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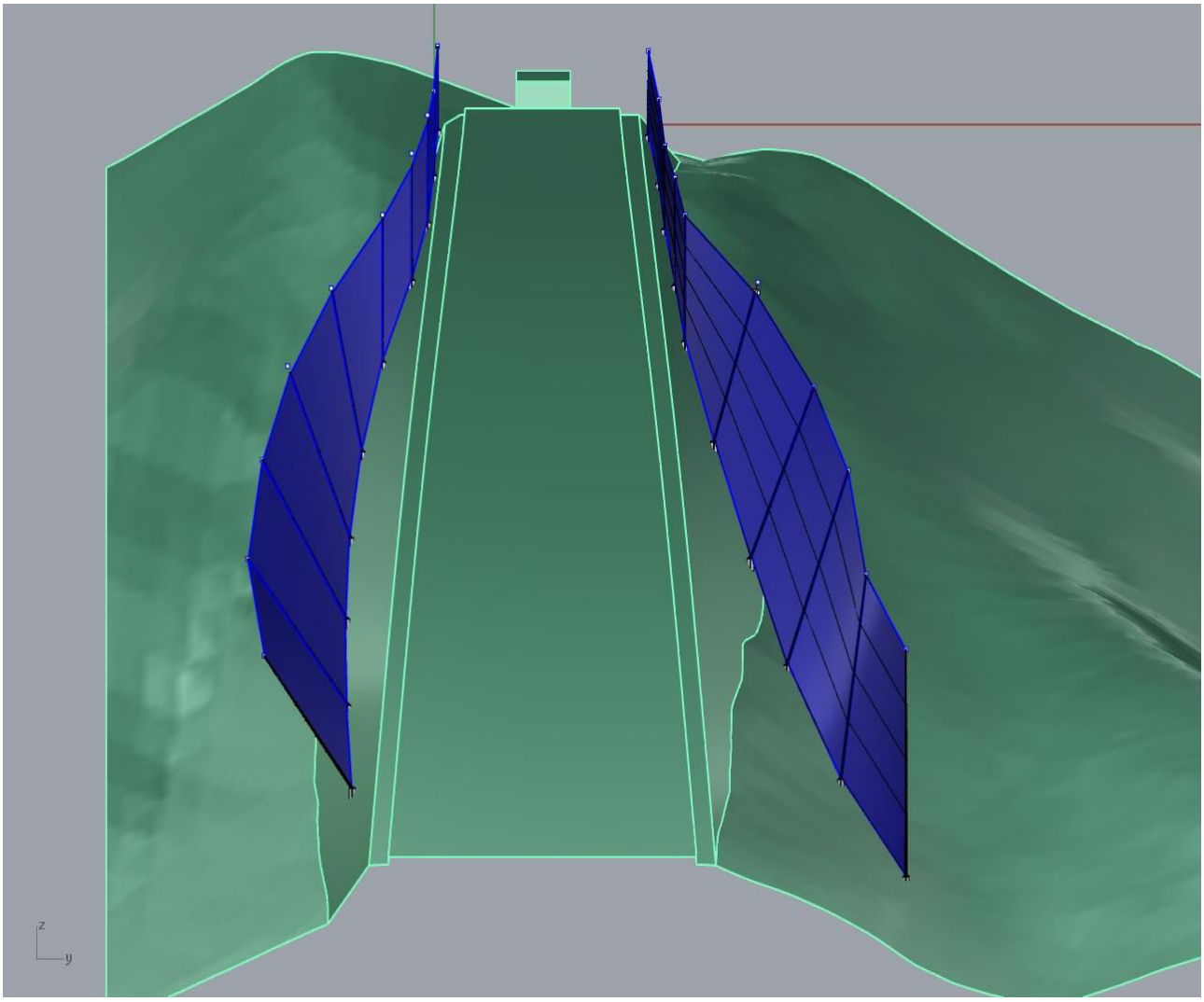
WIND PROTECTION SYSTEM FOR SKI JUMPS



