 14/M/18-19/89

Based on Eastwood & Partners
drw. no. 6708/8A

See also Ralph Brade
drw. no. 1340104
General view of turnstiles A-G from approach side.

General view of turnstiles A-G from the express side.
FIG. 4.

Twinståle 'A'
Pedal mechanism at turnstile 'B'
Turnstile 'c'
Pedal mechanism at turnstile ‘c’
Pedal mechanism at turnstile 'D'
Pedal mechanism at turnstile 'E'
Pedal mechanism at turnstile 'E'
Pedal mechanism at turnstile 'G'

Side view of pedal 'B'
Side View of Pedal 'C'

Fig. 12a

Plan View of Pedal 'C'

Fig. 12b
ELLISON'S

HEAVY DEEP STRAIGHT ARM TURNSTILES

The illustration shows two registering Turnstiles and one Barrier.

This type of Turnstile is of a very pleasing design and is generally used at Zoological Gardens, Museums, Art Galleries, etc., where there is a steady flow of people and not sudden rushes as at football matches.

It can be supplied either registering, controlled by foot-lever, or non-registering for exit only.

Ellison's "Rush-preventive" Footstep Motion.

This footstep is fitted to all our turnstiles and ensures free rotation of the spindle on ball, bearings which may be lubricated by removing the oiling screw. The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.

6'10"

3'6"

Height overall 3' 5"

Approximate Weights:

Turnstiles 4 cwts. each.

Barriers 2 cwts. each.

Prices on application.

W. T. ELLISON & COMPANY LIMITED

Turnstile Specialists

313 Bolton Road - Pendleton - Salford 6 - Lancs

Telephones: Penn 2030

Series No. 7.
Ellison's
"Rush-preventive"
Footstep Motion.

This footstep is fitted to all our turnstiles and ensures free rotation of the spindle on ball bearings which may be lubricated by removing the oiling screw.

The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.

The illustration shows two registering Turnstiles and one Barrier. This type of Turnstile has been specially designed with extra deep convex arms to prevent creeping underneath and also more than one person passing through for each payment. They are most effective in separating the crowd into units and are highly recommended where great rushes are anticipated.

Can be supplied registering only, controlled by footlever, or non-registering for exit only.

Approximate Weights:
Turnstiles 4 cwt. each.
Barriers 2 cwt. each.

Prices on application.

Series No. 6.
Ellison's Improved Patent Safety Counter

Made in our own Works — strongly constructed, reliable and easily read.

The cover and base are provided with two apertured lugs through which a screw is passed—thus securing the counter in position on the turnstile. Provision is made for sealing in accordance with the requirements of the Inland Revenue Authorities, so that any tampering with the counter cannot be concealed.

Prices on application.

W. T. Ellison & Company Limited

323 Bolton Road, Pendleton, Salford 6, Lancs

Telephones: Pen 2030

Telegram: Turnstiles, Manchester
ELLISON'S

Heavy Convex Arm Turnstiles

Can be supplied either registering, controlled by footlever, or non-registered for exit only.

The illustration shows two registering Turnstiles and one Barrier. This Turnstile has been specially designed to prevent more than one person passing through for each payment. It proves its efficiency where great rushes have to be coped with, as it is most effective in separating the crowd into units.

Approximate Weight:
Turnstiles, 4 cwt. each: Barriers, 2 cwt. each.

Prices on application.

ELLISON'S "RUSH-PREVENTIVE" FOOTSTEP MOTION.
This footstep is fitted to all our Turnstiles and ensures free rotation of the spindle on ball bearings which may be lubricated by removing the oiling screw.

The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.
RUSH PREVENTIVE

ELLISON'S

PATENT

TURNSTILES

With All Latest Improvements

THE ONLY
RELIABLE
MACHINE.

Buy
No,
Others.

No matter how cheap a Turnstile may be, it is useless unless accurate absolutely untamperable.

Are unequalled for durability, accuracy, and finish.

The following list of Clubs and Racecourses, among others, that have been supplied by us will show that we are the leading makers of Turnstiles, and have a world-wide reputation:

Racecourses. Association Football Clubs.
Lancashire County. Manchester. Manchester.
Southport Central. Queen's Park. Liverpool.
Borough. Bury St. Edmunds. &c.
Athletic Co. Ltd. Notts County. Dunfermline.
Lambeg (Ireland). Manchester City. Forfar.

Also

St. Anne's Pier. Altrincham Baths. Stretford Baths.

Festival of Empire, Crystal Palace, 1911. 108 Machines.

Prices on application. Send for testimonials.

W. T. ELLISON & CO., Ltd., ENGINEERS,
IRLAMS-O'-TH'-HEIGHT, MANCHESTER.

Telegram and Cables: "ELLISON'S LTD., IRLAMS-O'-TH'-HEIGHT"

Three words. National Telephone: No. 50, MANCHESTER.