

# Abacus Lighting Limited

## Neil Johnson

### UK Sports Lighting Manager



**From the outset Kempton Park provided Abacus Lighting with very interesting challenge, requiring unique engineering solutions and innovative design.**





## Design Brief and Environmental Requirements / Considerations

750lux rising to 1000lux on the finish line.

Defined mast positions and heights.

Switching down to 30% between races.

Emergency backup system to ensure 10% for equine safety.

Original planning approval gained environment zone E3 – 5%ULR.

Planning restrictions in the green belt dictated masts to be a maximum of 1m above ground level when not in use.

Bat Roost and Stag Beetle colony.

## ILE 'Guidance Notes For The Reduction of Obtrusive Light'.

Environmental Zone Categories:

E1: Intrinsically dark areas, National Parks, Areas of Outstanding Natural Beauty.

E2: Low district brightness areas, Rural or small village locations.

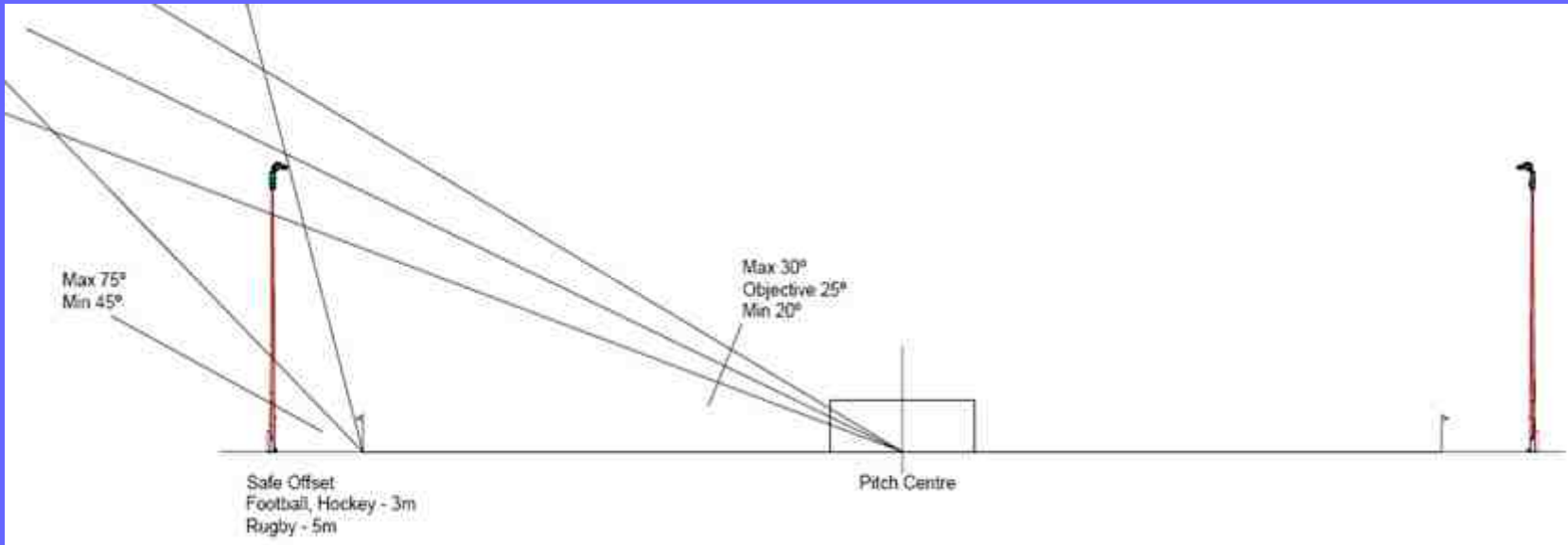
E3: Medium district brightness areas, Small town centres or urban locations.