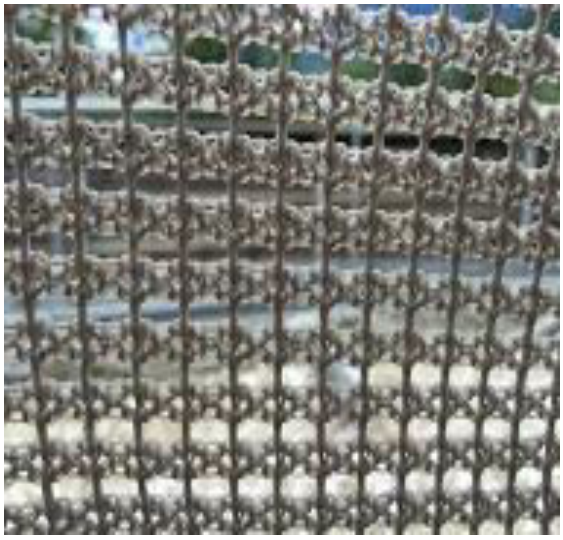
The intention of FIS and all organizers of ski jump events is to ensure atractiv but fair and safe competition for all athlets without delays for spectators on site or especially on TV.

All wind protection systems, classical or flexible are designed on following prepositions:

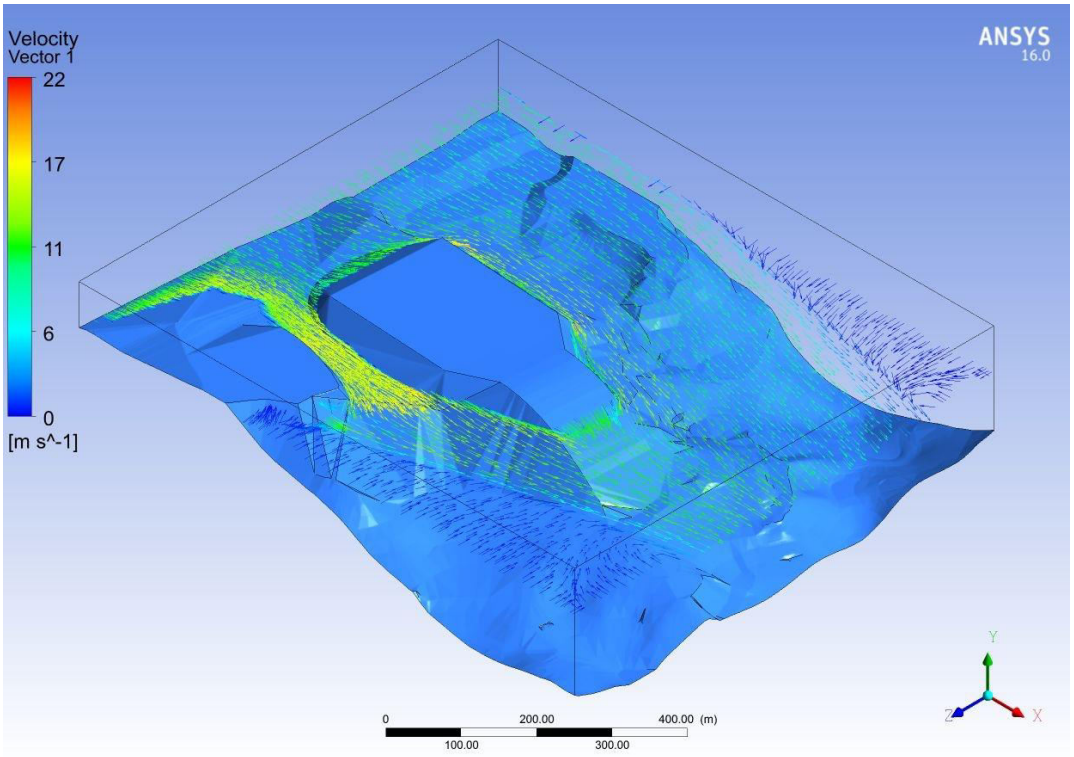
- There is actually no standards on wind protection systems. The only regulation is FIS directive allowing ski jumping with the wind at the curve of jumping with max. 3 m/s and local static regulations of each country.

