System solutions air distribution for Sports halls

IMP KLIMA

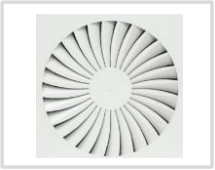
Components for Sports Halls

Swirl diffusers OD-11/TR

Supply air nozzles VŠ-5/TR

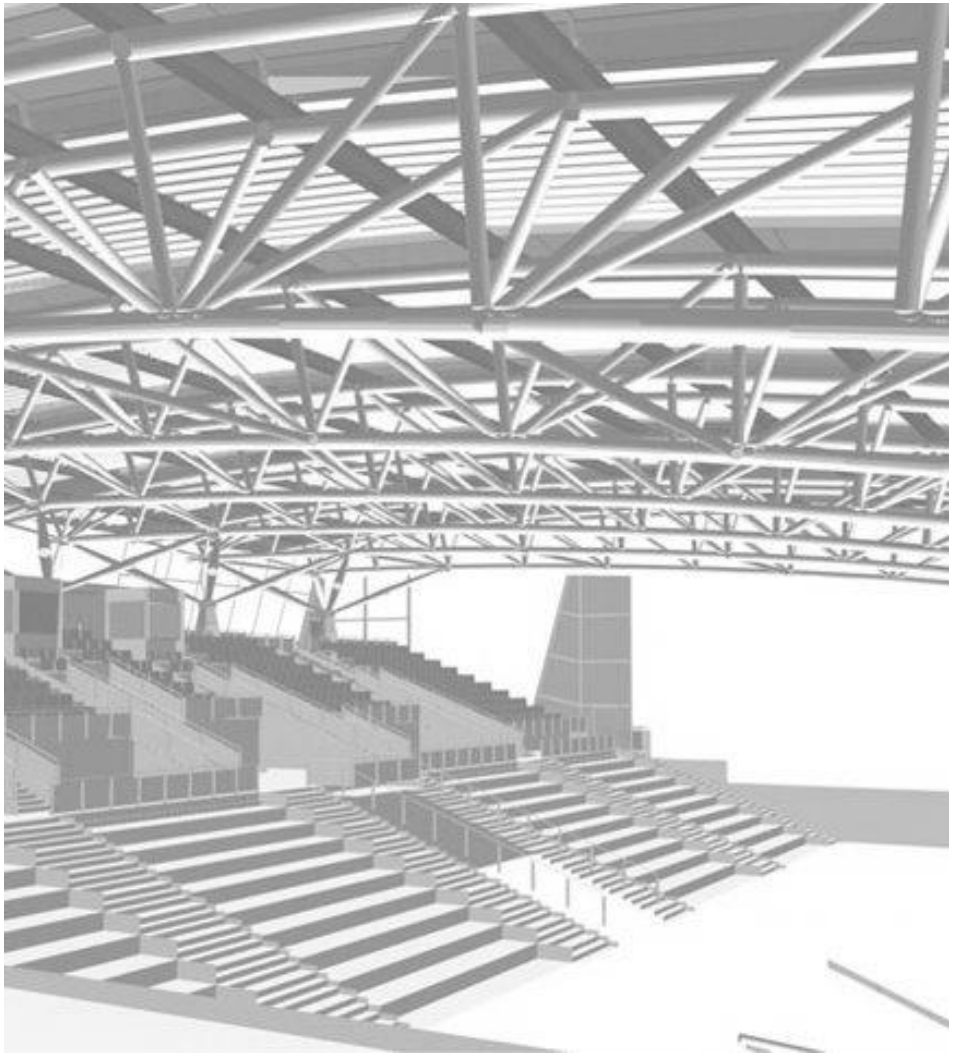
Air displacement units SD

Swirl diffusers OD-5



Ventilating towers SP

Steel weather louvres JZR-6



Fire damper

Mechanical air flow volume controller

Variable air flow volume controller

Floor convectors

Sound absorbers

Air handling units

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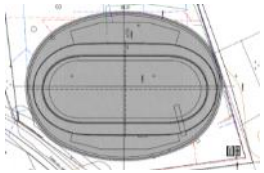
Sports Halls

Key object characteristics

Large room dimensions, large amount of users



Occupancy of the building varies greatly: very large number of visitors or completely empty facility.

Rational use of energy is very important.

Sports halls are mostly multi-purpose objects (for sports events, concerts, theatre events…) with a high representative value.

Key tasks for designers

- Choosing air distribution elements with large throw distances, that ensure the supply of adequate amounts of fresh air and a pleasant indoor climate for visitors and players
- Rational choise of energy saving air conditioning systems with a high degree of heat recuperation and centralized control of different regimes, depending on the current occupancy of the building is obligatory.
- In order to meet the requirements of different events, the equipment of sports halls must be both flexible and aesthetically pleasing.

AHU for Sports Halls

AHU TopAir

- new model with improved heat transfer and thermal bridge coefficient
- selection software AirCalc++
- better air thightness and mechanical stability
- high level of heat recuperation
- EUROVENT certificate
- integrated automation

Air Supply Elements for Sports Halls

Supply air nozzles, VŠ-4

- for rooms with large throw distance requirements
- **VŠ-4** – adjustable within a +/- 30° range, either manually or by means of a motor drive

Supply air nozzles VŠ-5

- can be adjusted in the same way as VŠ-4 – manually or motor-driven
- supply air nozzle is integrated in the housing and does not protrude into the room.

Air Distribution Elements for Sports Halls

Swirl diffuser OD-11

- designed for rooms with 3-10 m height
- suitable for large temperature differences between supply and room air
- various regulation options, also thermostatic regulation is possible

THERMOSTATIC REGULATION

Square diffuser OD-5

- for air supply and exhaust
- low static pressure drop and low noise level

Air displacement units

- suitable for larger rooms with high heat loads
- the supplied air forms a “fresh air pool” in the occupied zone
- even temperature field, without draught
- various installation options

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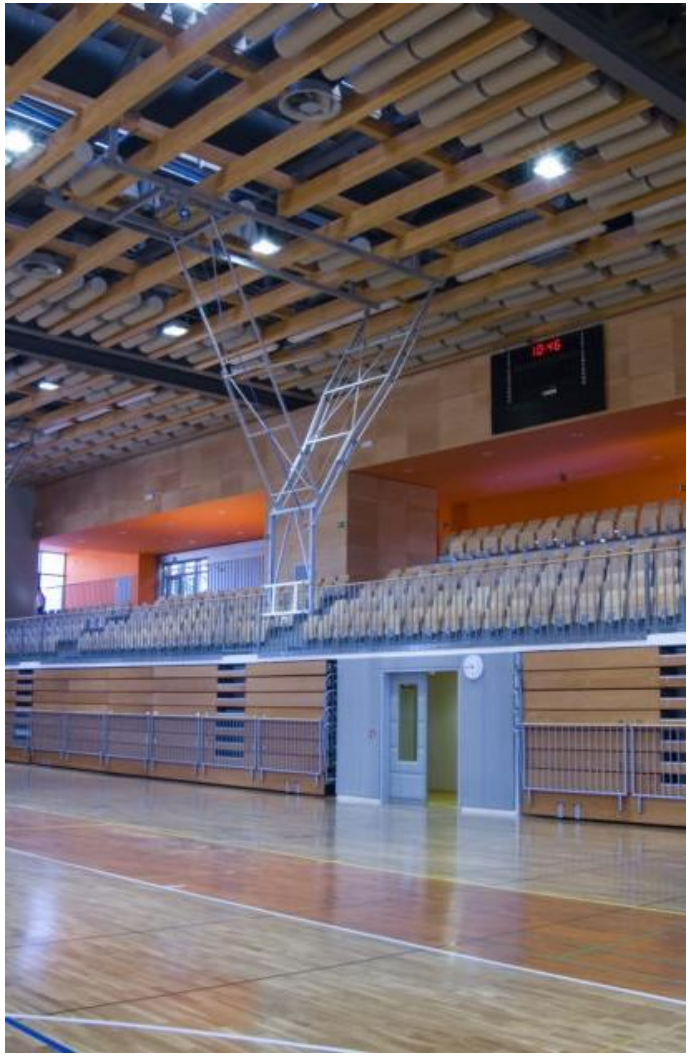
VAV and CAV Regulation for Sports Halls

Electronic flow rate controller ERP-1

- VAV (variable air volume) or CAV (constant air volume)
- easy setting of the parameters on the site
- option: LONWORKS with integrated MP BUS protocol

Mechanical flow-rate controller MRP-5

- designed for CAV only
- easy maintenance and manual setting of the air flow
- optional installation of an actuator



Fire Protection and External Elements

Fire damper WK and WH

- installation in rectangular or circular ventilation ducts
- tested and certified for different markets (A, PL, SLO, SRB, RU, UKR, RO, …)
- acc. to CE - EN15650, EN1366-2 and EN13501-3 and local standards

Ventilating towers SP

- supply and exhaust of air from rooms
- can be fitted with sound attenuator
- available in circular and square versions
- materials (aluminium, steel, inox,…) and dimensions are determined by the customer

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Business Excellence

Standardisation of business processes and certificates of suitability

Quality management system

Business processes according to standards ISO 9001:2000 and ISO 14001

Certification of products:

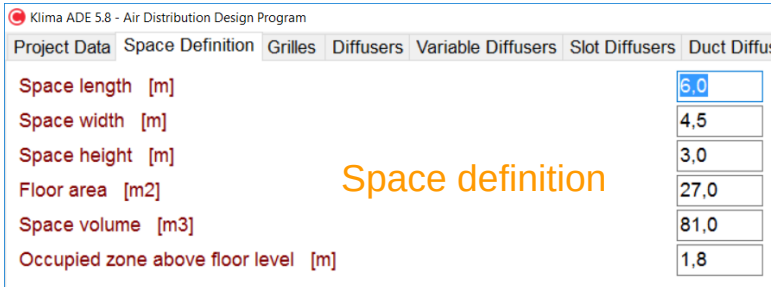
International certificates: CE, TÜV, Eurovent, Solar Keymark

