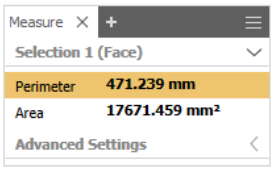
Water clearing area analysis

Proteus grating water clearing area vs DN 150 Gully Outlet Pipe

This analysis was to determine the water clearing performance of the Proteus grating in relation to the typical drainage network in which it is situated. It is usual for a gully arrangement to have DN150 outlet, it was this measure used to determine the clearing capacity and comparison

Area of 150mm pipe:



$$A = \pi r^2$$

Radius is half of diameter therefore:

$$A = \pi(\frac{D}{2})^2$$

$$A = \pi(\frac{150}{2})^2$$

$$A = 17671\text{mm}^2$$

As shown in *fig 1* on the right:

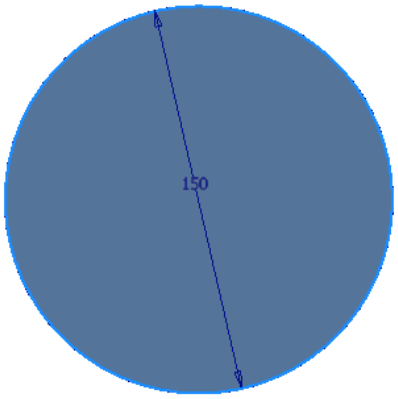
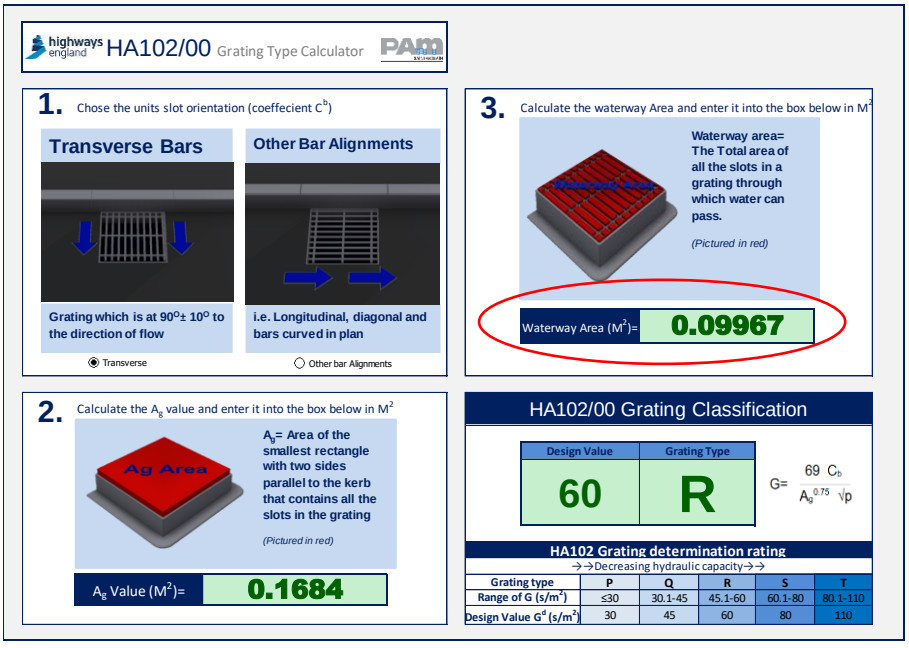


Fig 1

The water clearing area (the clear space that water can pass through) of the Proteus gully has been measured as 0.09967m^2 (99670mm^2) using the methodology as described in Highways England HA102 as shown in the calcualtor extract below:



Water clearing area analysis

The calculations determine that the Proteus grating has a water clearing area that is 5.5 times bigger than the DN150 pipe

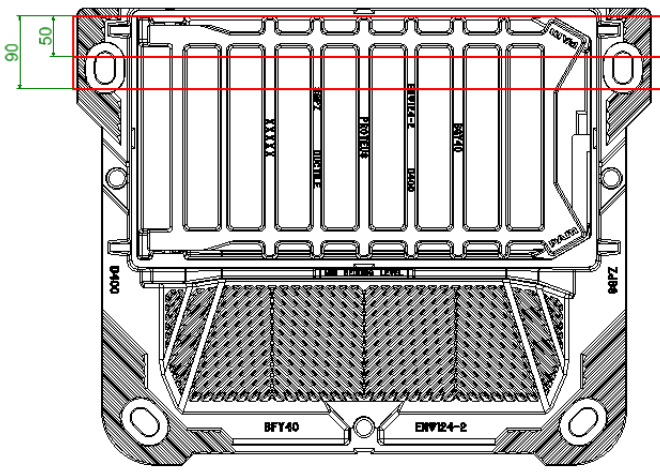
Proteus grating water clearing area vs Watershed 450x450 clear opening grating

The water clearing area nearest the kerb is critical as this is where the head of water is highest (shown in fig 2 below). There is a positive correlation between the magnitude of the head of water and the volume of water that is passed through a gully due to the higher pressure that is generated.