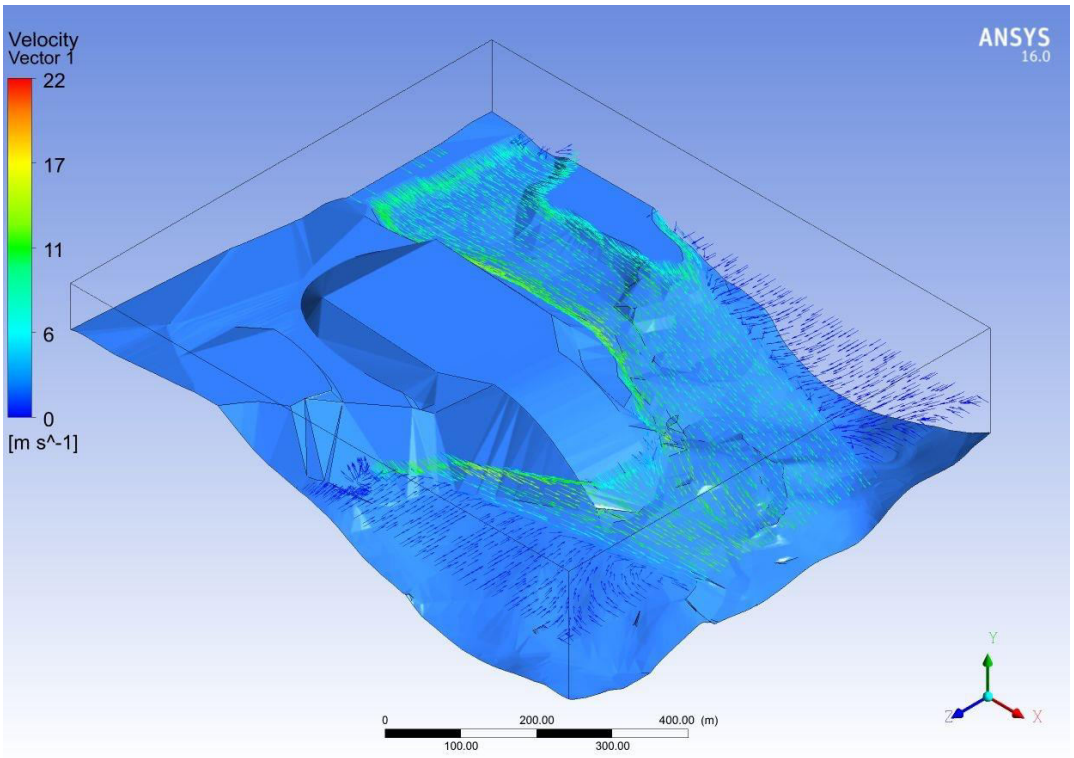
- The reduction of wind velocity is performed basicly by wind protection net. Through put of wind depends on the mesh of the net.. best results are achieved by using 5x5 mm mesh, which is the max. smollest mesh available with the quolity required for snow and UV resistance.

- With the use of 5x5 mm mesh and the appropriate shape of the system min. 70 % wind velocity reduction is guaranted, which means that the tournament can be hold with the wind speed of app. 10- 12 m/s. Above 12 m/s no wind protection can help except a wall is build which is generally not acceptable due to architectonic and en



- The wind velocity reduction depend also on the configuration of the wind protection system due to airpressure differences caused by wind protection system and due to the shape and high as well as the relation to the ground configuration. The design of the wind protection system is based on wind analyses of meteorological parameters supplied by local weather stations for a period of several years. The wind flow analyses is performed by our laboratory using the program ANSYS, which is used also for development and design of airplaine wings and guaranties top quolity design. Hereafter a preliminary design for two different ski jumps (Pyongchang in South Korea and Planica in Slovenia).


Velocity
Vector 1
22
17
11
6
0
[m s^-1]
ANSYS
16.0
0
200.00
400.00 (m)
100.00
300.00
Y
Z
X