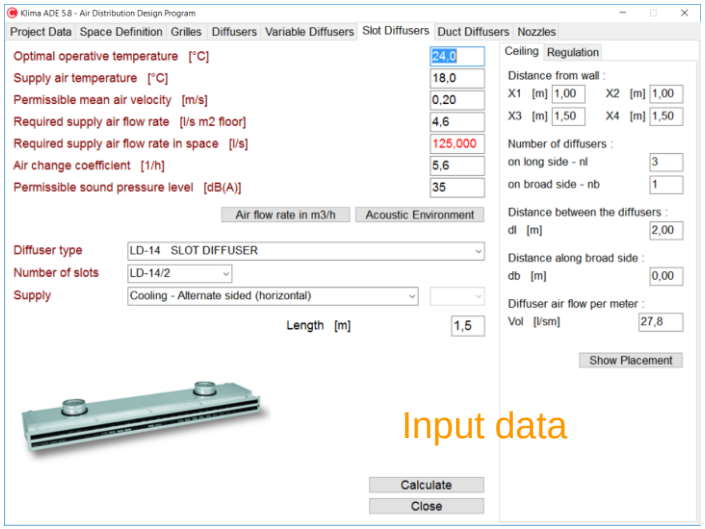
National certificates: GOST, SPF, ZAG

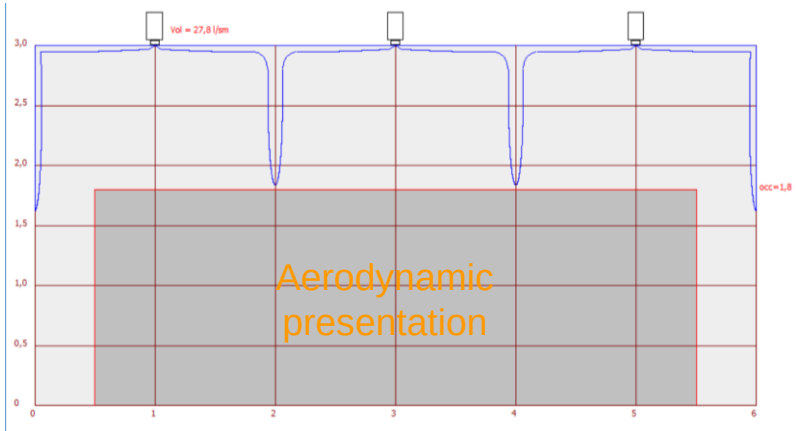
IMP KLIMA

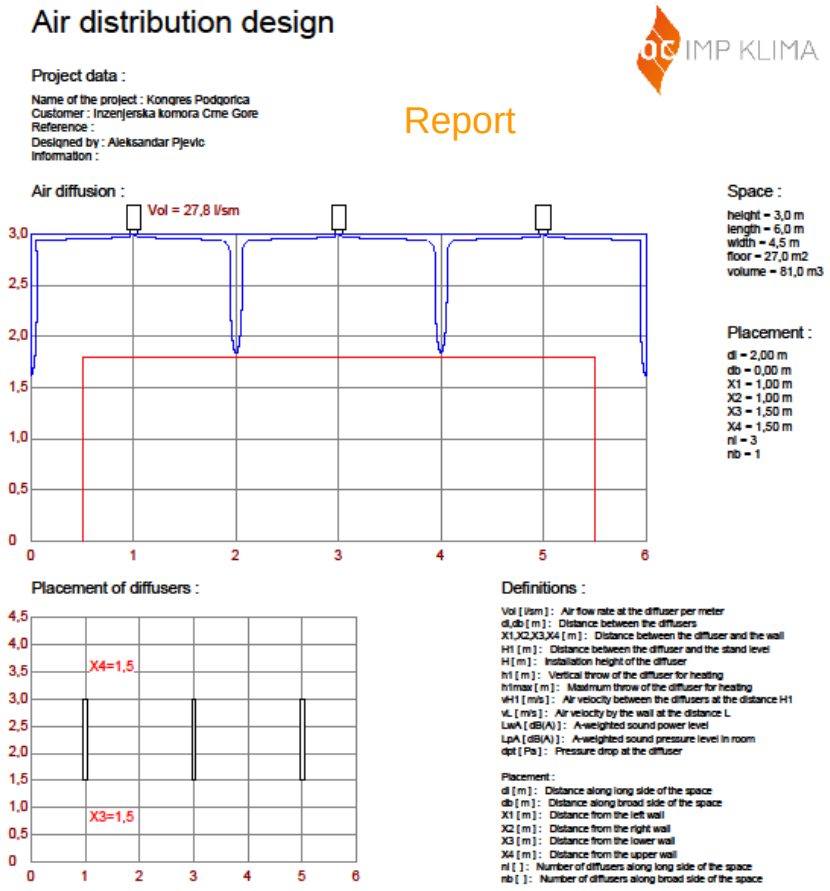
Software for the equipment selection

Klima ADE 5.8



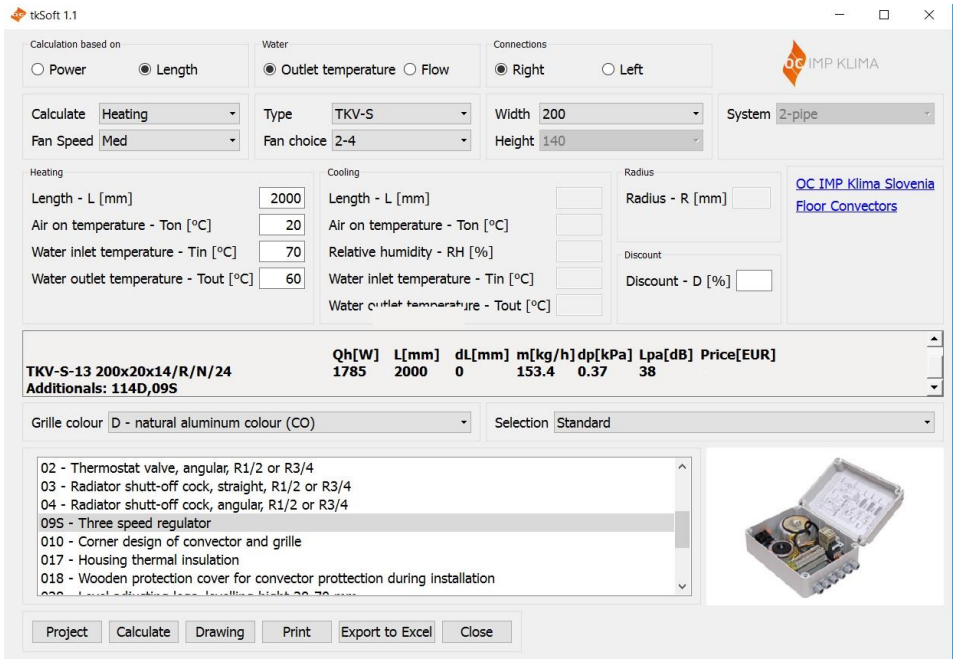




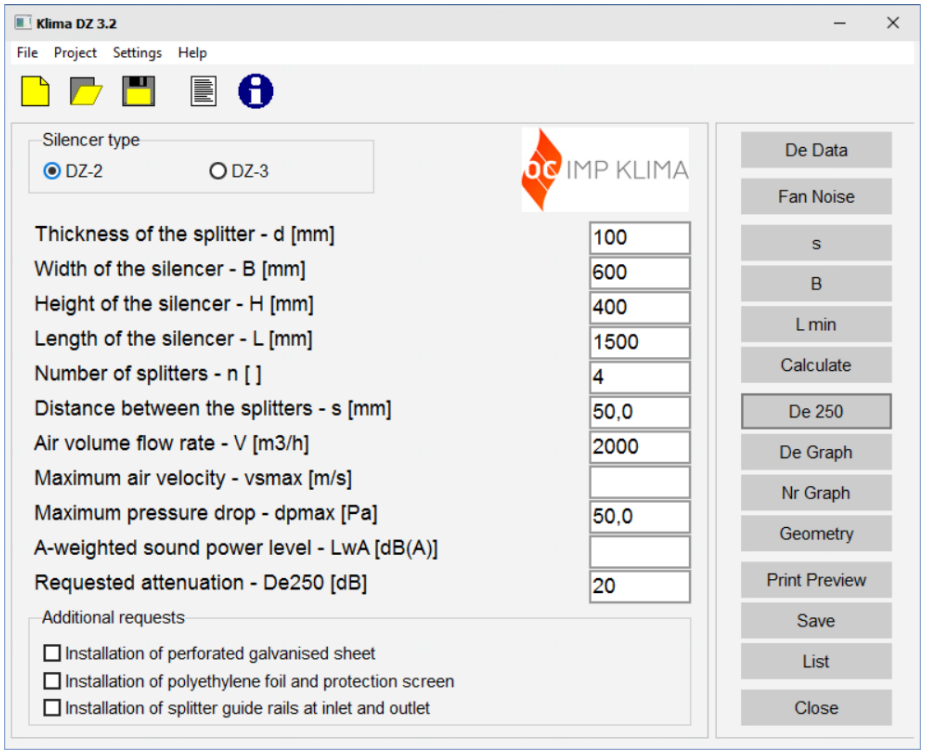


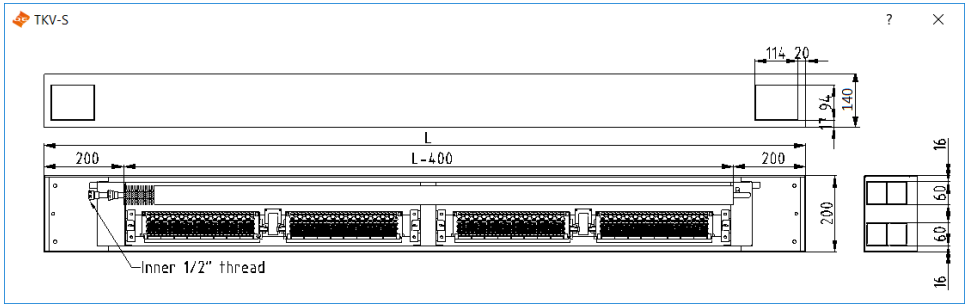
Software for the equipment selection

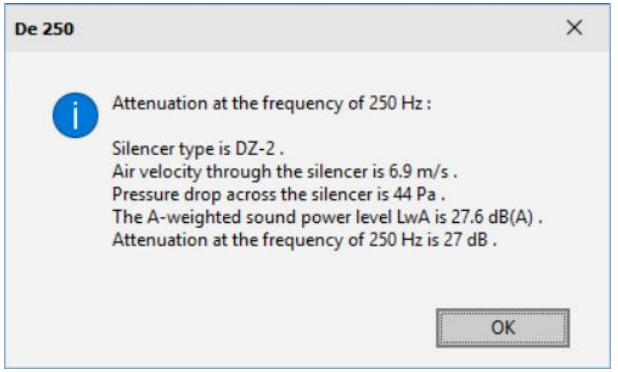
Floor convector selection



Sound absorber selection

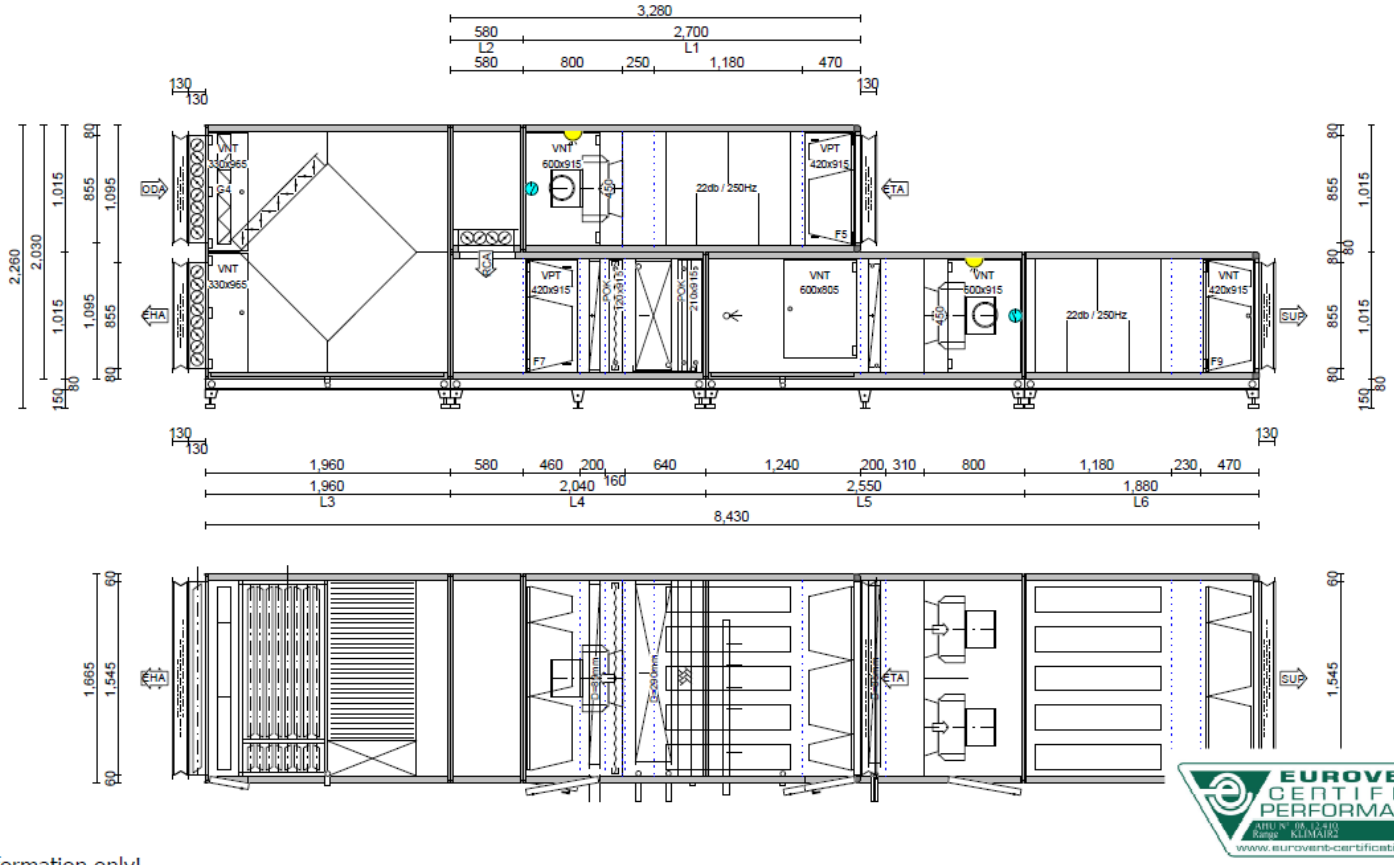






IMP KLIMA

AirCalc++



EUROVENT CERTIFIED PERFORMANCE
www.eurovent-certification.com

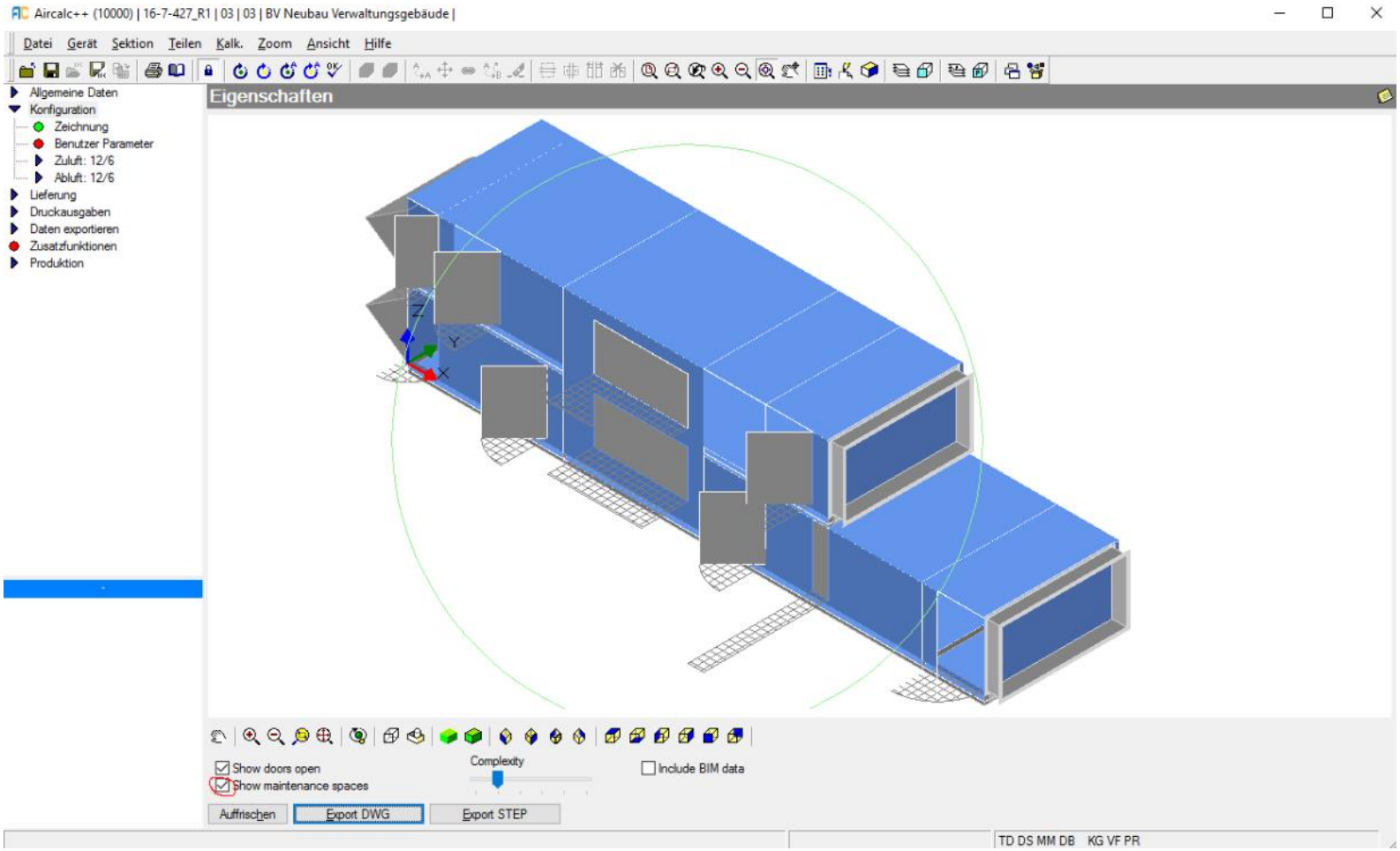
For information only!

AirCalc++ 3.20.171/1 - D.V.3.9.076 - 10001 - 9/6/2019

Lindab	pos. no. 01	Description PB1		Supply	Exhaust	Drawing ID	61364 1000
			Unit size	15/9 d50	15/9 d50	Order no	500008452
	Project Yuriya Pharm, Cherkassy	Client EMC LeoCon-Group Ltd.	Airflow [m³/h]	9,000	9,000	Designed by	Aleksandar Pjevic
			Tot. press. drop [Pa]	1,695	1,259	Date	9/6/2019
arrangement:	KHND d50 15/9 - RPDFK, U, FTT, EW, FR, KWTA, BD, EW, L, VF, S, L, FTT *** 15/9 - FTT, S, L, VF, U, RPDFK					Weight netto/brutto [kg]	2393 / 2523

IMP KLIMA

Export in 3D


Aircalc++ (10000) | 16-7-427_R1 | 03 | 03 | BV Neubau Verwaltungsgebäude |