E4: High district brightness areas, Town/city centres with high levels of night-time activity.



| Environmental Zone   | Sky Glow ULR. Inst. (max) | Light into Windows Ev. Lux | Source Intensity I (kcd) |
|----------------------|---------------------------|----------------------------|--------------------------|
| E1 Dark Landscapes   | 0 %                       | 2 lx                       | 2.5                      |
| E2 Rural             | 2.5 %                     | 5 lx                       | 7.5                      |
| E3 Urban             | 5 %                       | 10 lx                      | 10                       |
| E4 Town & City Ctrs. | 15 %                      | 25 lx                      | 25                       |

1. Establish basic lighting layout - Side lighting.
2. Verify the mounting height, using angles detailed in CIBSE LG4.



3. Ensure the maximum floodlight elevation was not greater than 70 degrees.
4. Estimate the number of floodlights required and process the design using suitable CAD program.
5. Check uniformity & illuminance level against specification.
6. Calculate Glare Rating & environmental impact.

## The Solution

Abacus Challenger 1 and 3 Floodlights

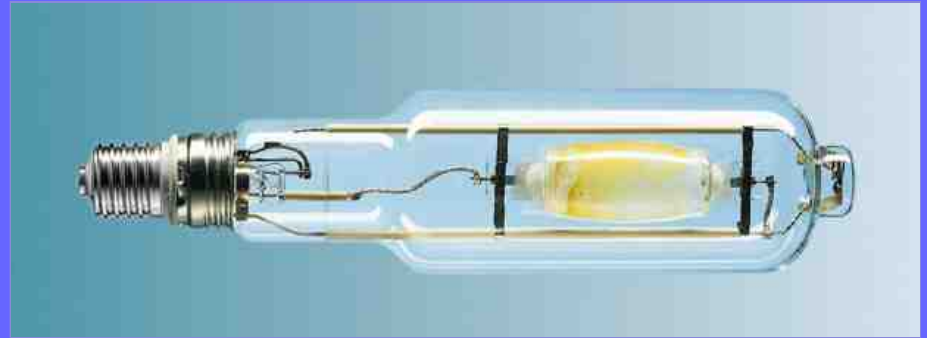
Incorporating precision optics

Compact double ended lamps

Aimed with gun sight for accuracy

Hoods for overspill control

Improved optical performance allowed Abacus to reduce the equipment by 5 Masts & 30 Floodlights when compared to our competitors.

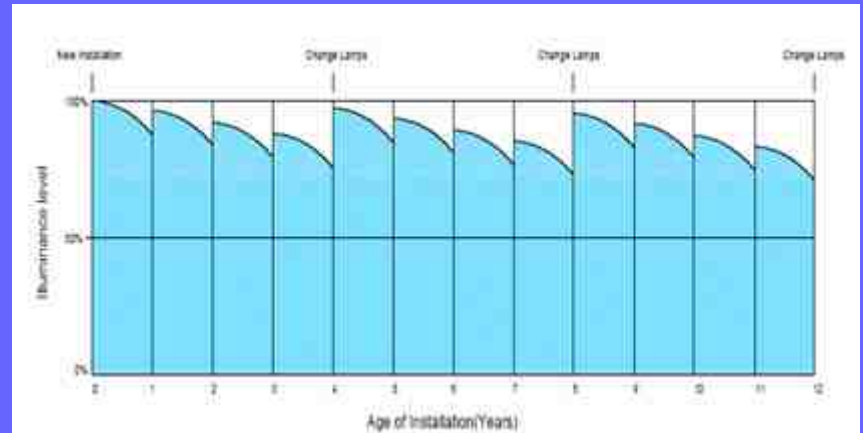


The Maintenance Factor is derived to ensure that the Maintained Illuminance is always achieved and is based upon: -.

Lamp lumen depreciation.

Depreciation due to dirt accumulation of front glass.