Velocity
Vector 1
22
17
11
6
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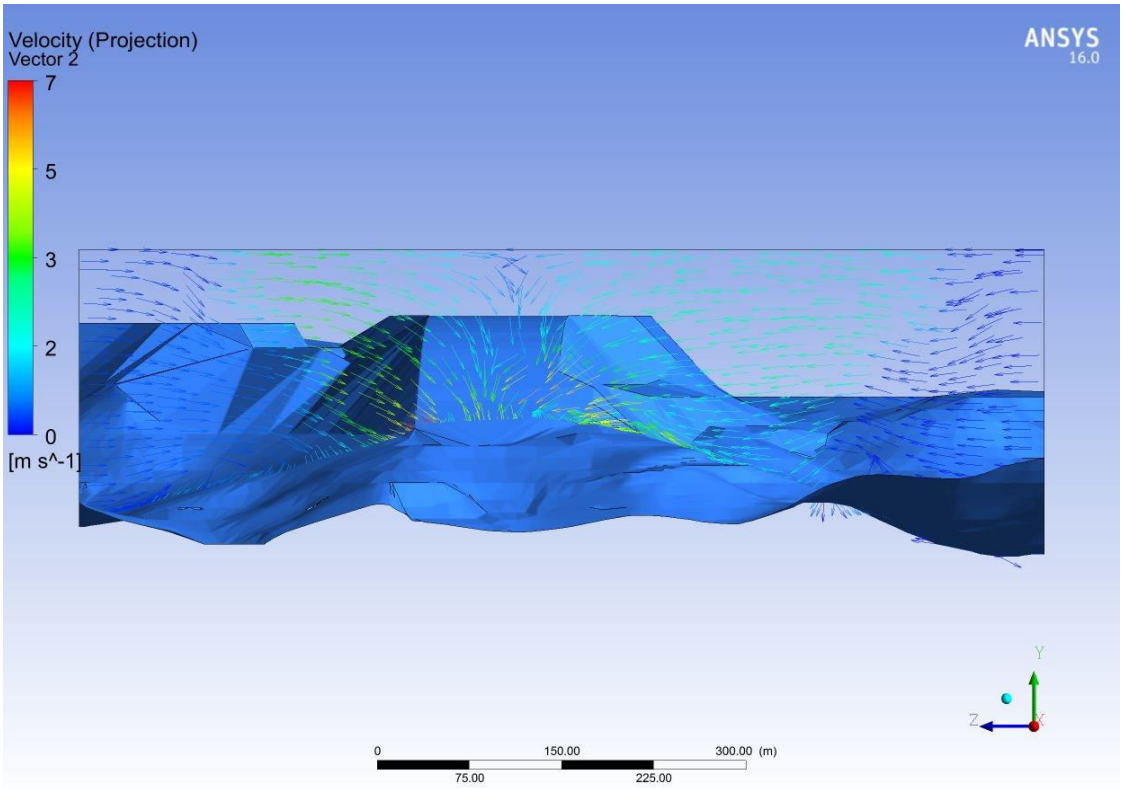
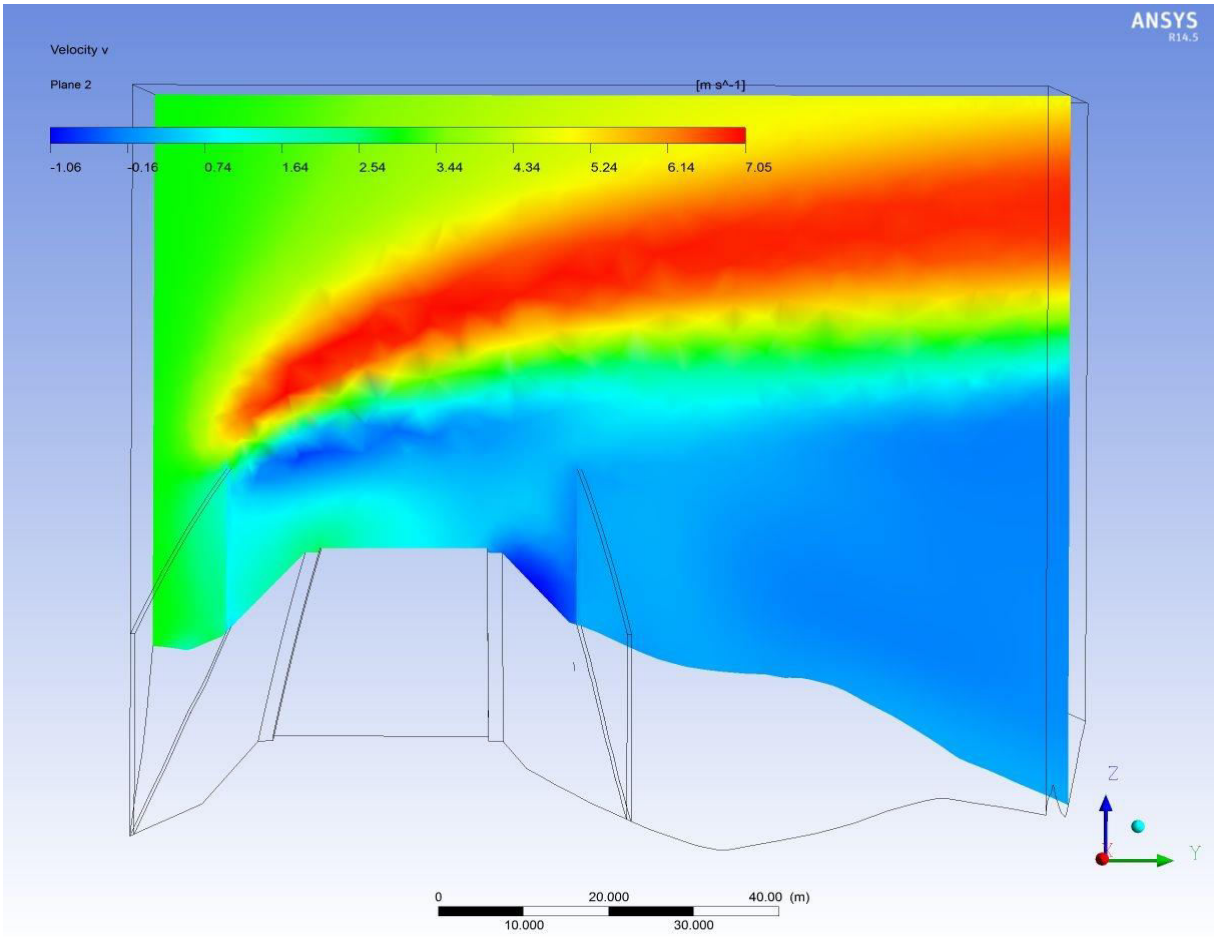
[m s^-1]
ANSYS
16.0
0
200.00
400.00 (m)
100.00
300.00
Y
Z
X