Datei Gerät Sektion Teilen Kalk. Zoom Ansicht Hilfe
Allgemeine Daten
Konfiguration
Zeichnung
Benutzer Parameter
Zuluft: 12/6
Abluft: 12/6
Lieferung
Druckausgaben
Daten exportieren
Zusatzfunktionen
Produktion
Eigenschaften
Show doors open
Show maintenance spaces
Complexity
Include BIM data
Auffrischen
Export DWG
Export STEP
TD DS MM DB KG VF PR

Case Studies

a) Velodrome, Novo mesto, Slovenia

b) Sports Complex, Ljubljana, Slovenia,

c) Belgrade arena, Belgrade, Serbia

d) ”Iceberg” Palace, Sochi, Russia

e) Rhythmic gymnastics centre, Moscow, Russia

c)

d)

a)

b)

e)

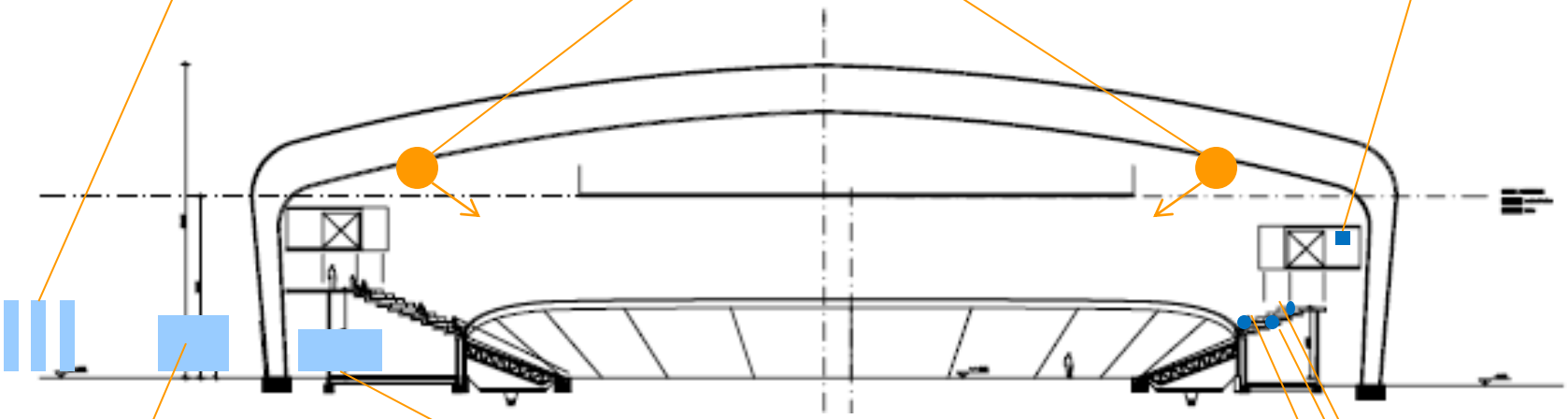
IMP KLIMA

Case Study – Velodrome Novo mesto

General data:

Surface area: 8.000 m²
Height: 13 m
Steel construction, covered with tehnical tilt.
Capacity: up to 5.000 visitors
Investment: 13. mio. €.
Architector/designer: M. Zupanc jr.

Case Study – Velodrome Novo mesto



Air towers
SP

Air supply nozzles
VŠ-5/TR

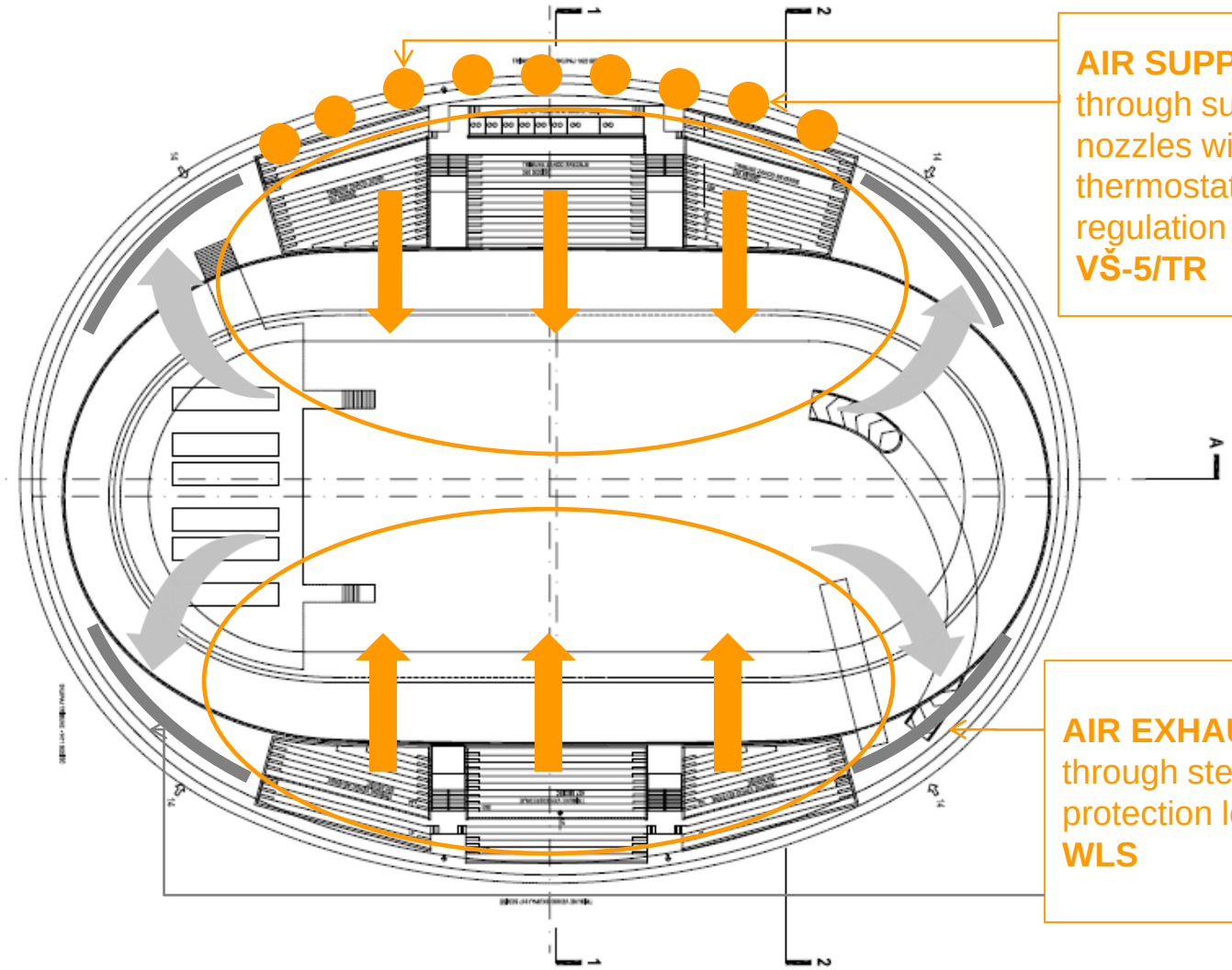
Swirl diffusers
OD-5

Chiller
Polaris MP

Air handling unit **TopAir**

Stair diffusers
STD-2

Case Study – Velodrome Novo mesto



AIR SUPPLY
through supply nozzles with thermostatic regulation
VŠ-5/TR

AIR EXHAUST
through steel protection louvres
WLS

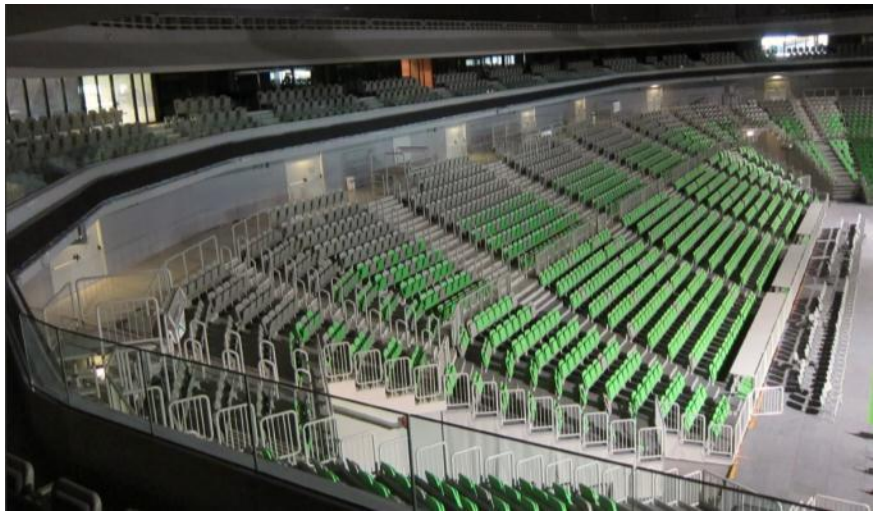
IMP KLIMA

Case Study – Sports Complex Stožice

General data:

