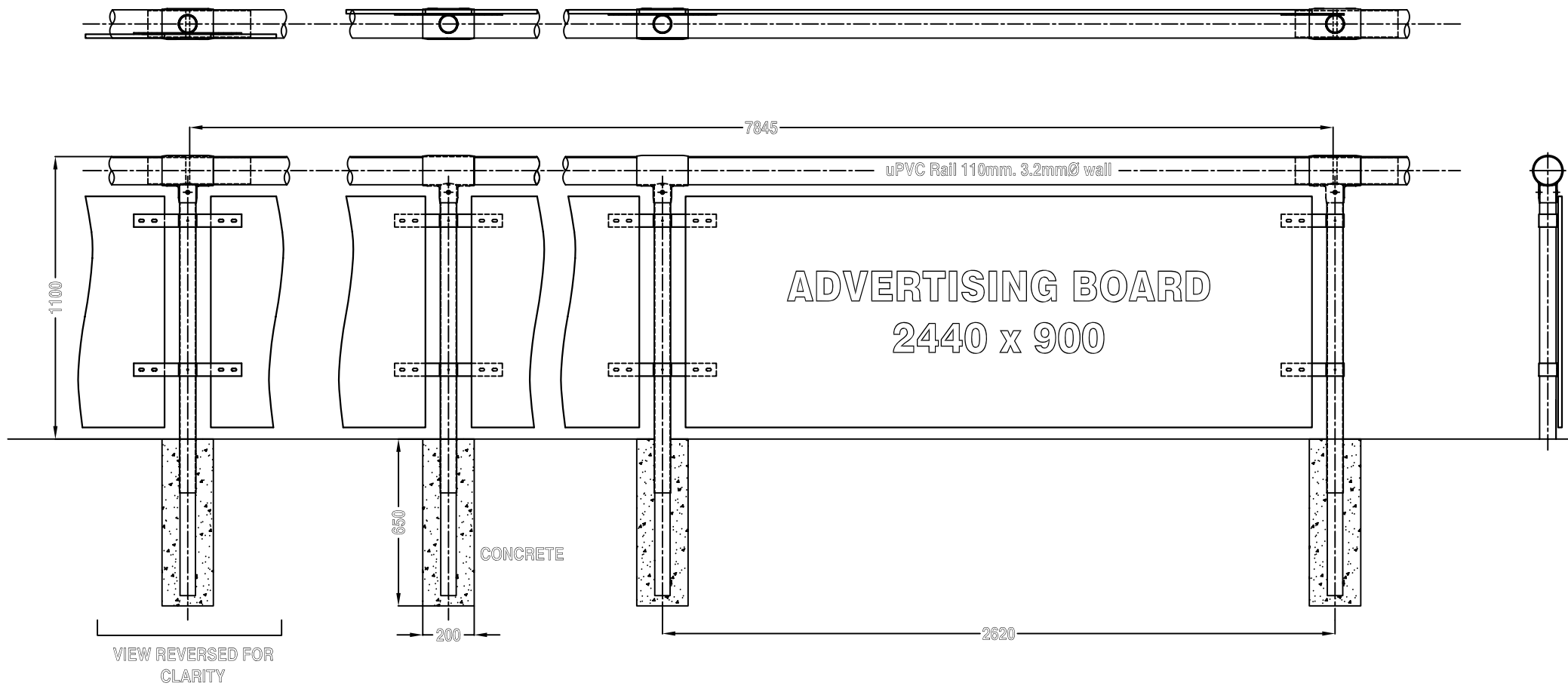


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	179-5000C-GW	Colour: Green & White/Vert & Blanc/Grün & Weiß
	179-5000C-W	Colour: White/Blanc/Weiß
Description:	Pitch Surround - 5.20 m Machinery Access - White COMPLETE	
Description:		
Beschreibung:		



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Drawing No: BAR 179 Issue: 01
 Date: 01.04.2008
 Scale: N.T.S. Units: mm



System No. 161

Colour:

Or:

Description: Pitch Surround - Crowd Barrier with Advertising Space

Description: Barrière spectateurs pour terrains de sport avec l'espace publicitaire

