

## SUBJECT: FLAGPOLE PROPERTIES VERIFICATION: "CRESKO S.R.L"

Poles of various height will be examined taking into account the wind force which could be acting on the flag.  
The flag could be of two different sizes - 4 m in height and 1,5 m in width or 2 m in height and 3 m in width.

In both cases the surface is equal to 6 sq. m.

Obviously we are speaking of a non-solid body structure so a percentage of the wind force which exerts on it should be considered.

Since the flag could be orientated itself we will have to position it according to the wind direction and not in the direction orthogonal to it. 30% of the kinetic pressure will be assumed.

It's a different question when a pole of a solid material should be examined where the entire surface is considered.

As per the technical standards we consider the kinetic pressure  $p = q_{ref} C_e C_p C_d$

$q_{ref} = \frac{1}{2} \rho V_{ref}^2$  ( $\rho =$  air density = 1,25 Kg/sq.m)

As per the tables in EUROCODE it is obtained  $C_e = 1,26$   $C_p = 1$   $C_d = 1$

The wind speed  $V_{ref}$  for the observed zone is equal to 28 m/s where  $q_{ref} = \frac{1}{2} V_{ref}^2$   $1,25 = \frac{1}{2} 28^2$   $1,25 = 490$

kinetic pressure  $p = q_{ref} C_e C_p C_d = 490 \times 1,26 \times 1 \times 1 = 618$  N/sq.m equivalent of 62 Kg/sq. m

We proceed now on the verification of various flagpoles:

FLAGPOLE ART. N° 0460 – REVOLVING ARM – MATERIAL FIBERGLASS

FLAGPOLE SIZE:  $h = 10,00$  m, diameter range from  $\phi$  65 mm to 140 mm

An average diameter of 100 mm will be assumed.

FLAG SIZE:  $h = 4,00$  m  $l = 1,50$  m; (3,00 m x 2,00 m) Surface = 6,00 sq. m.

Kinetic pressure applied on the flagpole: (for cylindrical body structures)  $F = c_f c_d q d$  (with  $q = 62$  Kg/sq.m)

from the tables  $c_f = 1,2$   $c_d = 1$  obtained  $1,2 \times 1 \times 62 \times 0,08 = 6$  Kg/sq.m

Pole surface:  $10 \times 0,10 = 1,0$  sq.m.

$F = 6 \times 1,0 = 6$  Kg which applied at 5,00 m height (the middle of the pole)

creates a bending moment  $M$  (Pole) =  $6 \times 5,0 = 30$  Kgm

Kinetic pressure on the flag:

The central point of the flag will be at 8,00 m height starting from the fixing point on the base.

$p = 30\% c_d c_f q A$  from the tables  $c_f = 0,7$   $c_d = 1$

obtained:  $30\% \times 0,7 \times 1 \times 62 \times 6 = 78,12$  Kg which applied at 8,0 m

height creates a bending moment  $M$  (flag) =  $78,12 \times 8,0 = 625$  Kgm

$M$  total =  $625 + 30 = 655$  Kgm

The flagpole basement will be inserted into a tube made of galvanized iron with appropriate height and with 5 mm diameter. The tube is rigidly anchored on the base plate where the base plate is made of galvanized iron as well.

It should be taken into account that the fiberglass material has an elevated elastic form (29000 Mpa)

very similar to that one of the steel for which will be assumed an allowable tension of 1600 Kg/sq. cm.

The form of resistance of cylindrical bodies is:  $W = \pi (D^4 - d^4) : 32 D$ .

The junction section has  $D = 140$  mm  $d = 130$  mm for which  $W = 69$  sq. cm.

Verification:

$$\sigma = M/W = 65500 : 69 = 949 \text{ Kg/sq.cm} < \sigma_{amm} = 1600 \text{ Kg/sq.cm}$$