Surface area: 14.164 m^2 (arena)
24.694 m^2 (stadium)
Seat capacity: 12,500 (arena)
16,000 (stadium)

Case Study – Sports Complex Stožice



The air flow volume in Stožice is maintained by **94 square and circular electronic air flow volume control units** from the SimpLY family, which enable not only the very precise regulation of desired air speeds, but also the possibility of subsequently resetting any of the desired parameters.

Nine air handling units (indoor double-stage versions with rotary wheel, bypass, mixing block, water heater and cooler, cassette filter EU4) have been built in, with a total flow rate of 306.000 m^3 /h, which ventilate the change rooms, corridors and entrance hall, the VIP lounges, conference areas for journalists and the banquet hall, and rooms for doping control and judges – all together an area of 5,900 m^2.

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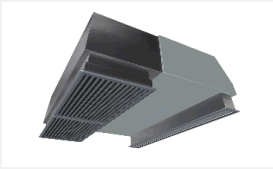
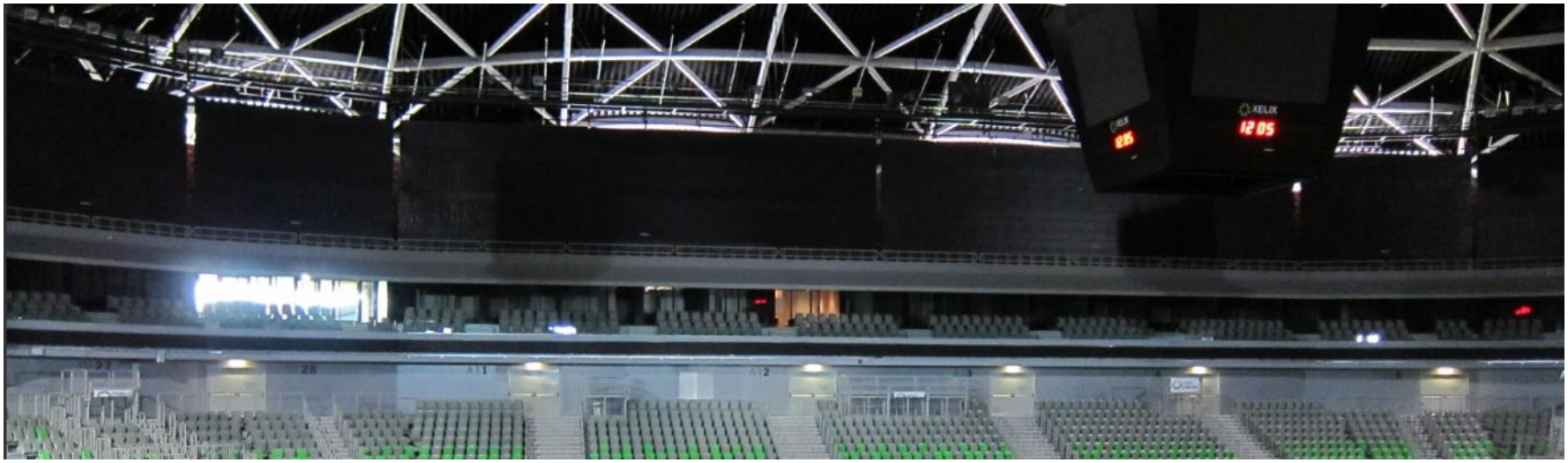
Case Study – Sports Complex Stožice

The secondary air preparation and diffusion is carried out by **ceiling cassette convectors.**



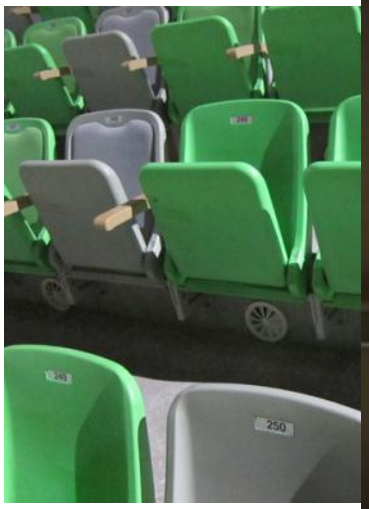
Intrusion of cold outside air is prevented by **air curtains** at all arena entrances**.**

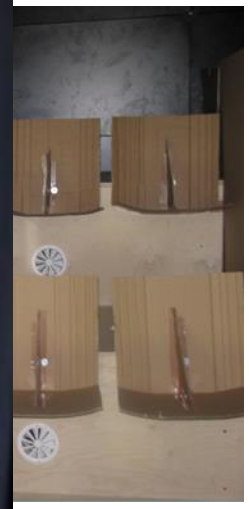
Case Study – Sports Complex Stožice



In central part the sporting arena of the complex, a suitable quantity of fresh air is supplied by **supply nozzles VŠ-5**

Case Study – Sports Complex Stožice





it was
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air displacement units approximately 30% of the energy, needed for heating and cooling could be saved.

IMP KLIMA

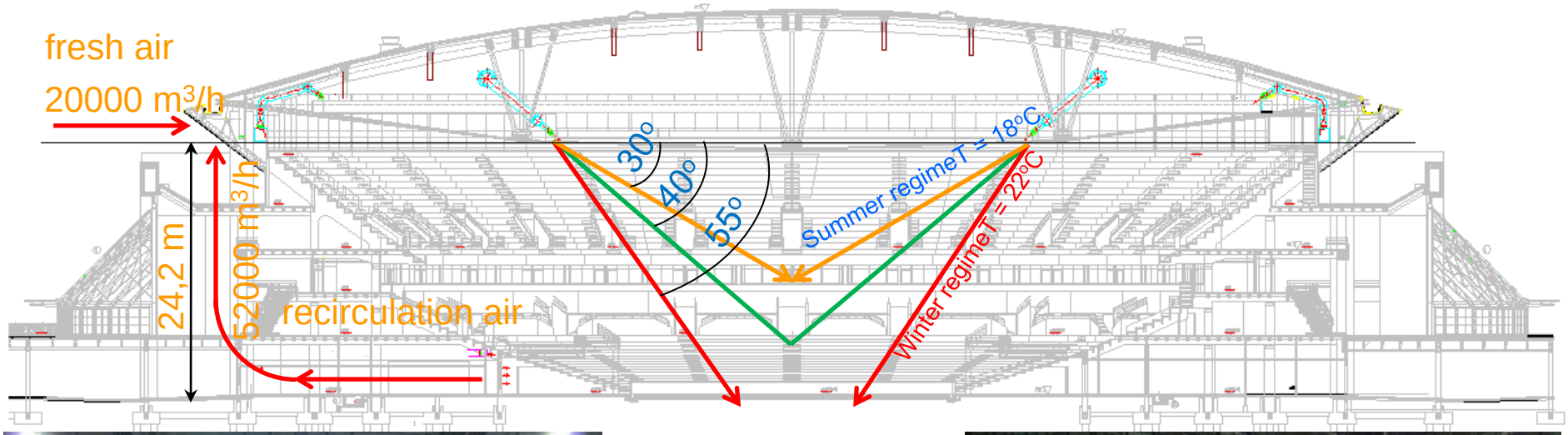
Case study – Belgrade arena

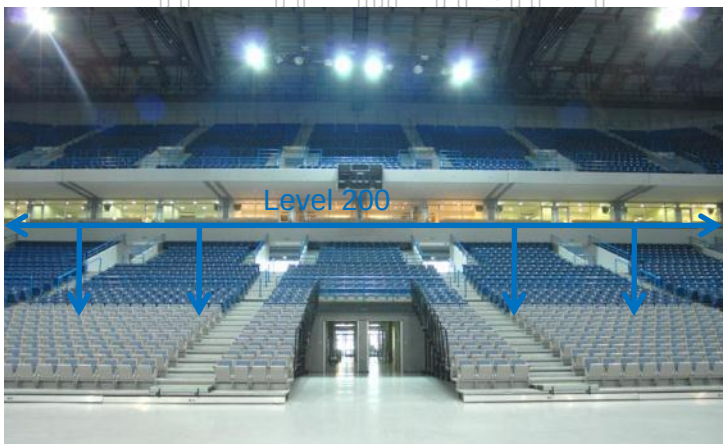
General data:

Surface area: 48.000 m²
Capacity: 22,680 seats
Built-in Lindab equipment :

- 1200 supply air nozzles VŠ-4
- 600 fire dampers
- 5 chillers
- various air distribution units

Belgrade arena – central part of the arena





Recirculation air area

STD ϕ200 - 1100 pcs.