Velocity (Projection)
Vector 2
ANSYS
16.0
7
5
3
2
0
[m s^-1]
Y
Z
X
0
150.00
300.00 (m)
75.00
225.00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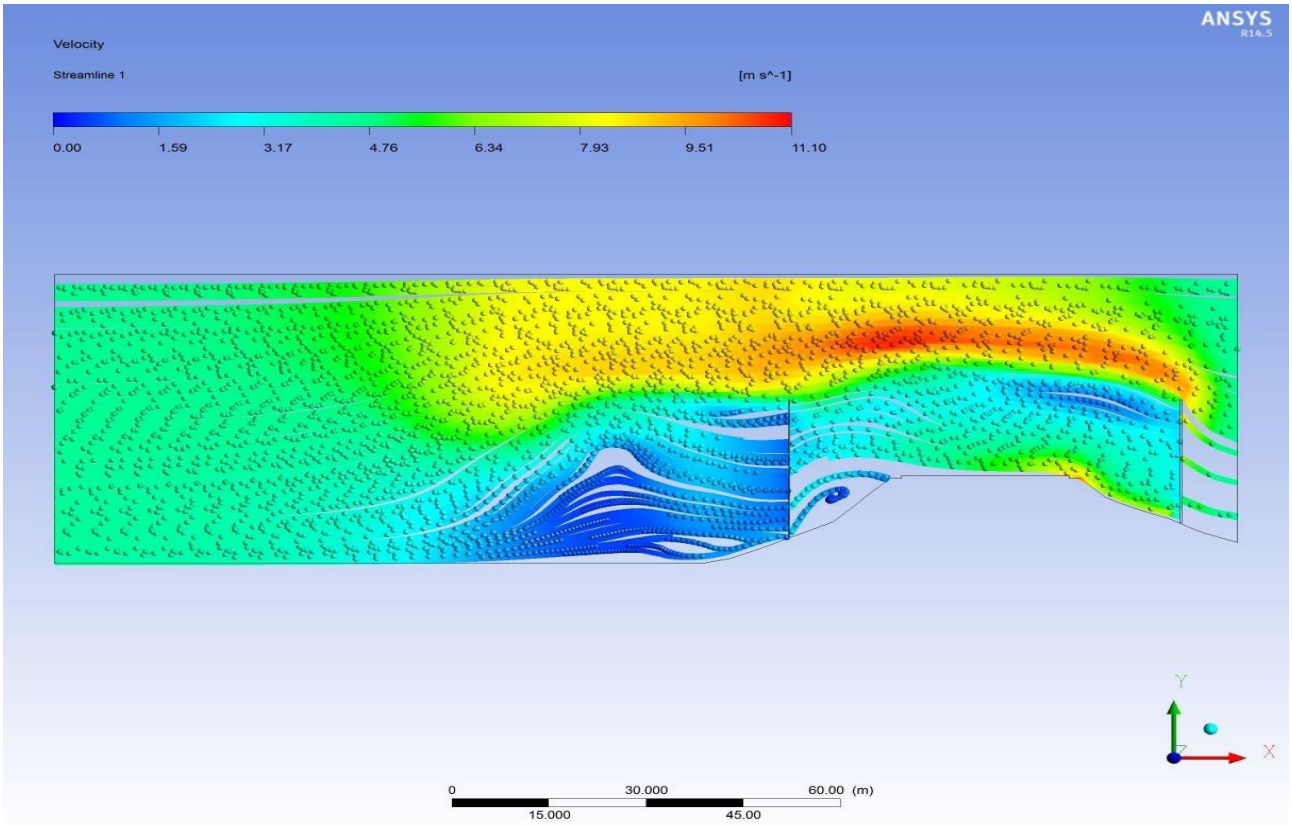
R14.5
Velocity v
Plane 2
[m s^-1]
-1.06
-0.16
0.74
1.64
2.54
3.44
4.34