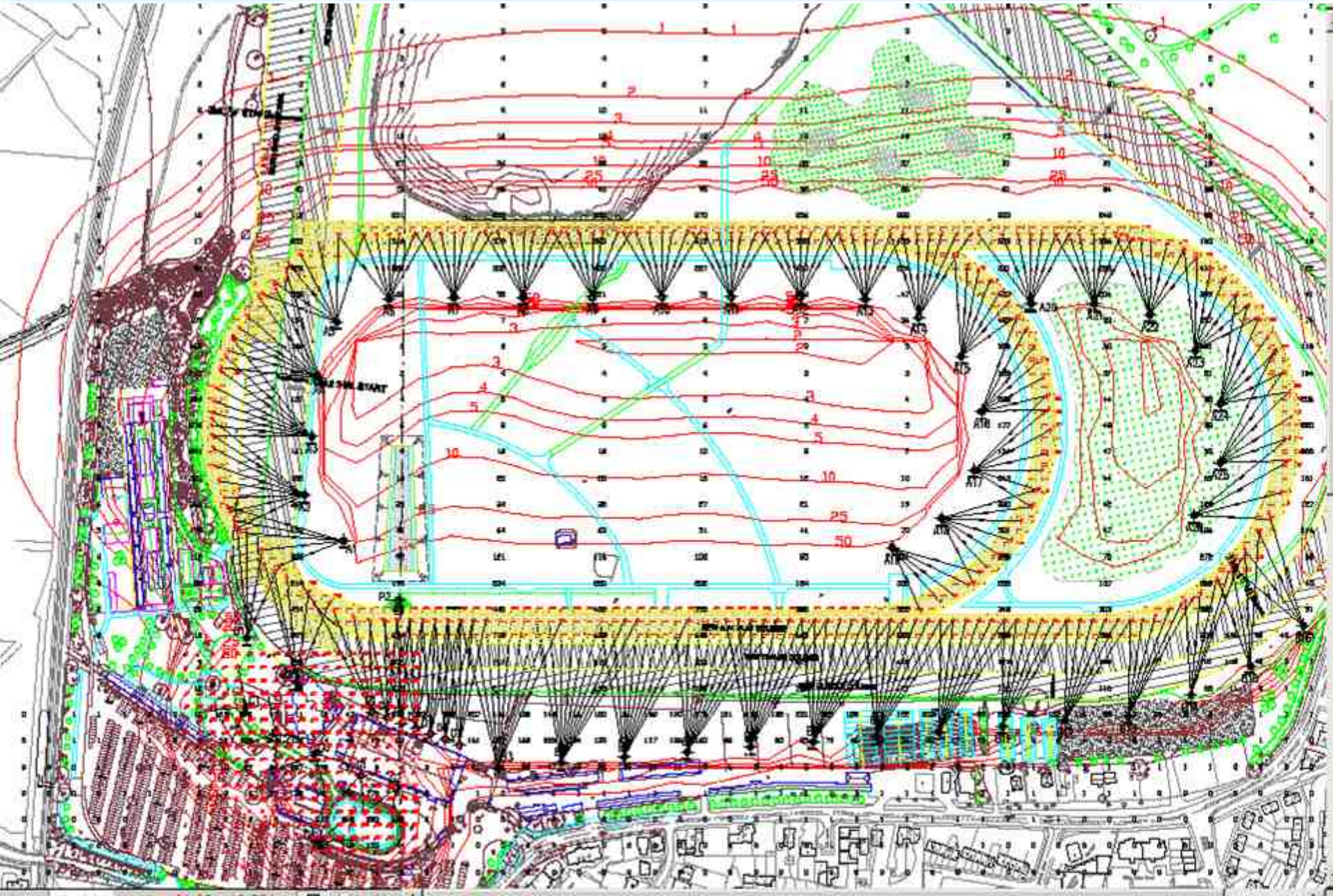
Bulk lamp replacement interval related to hours of use.