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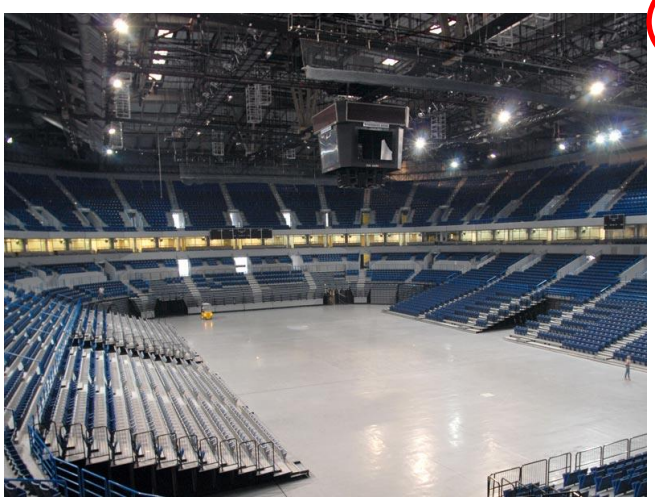
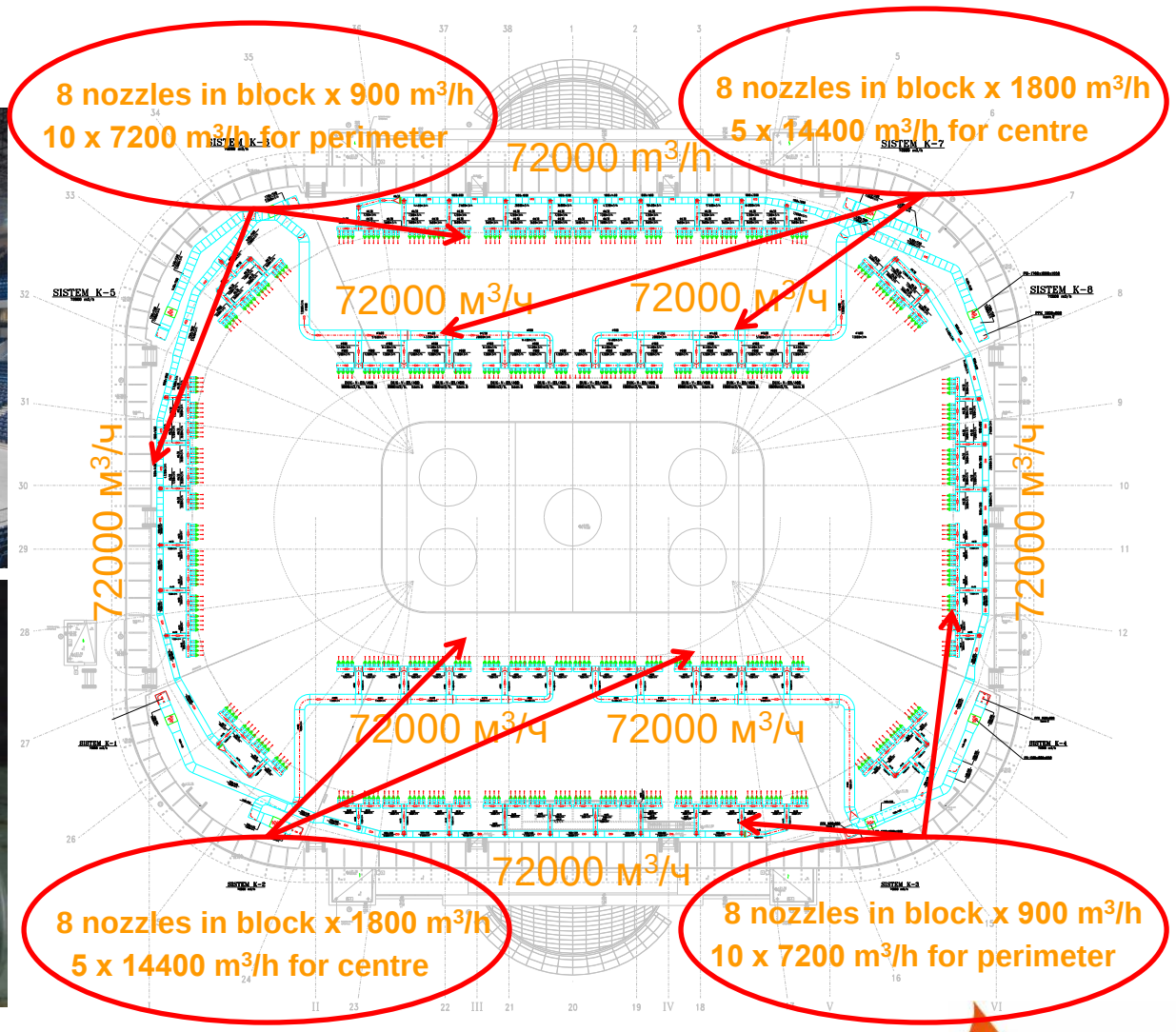
Belgrade arena – central part of the arena

Level 600





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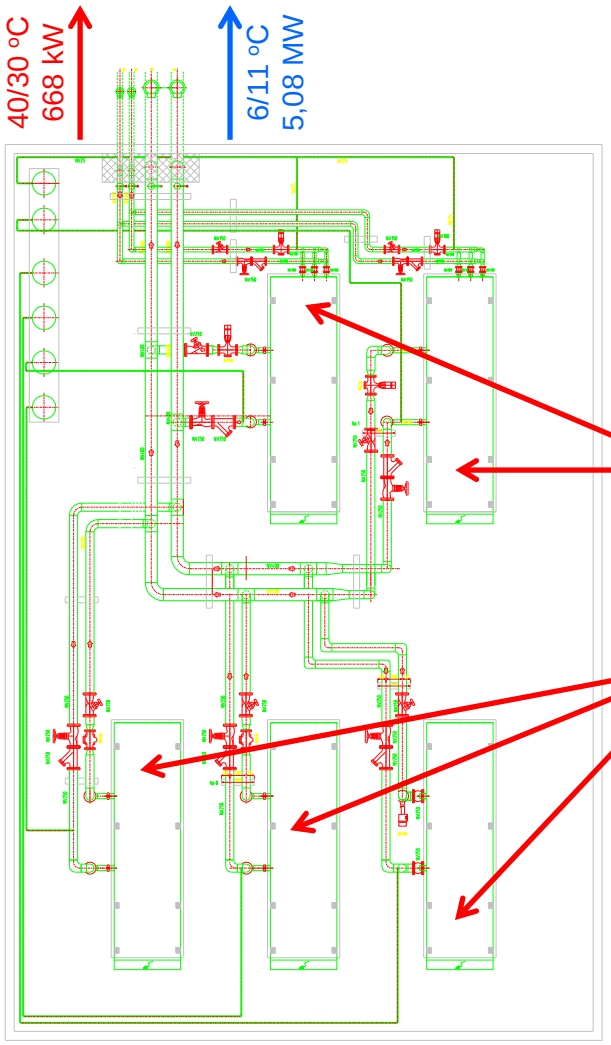
Belgrade arena - chillers



3 scroll compressors with possibility to regulate the cooling capacity in the range from 8,5 up to 100 %

2 chillers with recuperation:
6/11 °C each 1016 kW
40/30 °C each 334 kW
for humidity regulation in the summer period

3 chillers without recuperation:
6/11 °C each 1016 kW

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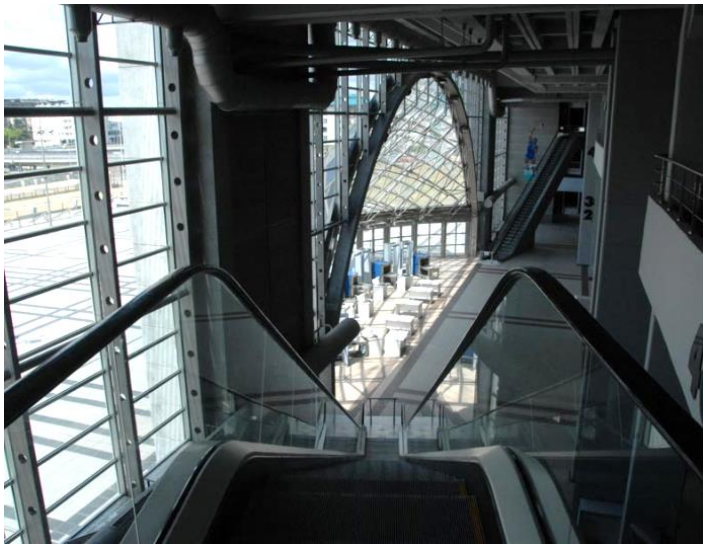
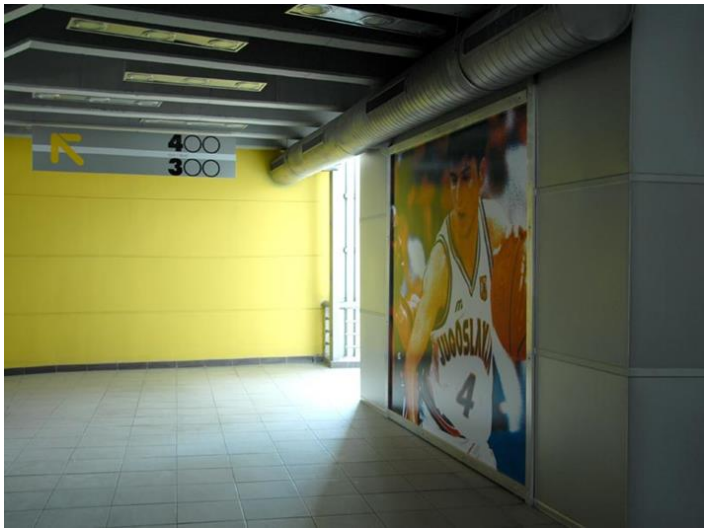
Belgrade arena – Air Distribution Units

Main entrance





VŠ-4/E/R

RGS

IMP KLIMA

Belgrade arena – Events

Eurovision Song Contest 2008

Basketball EuroLeague, Partizan – Panathinaikos, 2009, 22.536 spectators

Water polo, European Championship, 2016

Tennis Davis cup

Concerts

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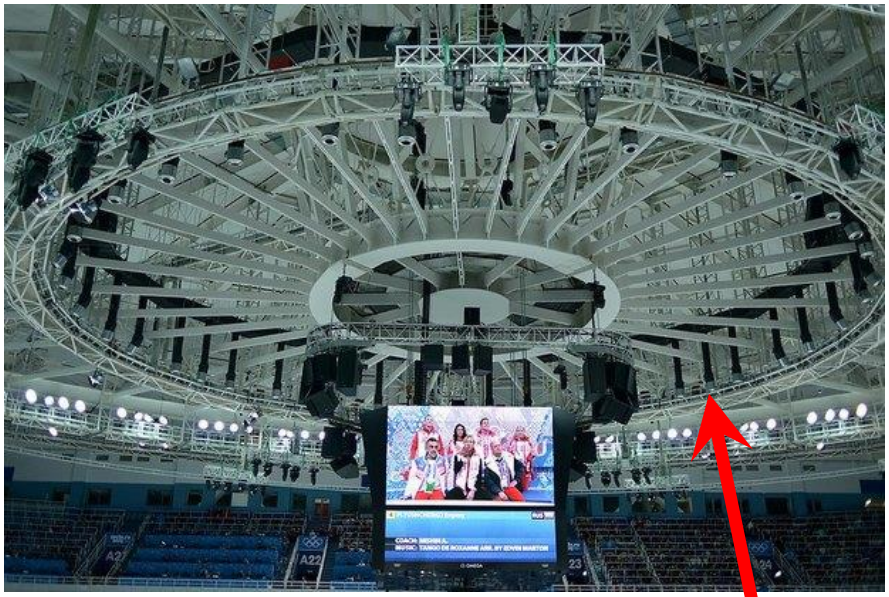
Case study – ”Iceberg” Palace, Sochi

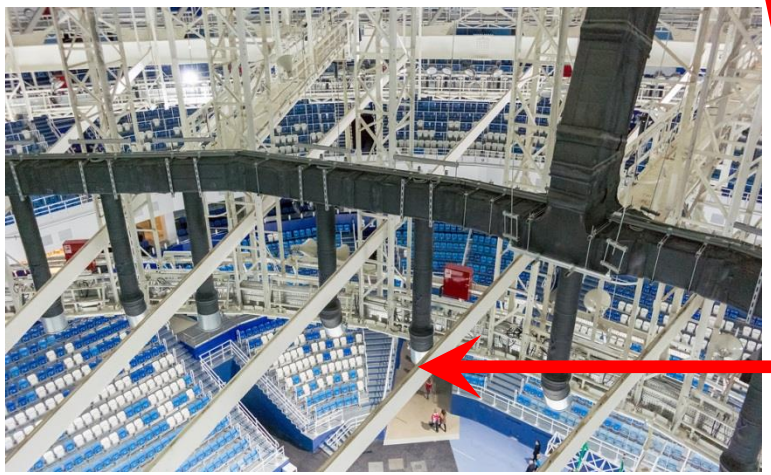
General data:

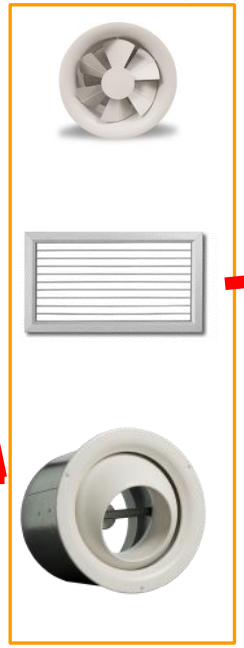
Surface area: 20,917 m²
Height: 37,5 m
Capacity: 12.000-seat multi-purpose arena, mainly for figure skating and short track speed skating