5.24
6.14
7.05
Z
Y
0
20.000
40.00 (m)
10.000
30.000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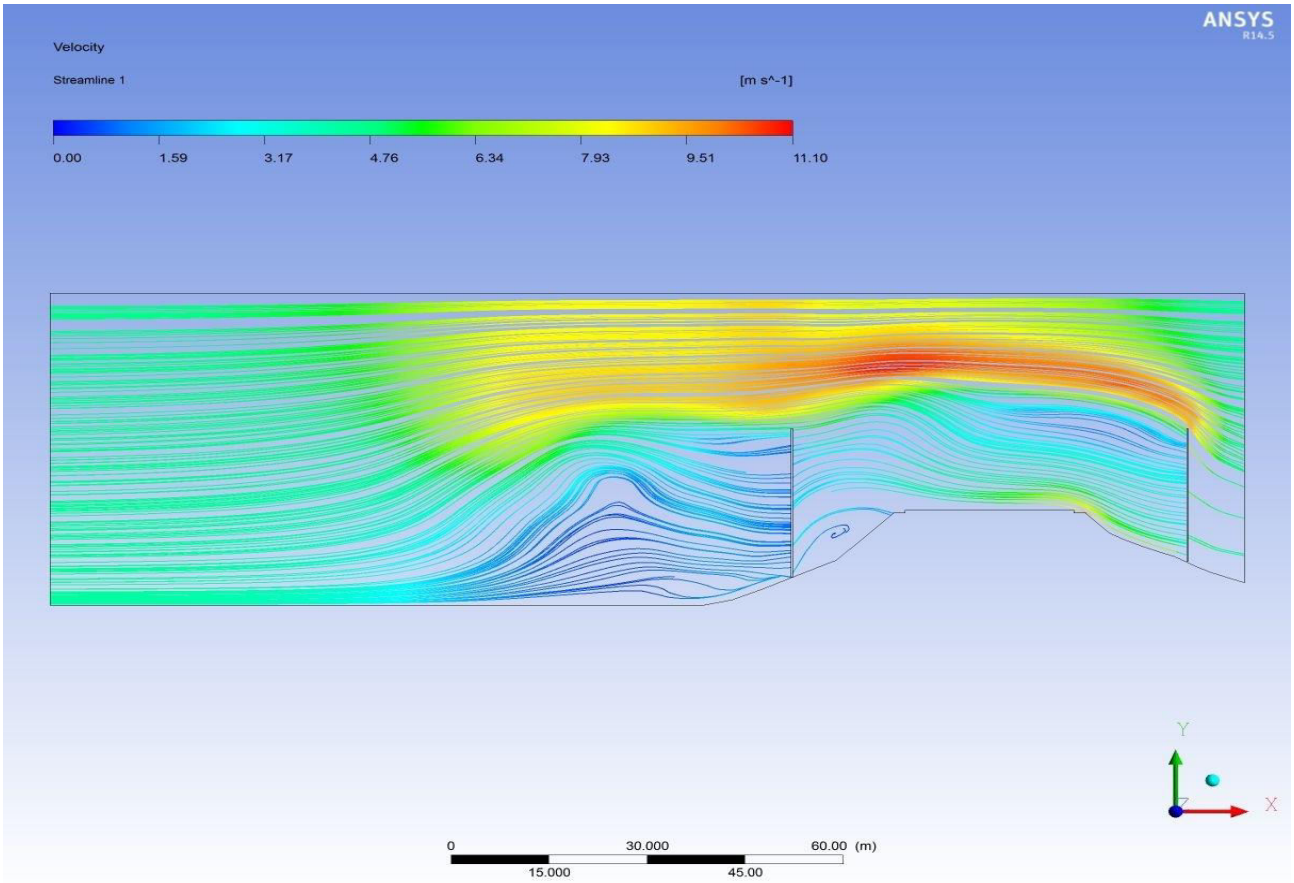
R14.5
Velocity
Streamline 1
[m s^-1]
0.00
1.59
3.17
4.76
6.34
7.93
9.51
11.10
Y
X
0
30.000
60.00 (m)
15.000
45.00