Beschreibung: Taktabstands-Einfassung - Masse-Sperre mit Reklamefläche



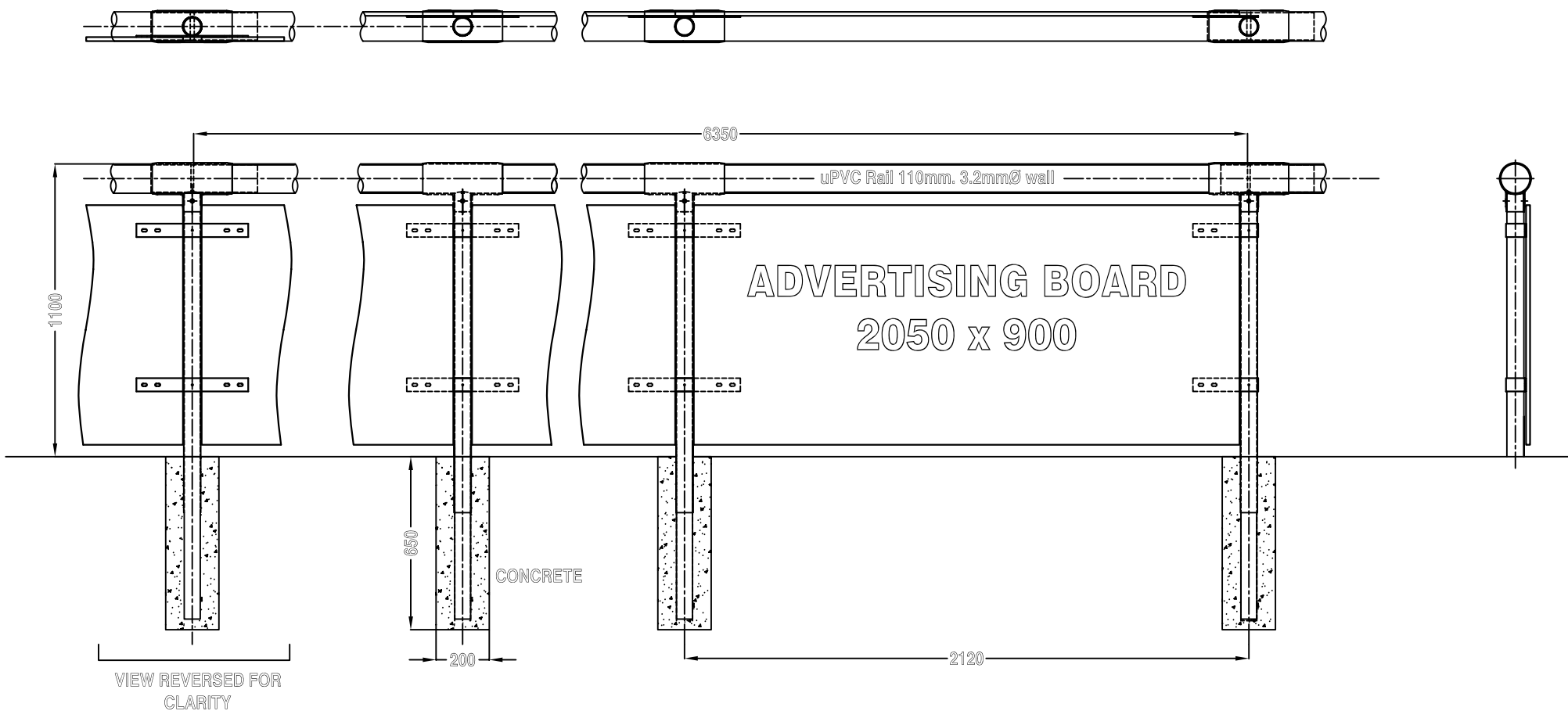
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Drawing No: BAR 161 Issue: 05

Date: 01.10.2010

Scale: N.T.S. Units: mm



System No. 162

Colour:

Or:

Description: Pitch Surround - Crowd Barrier with Advertising Space

Description: Barrière spectateurs pour terrains de sport avec l'espace publicitaire