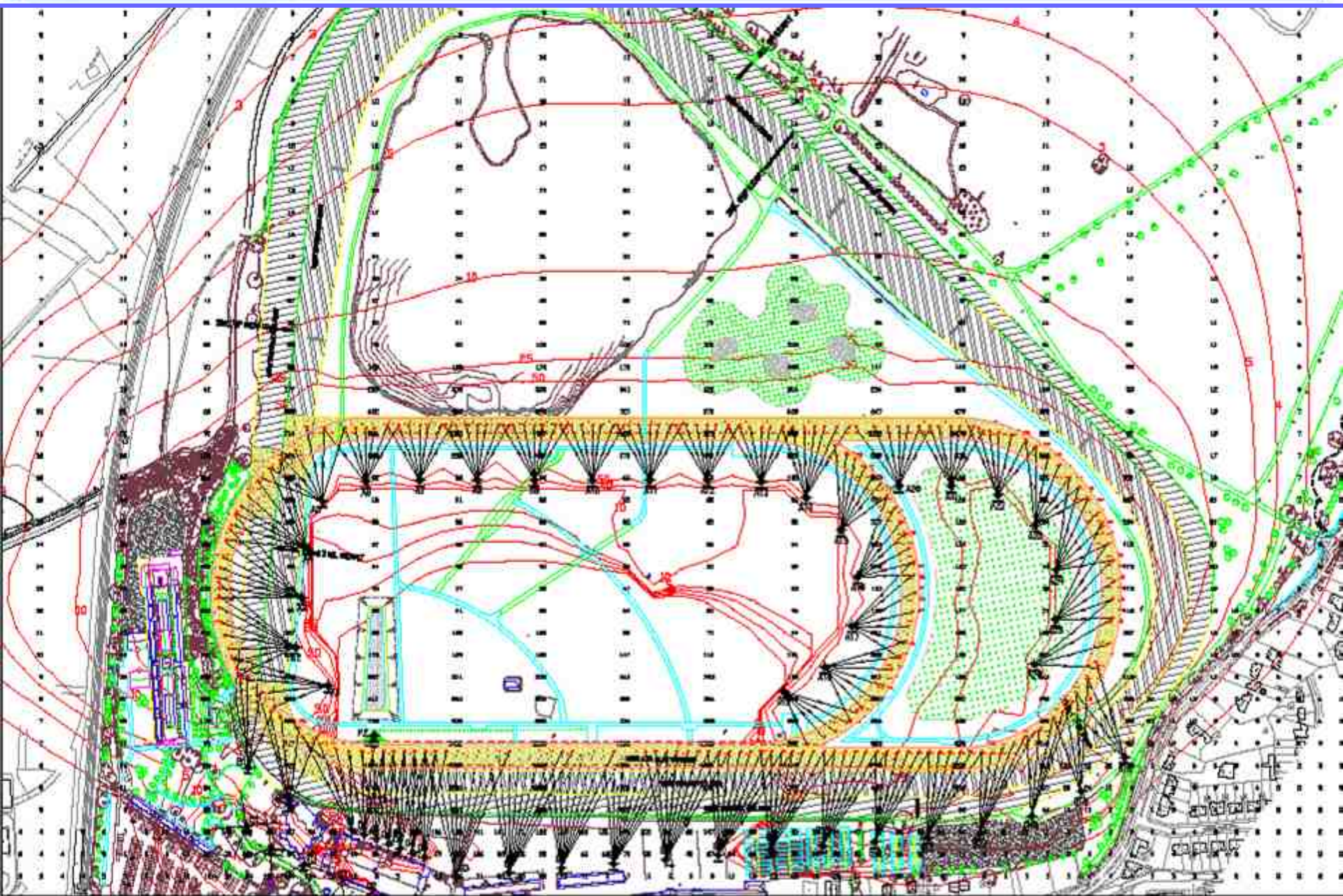


| Cleaning interval (months) | Pollution category |        |      |
|----------------------------|--------------------|--------|------|
|                            | High               | Medium | Low  |
| 6                          | 0.91               | 0.92   | 0.96 |
| 12                         | 0.86               | 0.88   | 0.94 |
| 18                         | 0.83               | 0.85   | 0.92 |
| 24                         | 0.81               | 0.83   | 0.91 |
| 36                         | 0.79               | 0.82   | 0.9  |

It is not just an inflexible number, but the product of all Depreciation Factors, combined to achieve the best maintenance plan for the proposed installation.