The usual design of wind protection systems is based on fix structures for net installation that has to reduce the wind velocity and eliminate wind turbolences in the curve of jumping. Structures are assembled before the start of tournament and disassembled after ski jumping is finished.

Following the idea of our customers the classical wind protection has been upgraded by introducing a uniqe flexible and active wind net lifting system. The system is designed by implementation of military telescopic masts as to enable extremely fast lifting and retraction of the system or adjustment of its hight and shape by the organizers in accordance with the change of wind and weather conditions. The adjustment takes some minutes and is performed through computer unit.

The first installation of that kind of system has been installed at the mega ski jump K 200 in Planica in Slovenia in 2015, where flights up to 250 m are possible. The design of the wind net shape enabled the majority of athletes to jump more than 180 m to the difference of other mega jumps where extreme length of flights are achieved only by several athletes.

There is no need for numerous staff in order to set up classical structure. With the flexible system, the staff just distributes all net units to its position, fixes it to the hooks at the mast sections and horizontal top rope and vertical guide ropes. Before electrical cabling of masts has to be performed. With that the manual part of the job is done. Lifting and retraction is performed by electric driven telescopic masts that are only app. 2,5 m high when retracted and have then no impact on the landscape and enviroment, so they stay fixed. There is no cost of setting up the construction for future tournaments and dismantling.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The flexible wind protection system can withstand wind gusts up to app.15 m/s If wind forecast is that there might be a constant wind of more than 12 m/s the system should be reffed and lifted again after the wind gets normal. The procedure of reffing or lifting can be effected in app. 4 minutes.

The system has a further advantage in case of upwind (front wind) where the side nets might cause problems, we can reff the nets and enable normal conditions for the tournament In this case athlets are not exposed to the turbulences of the front wind as it can flow without obstacles.

The construction of our flexible wind protection system relays on the polyethilen net with breaking load certificate according to En1263-1 and telescopic masts produced in accordance with standards such as IEC 60204-1, EMC Radio, E 13 and EMC wired. Normally a wind protection net in UV stabilized polyethilen with partly strech fibers, high tenancity is used. Net is water repellent, thermofixed knoted and completed with perimetral rope. To achieve 70 % ofv wind flow reduction a mesh of 5x5 mm is used.

Wind protection net is flexibly fixed to stainless steel ropes vertically installed to aluminium alloy mechanical telescopic masts. Each mast is driven by an electric motor which enables controlled lifting and reefing of the net system.

The main features of the electric motor driven mast are sturdiness and extending and retracting precision which enables consistent accuracy of the extended high and synchronization of lifting and reefing of nets sections fixed to masts of different high.

Masts have impressive lifting strenght and lowest needed maintenance compared to similar products.


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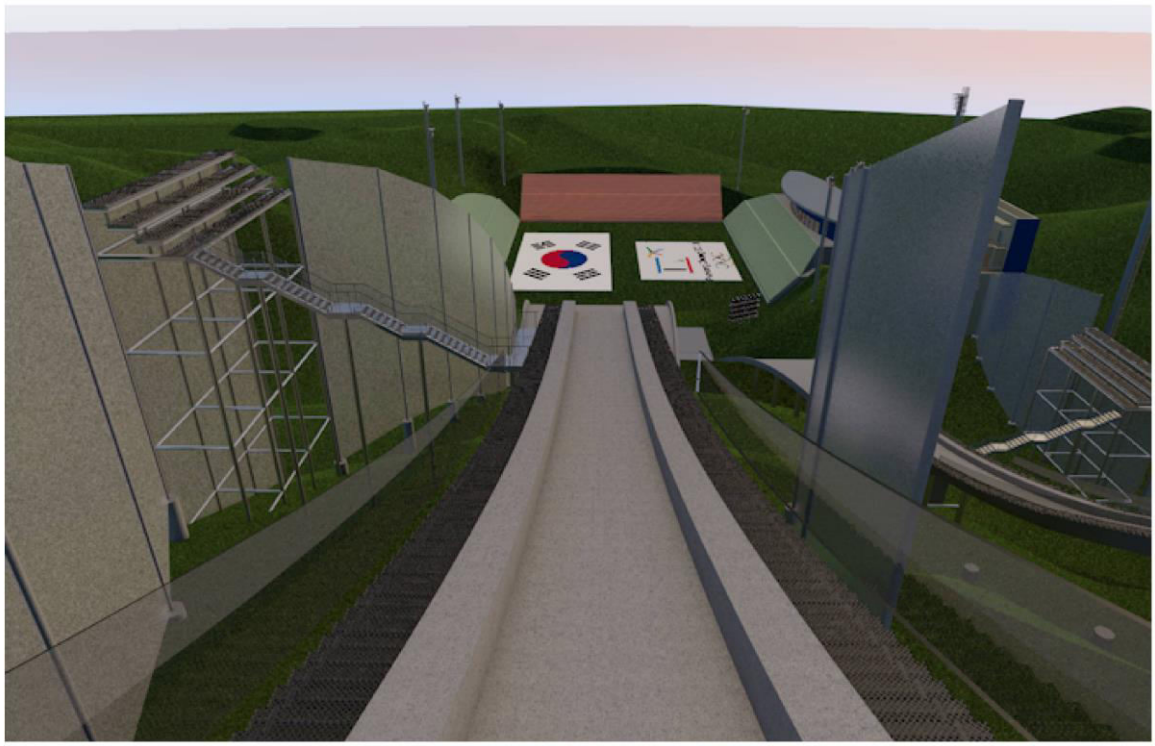