Beschreibung: Taktabstands-Einfassung - Masse-Sperre mit Reklamefläche



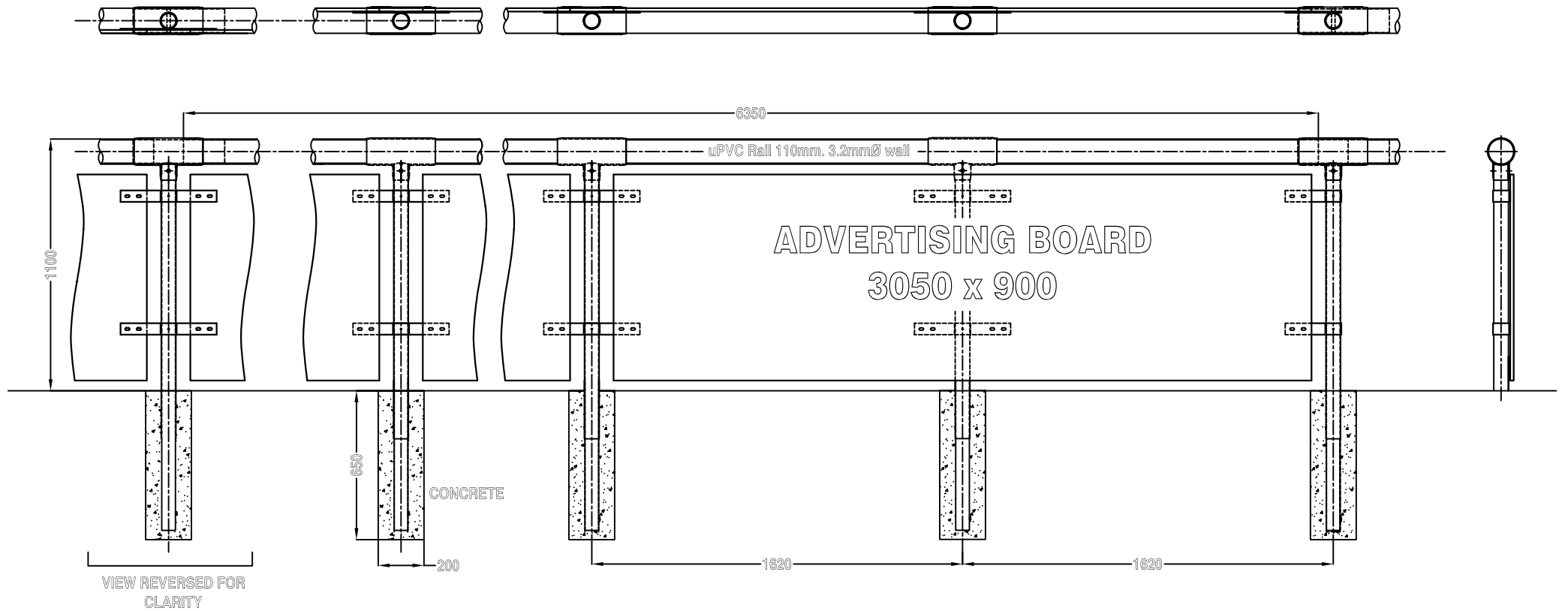
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Drawing No: BAR 162 Issue: 05

Date: 01.10.2010

Scale: N.T.S. Units: mm



System No. 163

Colour:

Or:

Description: Pitch Surround - Crowd Barrier with Advertising Space

Description: Barrière spectateurs pour terrains de sport avec l'espace publicitaire

Beschreibung: Taktabstands-Einfassung - Masse-Sperre mit Reklamefläche



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Drawing No: BAR 163 Issue: 05

Date: 01.10.2010

Scale: N.T.S. Units: mm

REPORT TO
BARRIERS INTERNATIONAL LTD

SUITABILITY OF THEIR CROWDBARRIER SYSTEMS
TO
COMPLY WITH THE STANDARDS LAID OUT IN THE
‘SAFETY IN SPORTS GROUNDS GUIDE’

REPORT No. 05058/02

MARCH 2010



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1. INTRODUCTION

This report discusses the results of full scale load tests carried out on sports pitch barriers, manufactured by Barriers International Ltd to separate the playing surface from spectators. An earlier report (Ref: 05058/01) described the construction of the barrier and its intended use in areas that do not require a perimeter crush barrier.