A larger water clearing area will also improve the volumetric flow of water. These two points mean that a large water clearing area towards the kerb face will be able to pass a far larger volume of water.

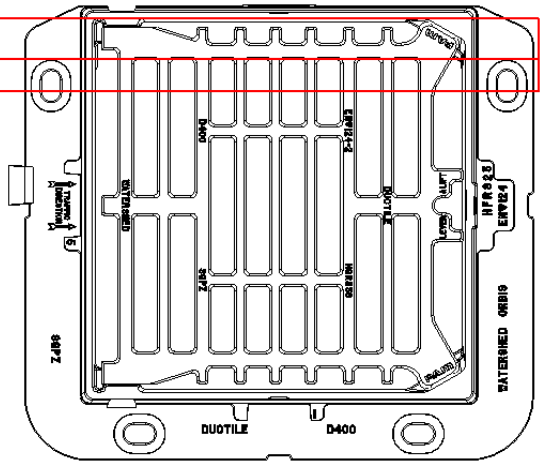
The water clearing area of the Proteus gully has been compared to the Watershed 450x450 clear opening gully product ref. HR833 in CAD software as shown below:

BY40



WATER CLEARING AREA AT 50mm FROM CURB EDGE = 109.2 cm^2
WATER CLEARING AREA AT 90mm FROM CURB EDGE = 261.8 cm^2

HR833



WATER CLEARING AREA AT 50mm FROM CURB EDGE = 86.75 cm^2
WATER CLEARING AREA AT 90mm FROM CURB EDGE = 205.1 cm^2

Note: DMRB Volume 4 Section 2 Part 5 HA104/09 Chapter 5 Design Requirements Gully Tops parapgraph 5.3 states Of the total waterway area, there should be a minimum waterway area of 45 cm2 between the kerb face of the frame and a parallel line 50 mm distant, and there should be a minimum waterway area of 65 cm2 between the kerb face of the frame and a parallel line 90 mm distant

Water clearing area analysis

The overall water clearing area of the Watershed 450x450 HR833 is stated within literature as 1221cm^2. All of the different water clearing areas are converted into mm^2 and are shown in the table below:

HA104/09 Chapter 5 paragraph 5.3	Proteus BY40	Watershed HR833
50mm Water Clearing Area (mm^2)	10920	8675
90mm Water Clearing Area (mm^2)	26180	20510

This confirms that the Proteus grating has a greater water clearing area closer to the kerb than the Watershed 450x450 . This is shown by a 26% higher water clearing area at 50mm and a 28% higher water clearing area at 90mm.

While the comparison has been made against a grating with a 450x450 opening it must be noted that it is common practice for smaller gratings to be used within the network. Design requirements contained within paragraph 5.3 of Chapter 5 Gully tops of HA104/09 (now CD534) states a minumum waterway area of 900cm^2 often resulting in gratings of a 370x430 clear opening being used. Meaning that the gain in hydraulic performance would be even greater if this comparison had also been made.

Figure 2.2 Flow width of water against kerb

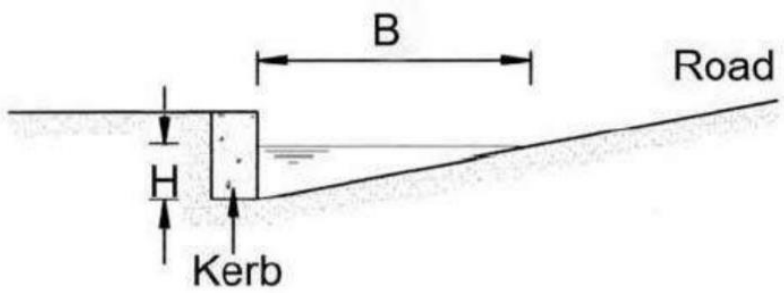


fig 2