**No Maintenance Plan.....No Maintained Illuminance.**





The Lighting Design Solution: -

22 No. GL520 / 620m 27.4m base hinged raising and lowering masts installed inside the track.

2 No. GL520 27.4m base hinged raising and lowering masts installed outside the track.

20 No. varying height fixed masts from 40m down to 27.4m.

1 No. 12m column at the finish line.

The main Grandstand roof was increased in height to carry a combination of 56 2kw Challenger 1 and 3 floodlights.

A total of 600 2kw Challenger 1 and 3 floodlights used.

29km of cable weighing a total of 133,000kg

The Total Design Solution: -

Lighting design calculations using Abacus G.O.L.D. CAD program

30% Switching provided by custom built twin ballast system.

UPS system with generator backup provides 10% emergency lighting.

Advanced floodlight design reduced the environmental zone from E3 to E2.

Reduced the number of floodlights by 49 (7.5%) and masts by 5 (13%)

Abacus Auto Sequencing system used to raise and lower masts.

Phase-shift transformer used to reduce flicker on the photo finish camera.

## The Solution

Automatic sequencing system.

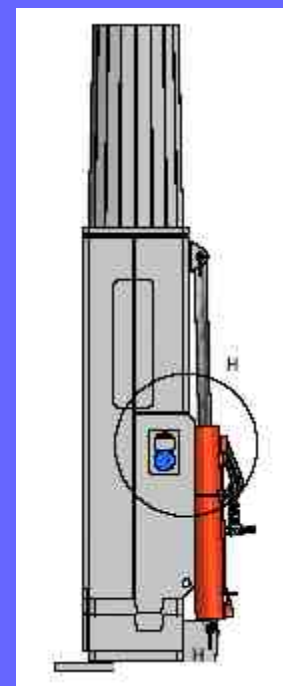
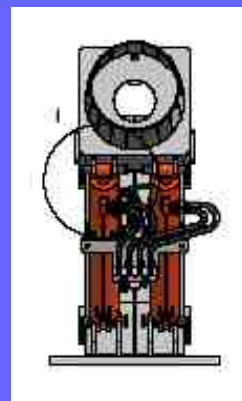
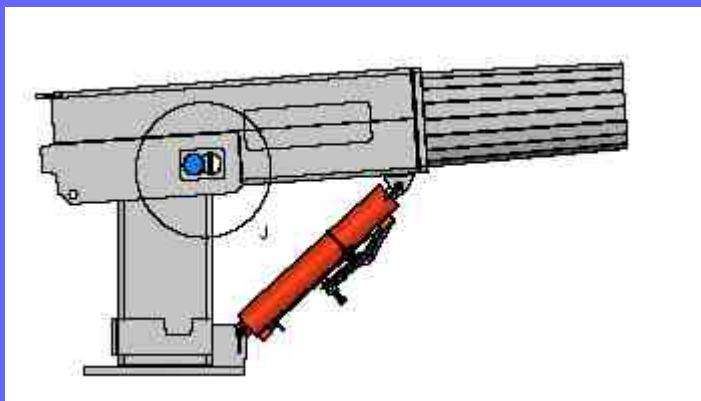
Designed in house at our HQ in Sutton-in-Ashfield

Computer simulations allowed engineers to check tolerances before manufacture.