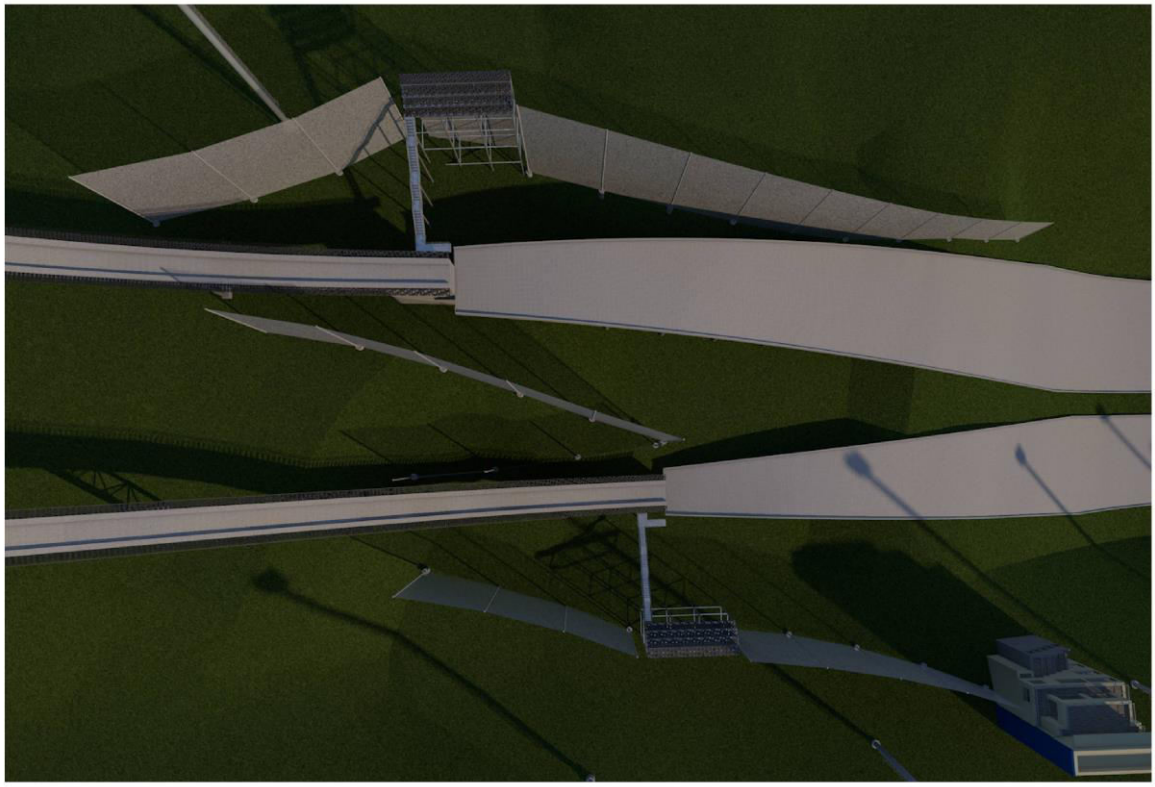

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