The barrier construction was assessed from a static structural analysis of the proposed members which suggested horizontal load capacities in the range 0.6-0.7kN/m. This limit was the result of anticipated failure at the base of the posts. The analysis suggested that the rail would be capable of sustaining much higher loads at post centres of between 2.0 and 2.5m.

As a result, it was considered likely that the post design could be altered to allow the assembly to meet the criteria of "Guide to Safety at Sports Grounds" published by TSO on behalf of The Department for Culture, Media and Sport, for both pitch side and crush barriers.

To confirm this to be the case a series of assemblies were tested and then a full scale assembly prepared for testing, the details of which are given below, together with the test results and assessment of the section sizes required to meet the criteria set out in Guide to Safety at Sports Grounds.

2. PERFORMANCE REQUIREMENTS

The minimum load capacity of the barrier is determined from Tables 1 and 2 of the document referred to above as 2.0kN/m, on the basis of the following:

- Maximum angle of viewing slope of 5°.
- Maximum depth of viewing area of 2m.

3. PROPOSED TESTING

The test panel was developed to allow a true horizontal load to be applied to the rail in a variety of positions to simulate full scale loading as set out in the guide, from which the relative contribution of the posts and the rail to the overall system could be assessed. In each test the assembly was tested to failure to determine an ultimate load capacity, from which a working load capacity could then be determined, based a required proof load of 1.2 x working load.

The test assembly comprised 60mm diameter steel CHS posts with a wall thickness of 2.5mm, spaced at 2.5m centres. The rail used was the standard 110mm PVC circular section as described in the earlier report. The load was applied horizontally by a single strap wrapped around the rail linked to a load cell mounted on a cradle attached to a forklift, which pulled away from the barrier, applying the load progressively. The test was carried out with the load applied at midpoint of the rail to determine the capacity of the rail section and then repeated with the load applied immediately above a single post to confirm the capacity of the post itself. In each case the load to failure was recorded in kN as set out below.

5. RESULTS

As the load was applied as a single point load and the performance criteria relate to a uniformly distributed load (UDL), the failure load has been presented together with an equivalent UDL, based on simple beam theory and the resulting bending moments within the sections that the differing loading patterns will produce. The final column gives a predicted working load capacity based on a 1.2 proof load factor.

Load position	Element Tested to Failure	Failure Load (kN)	Equivalent UDL at Failure (kN/m)	Maximum Working Load Capacity
Rail Centre	Rail	2.68	2.10	1.75
Above Post	Post	4.00	1.60	1.33

6. DISCUSSION

The capacity of the rail will vary with post centres and at 2.5m it is below the strength required of the crush barrier. However if the post centres are reduced to 2.0m a working load capacity of to 2.6kN/m may be assumed, which satisfies the performance criteria.

The result for the posts at 2.5m centres giving a working load of 1.3kN/m is clearly below the minimum required. Closing the posts up to 2.0m centres would lift this to 1.6kN/m which is still below the minimum required. A number of alternative posts sections have therefore been considered and the preferred size of 60.3 x 4.0 CHS has a section capacity that is approximately 1.65 times greater than the post used in the test. With this tube a working load of 2.1kN/m could be assumed for posts at 2.5m centres, increasing to and 2.6kN/m for posts at 2.0m centres.

6. CONCLUSIONS

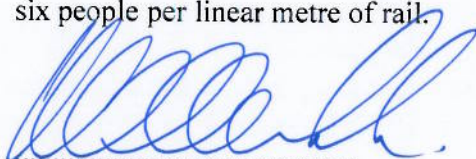
The capacity of the pitch barrier system using the 110mm top rail can be enhanced by the use of heavier post sections to achieve the requirements of Guide to Safety at Sports Ground and with specific capacities as follows:

Grade A – 2.0kN/m – Standard Rail with 60.3 x 4.0 Posts at 2.25m c/c.

Grade B – 2.5kN/m – Standard Rail with 60.3 x 4.0 Posts at 2.00m c/c

Grade C – 3.0kN/m – Standard Rail with 60.3 x 4.0 Posts at 1.75m c/c

The section sizes used in the test have been demonstrated a working load capacity in excess of 1.3kN/m, which in itself is equivalent to the effects of a crowd up to 1.2m deep loading the rail – or six people per linear metre of rail.



M S P Walsh B Eng (Hons) C Eng MI Struct E
17 March 2010