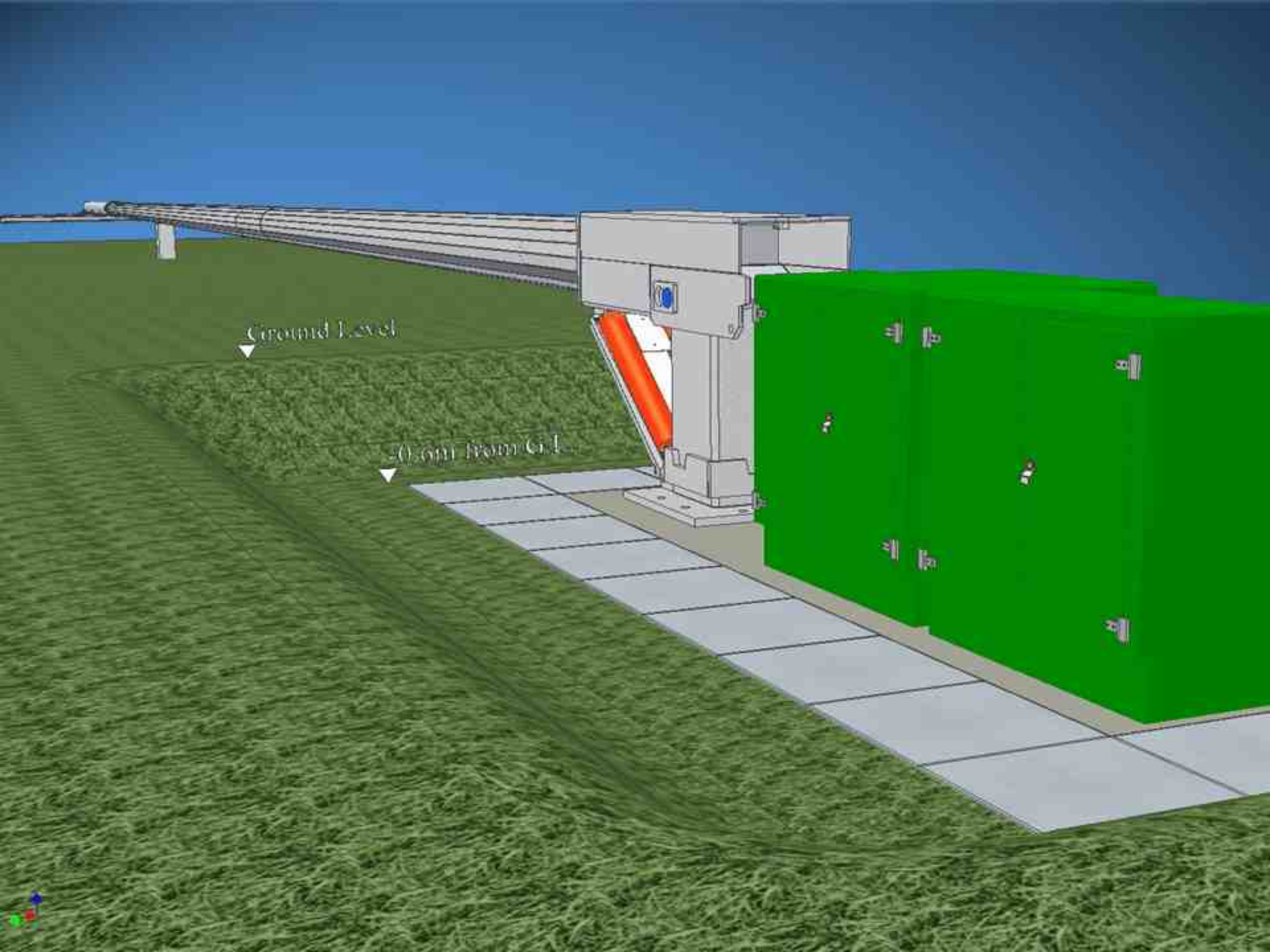
Video animations used as a selling aid.

Full lifetime testing of prototype demonstrated to client.

Fully detailed animations satisfied planning.







Ground Level

-0.6m from G.L.





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