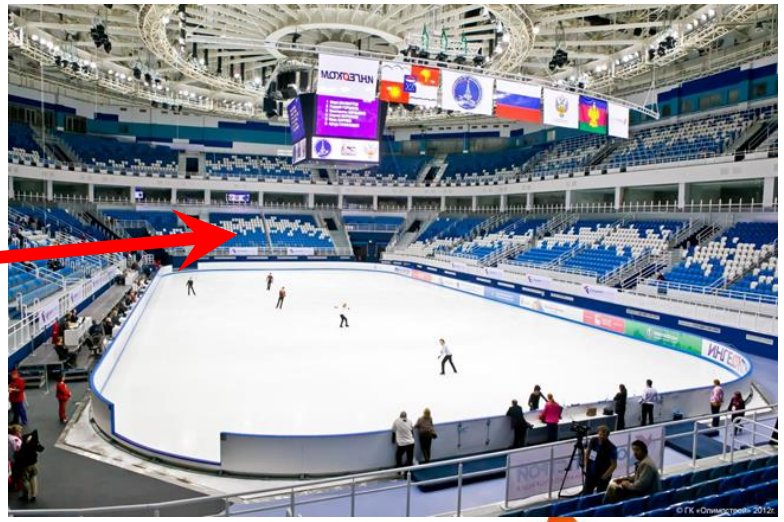
Case study – ”Iceberg” Palace, Sochi



Supply air





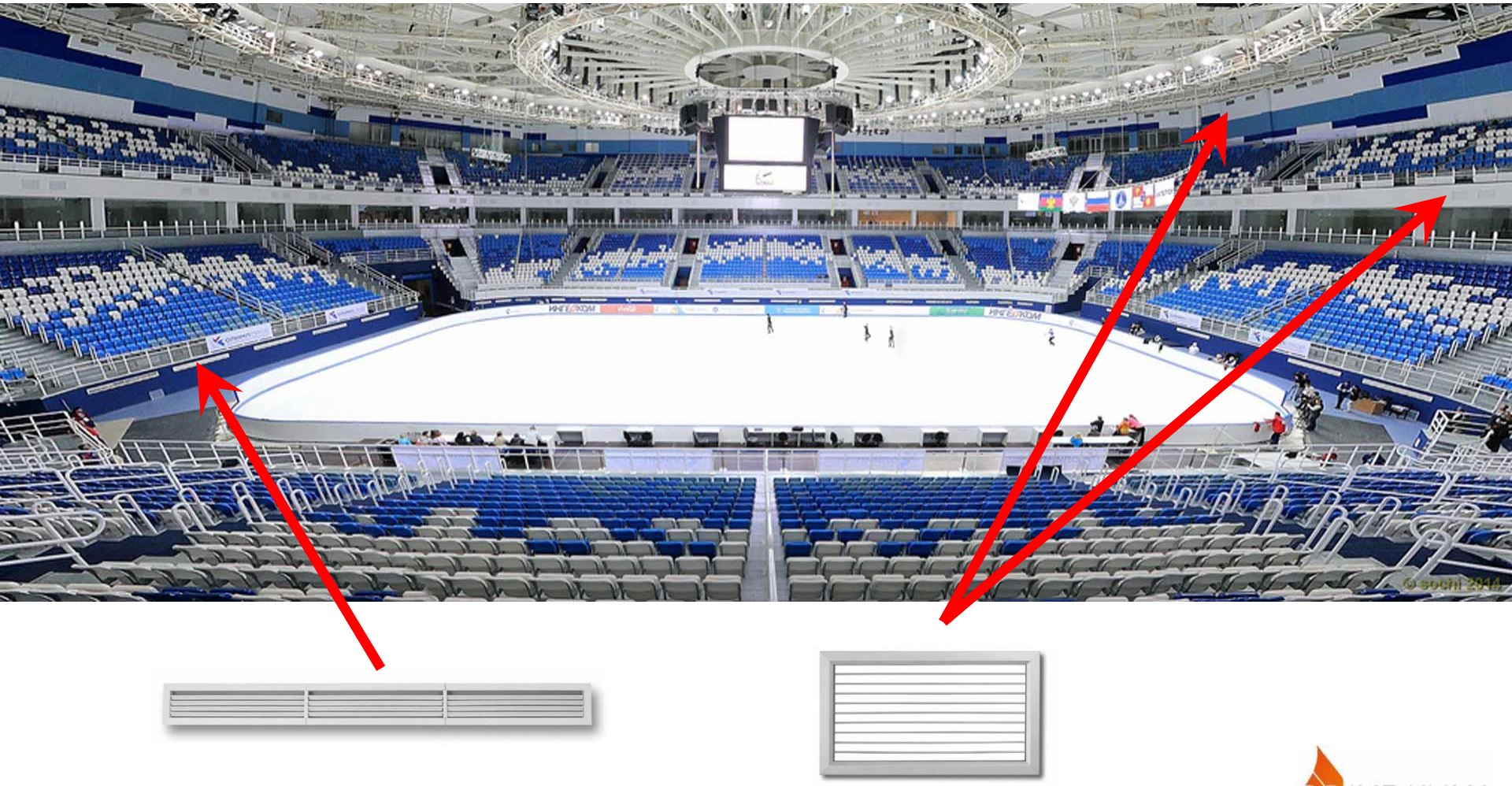


4x12.000 m³/h

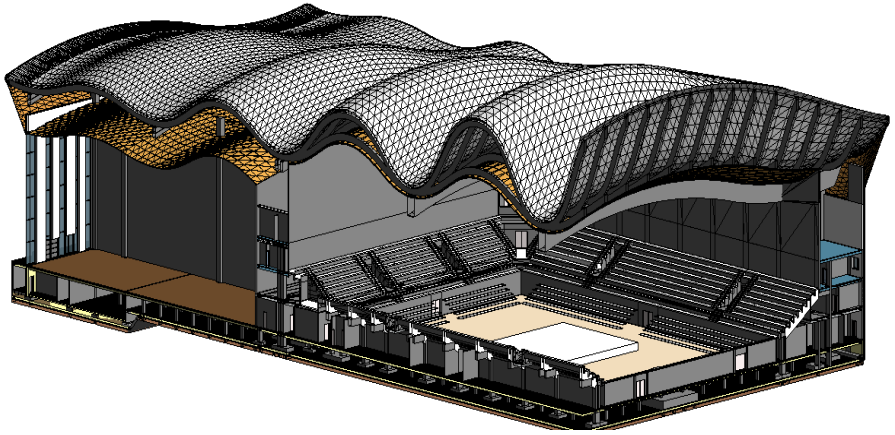
IMP KLIMA

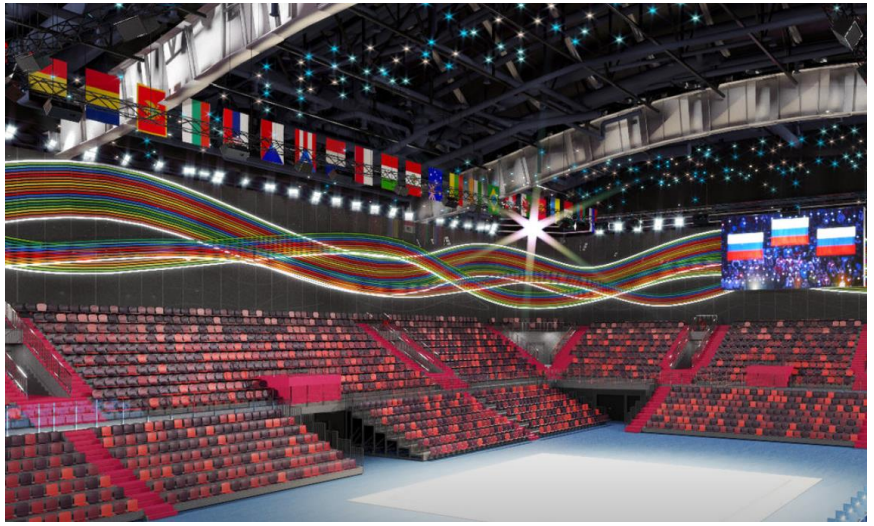
Case study – ”Iceberg” Palace, Sochi

Exhaust air



Case study - Rhythmic gymnastics centre, Moscow

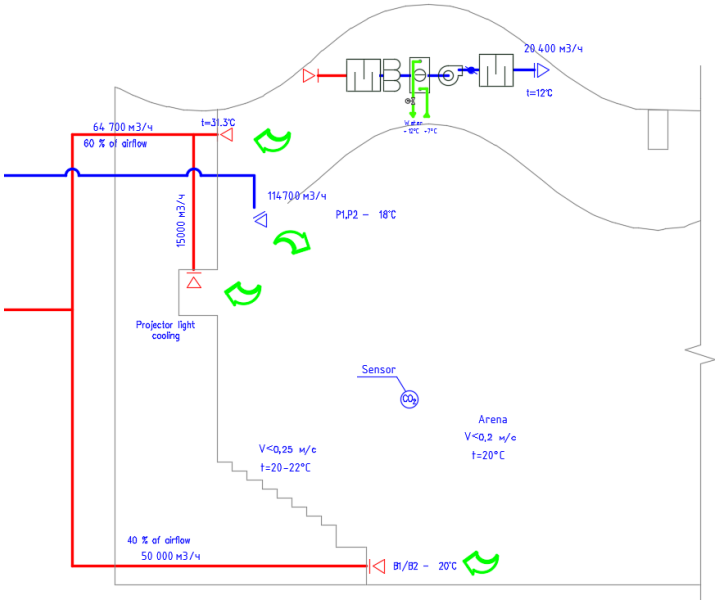


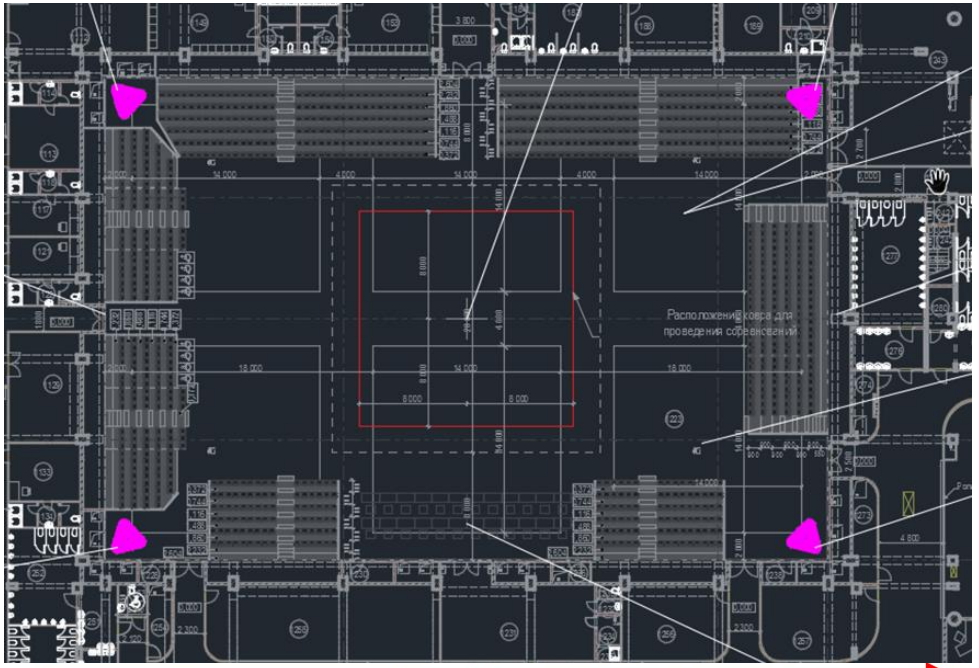


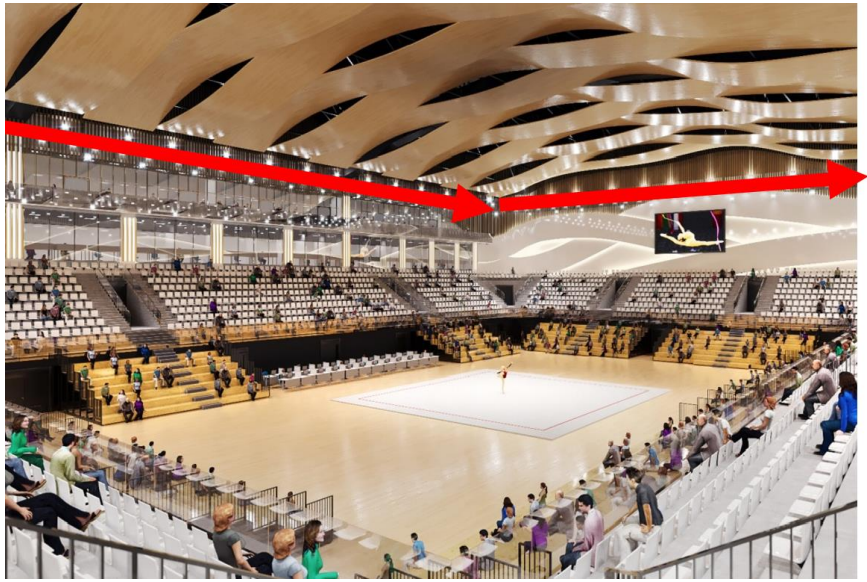
General data:

Surface area: 23.500 m²
Height: 40 m
Capacity: up to 4.000 visitors during competitions and 250 sportsman

Case study - Rhythmic gymnastics centre, Moscow

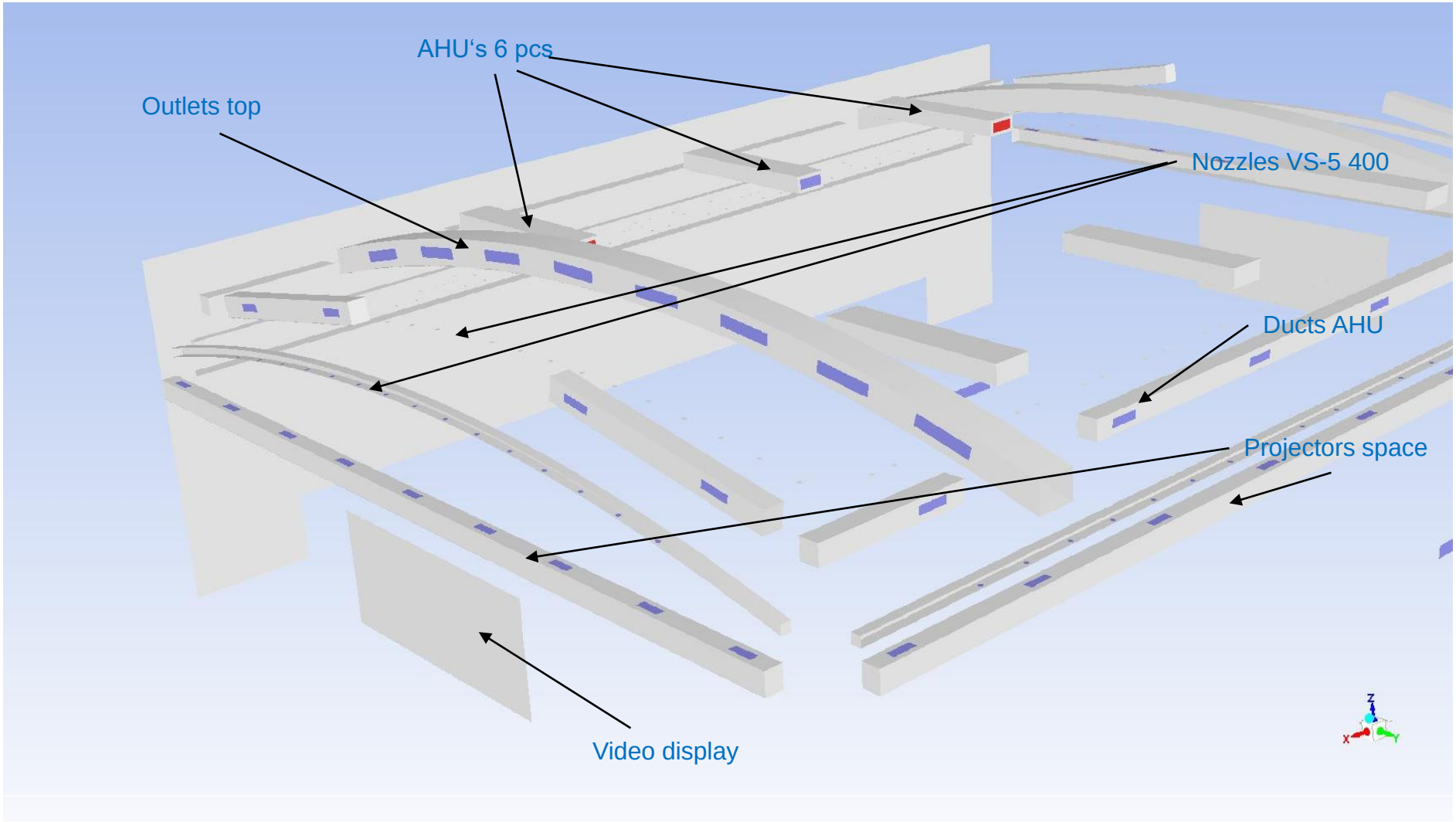




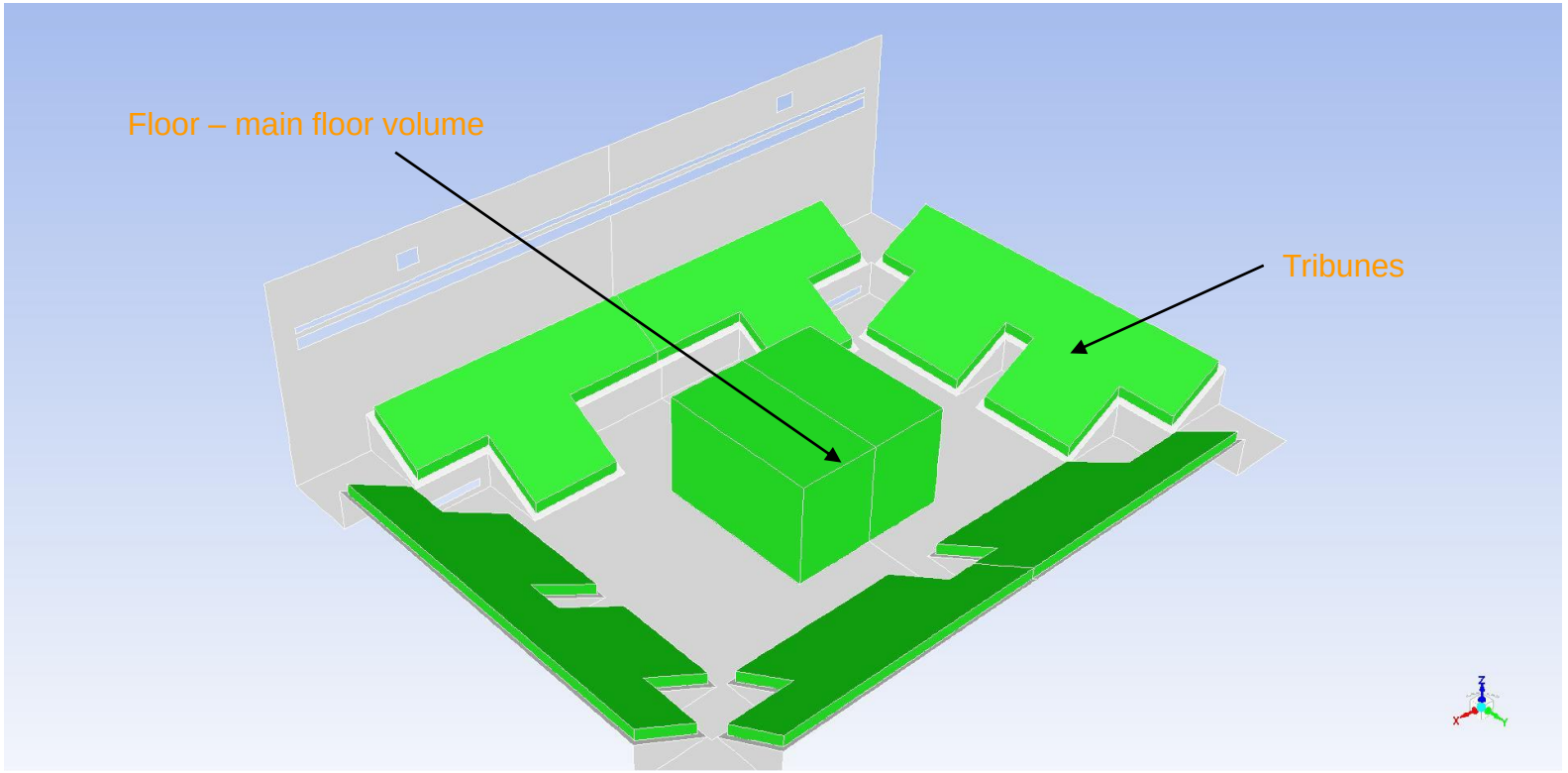


IMP KLIMA

Case study - Rhythmic gymnastics centre, Moscow



Case study - Rhythmic gymnastics centre, Moscow



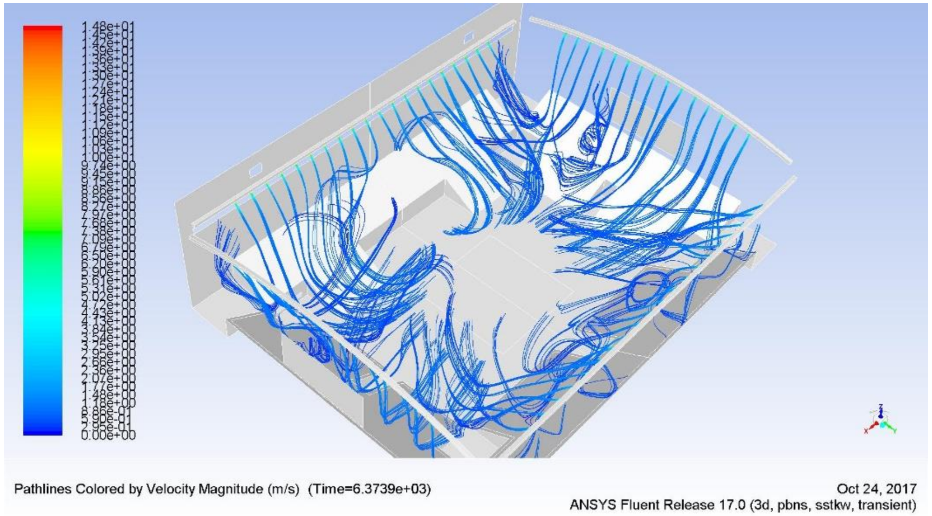
Inlets:
•Nozzles VS-5 400, 70 pieces (40 pcs per long side on both sides – **65500** m3/h, direction angle 50 ˚ down, 30 pcs per short side curved position with suspended ceiling on both sides – **49200** m3/h, direction angle 65 ˚ down)
•Total volume airflow: 114700 m^3/h (1640 m3/h per nozzle)
•Temperature: summer regime: 16 ˚C

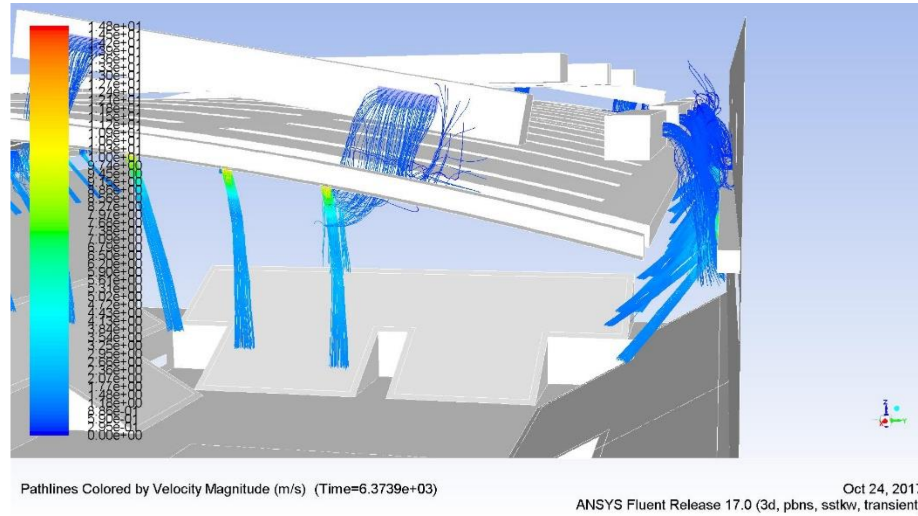
Inlets/Outlets – ceiling
•AHU, 6 pieces, 3400 m3/h
•Total volume airflow: 20400 m^3/h
•Temperature: 12 ˚C