THE VERIFICATION IS SATISFIED

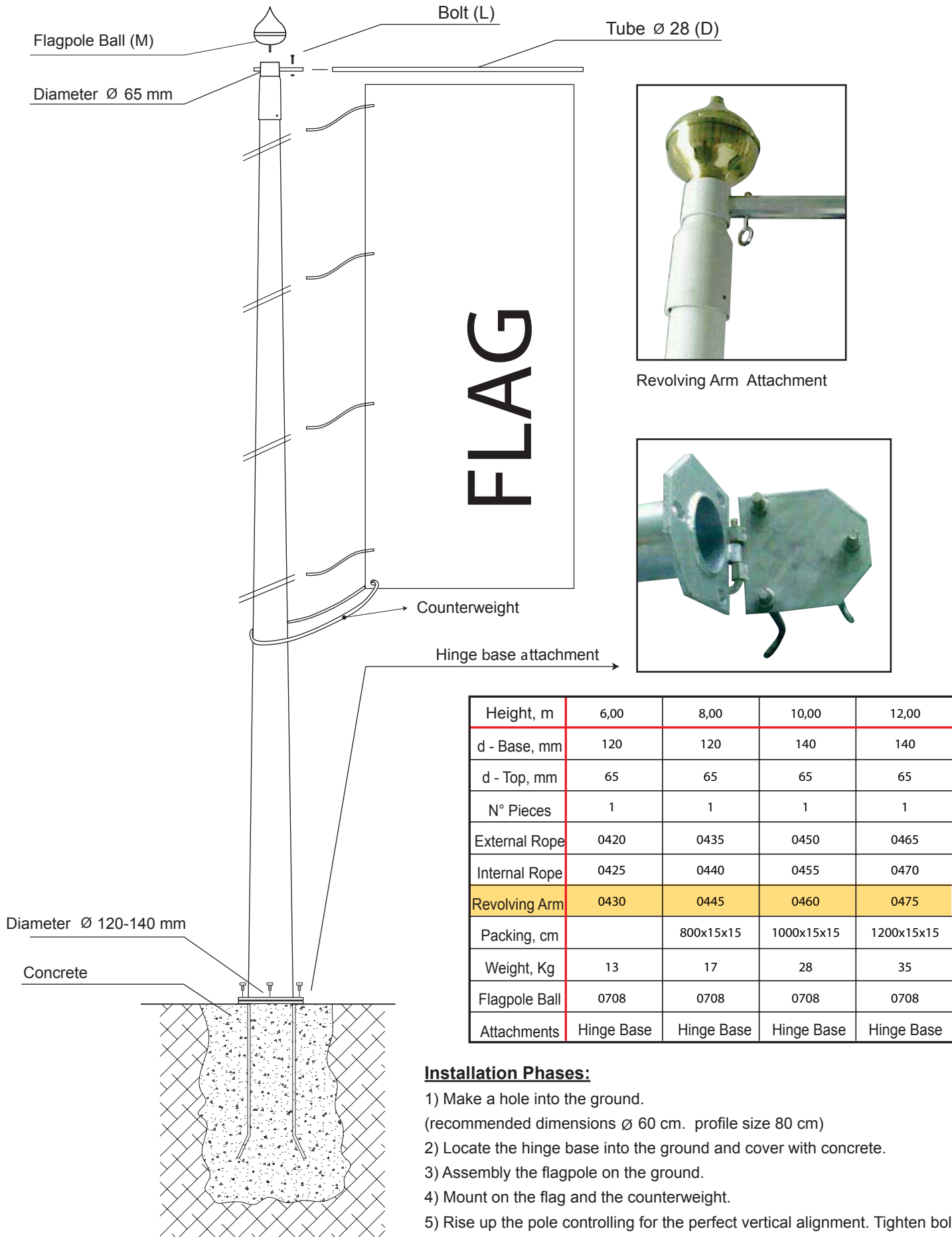
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# INSTALLATION SHEET FIBERGLASS FLAGPOLE WITH A REVOLVING ARM



Height, m	6,00	8,00	10,00	12,00
d - Base, mm	120	120	140	140
d - Top, mm	65	65	65	65
N° Pieces	1	1	1	1
External Rope	0420	0435	0450	0465
Internal Rope	0425	0440	0455	0470
Revolving Arm	0430	0445	0460	0475
Packing, cm		800x15x15	1000x15x15	1200x15x15
Weight, Kg	13	17	28	35
Flagpole Ball	0708	0708	0708	0708
Attachments	Hinge Base	Hinge Base	Hinge Base	Hinge Base

### Installation Phases:

- 1) Make a hole into the ground.  
(recommended dimensions  $\varnothing$  60 cm. profile size 80 cm)
- 2) Locate the hinge base into the ground and cover with concrete.
- 3) Assembly the flagpole on the ground.
- 4) Mount on the flag and the counterweight.
- 5) Rise up the pole controlling for the perfect vertical alignment. Tighten bolts.

Ref.	Quality	Title/ Fiberglass Flagpole With A Revolving Arm			Item Number/Reference	
Projected by: CRESKO'S PROJECT OFFICE	Checked by: Arch. Marco Scozzari	Approved by: Dr. Enrico Scozzari	File Name: Fiberglass Pole With Revolving Arm	Date: 30/06/2009	Scale: ----	
			1 PIECE FLAGPOLE WITH BANNER			
			Technical Sheet	Modification 0	Sheet 1/1	