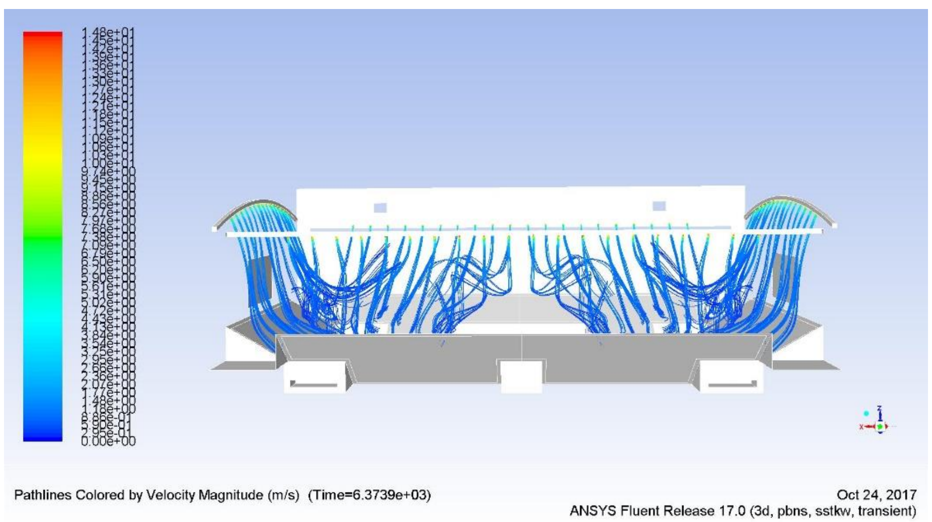
Heat loads:
Tribunes: 281600 W (volumetric heat generation, sensible)
Projectors space: 75100 W (heat flux heat generation)
Ceiling: 44900 W (heat flux heat generation)
Video display 2pcs: 29000 W (heat flux heat generation)
Total heat load: 430600 W

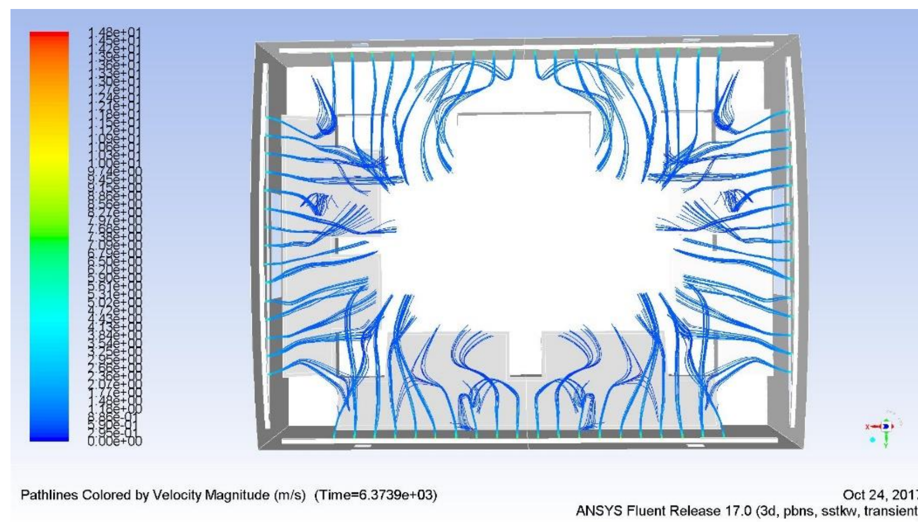
Outlets:
- Outlets bottom: Grille 5400 x 800, 4 pcs; Total volume airflow: 40000 m^3/h (10000 m3/h per grill)
- Outlets middle: Grille 1200 x 400, 36 pcs; Total volume airflow: 25000 m^3/h (694 m3/h per grill)
- Outlets top: Grille 1800 x 600, 16 pcs; Total volume airflow: 49700 m^3/h (3106 m3/h per grill)

Case study - Rhythmic gymnastics centre, Moscow









Pathlines from nozzles and AHUs

Case study - Rhythmic gymnastics centre, Moscow

Nozzles 40 pcs. 65500 m3/h, angle 50 degree down (longside)
Nozzles 30 pcs. 49200 m3/h, angle 65 degree down (shortside)

Floor Area 10x10x16	Velocity (m/s)	Temperature (°C)
MAX	1.08	24.4
Average	0.55	23.6
MIN	0.01	23.3

Tribunes	Velocity (m/s)	Temperature (°C)
MAX	1.15	27.2
Average	0.57	24.1
MIN	0.01	22.5

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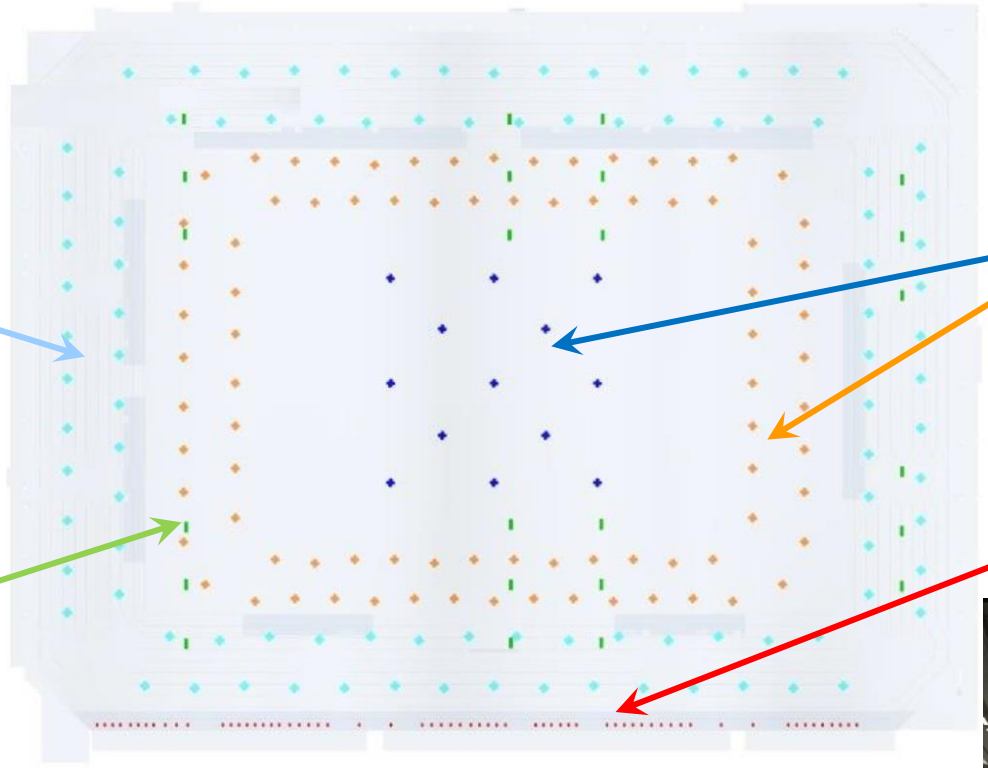
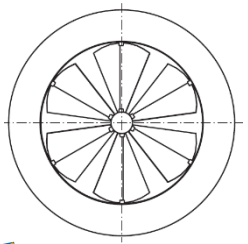
Case study - Rhythmic gymnastics centre, Moscow

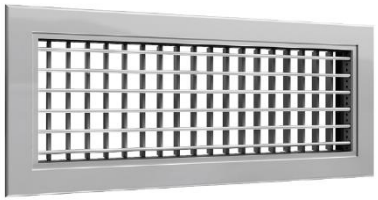
RCW 315





RCW 250

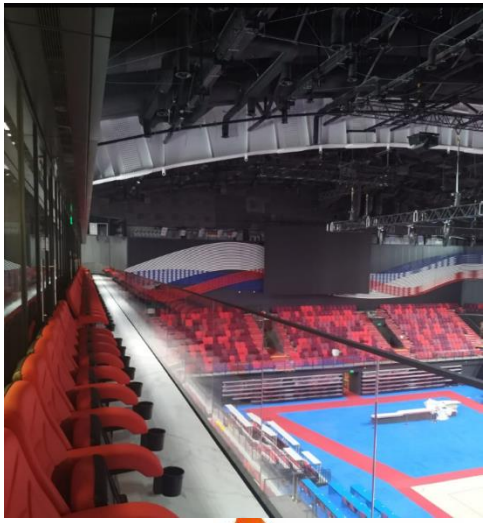
AL, 50 m



AD-21-HM

AHU	Distributor Colour	Distributor type	Q-ty pcs.	Total airflow m^3/h	T °C
P1	Red	AL	63	5.000	20
P2	Blue	RCW 250	13	5.200	20
P3	Green	AD-21-HM	24	10.000	16
P4, P5	Orange	RCW 250	84	42.000	16
P6, P7, P8	Cyan	RCW 315	100	70.560	14

Supply airflow for arena 132.760 m^3/h



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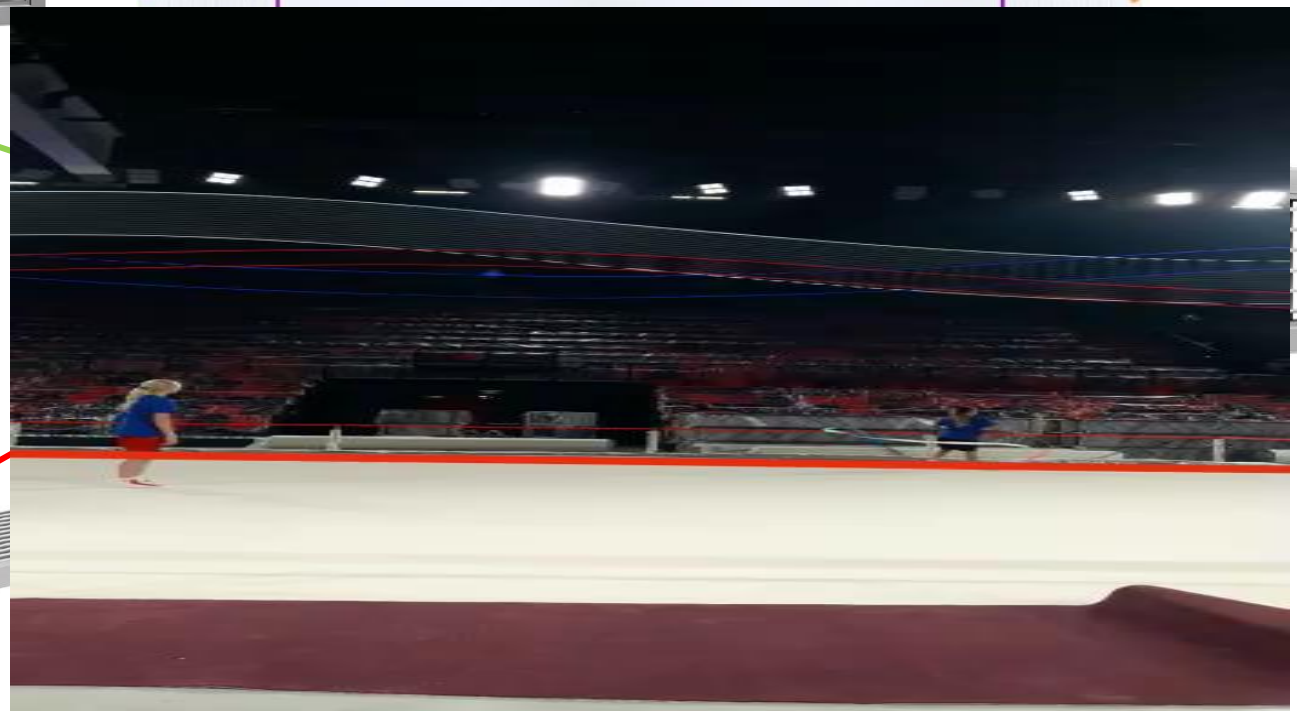
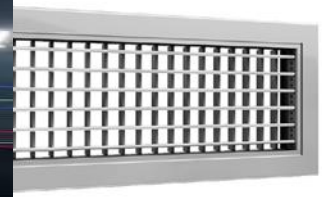
Case study - Rhythmic gymnastics centre, Moscow

AR-11-HM





AD-21-HM

AG-10

Cyan	AD-21-HM	30	15.000
Orange	AD-21-HM	50	40.000
Green	AR-11-HM	4	5.000
Red	AG-10	48	10.800
Magenta		8	56.700

Exhaust airflow for arena 127.500 m^3/h

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References – Sports halls

Serbia

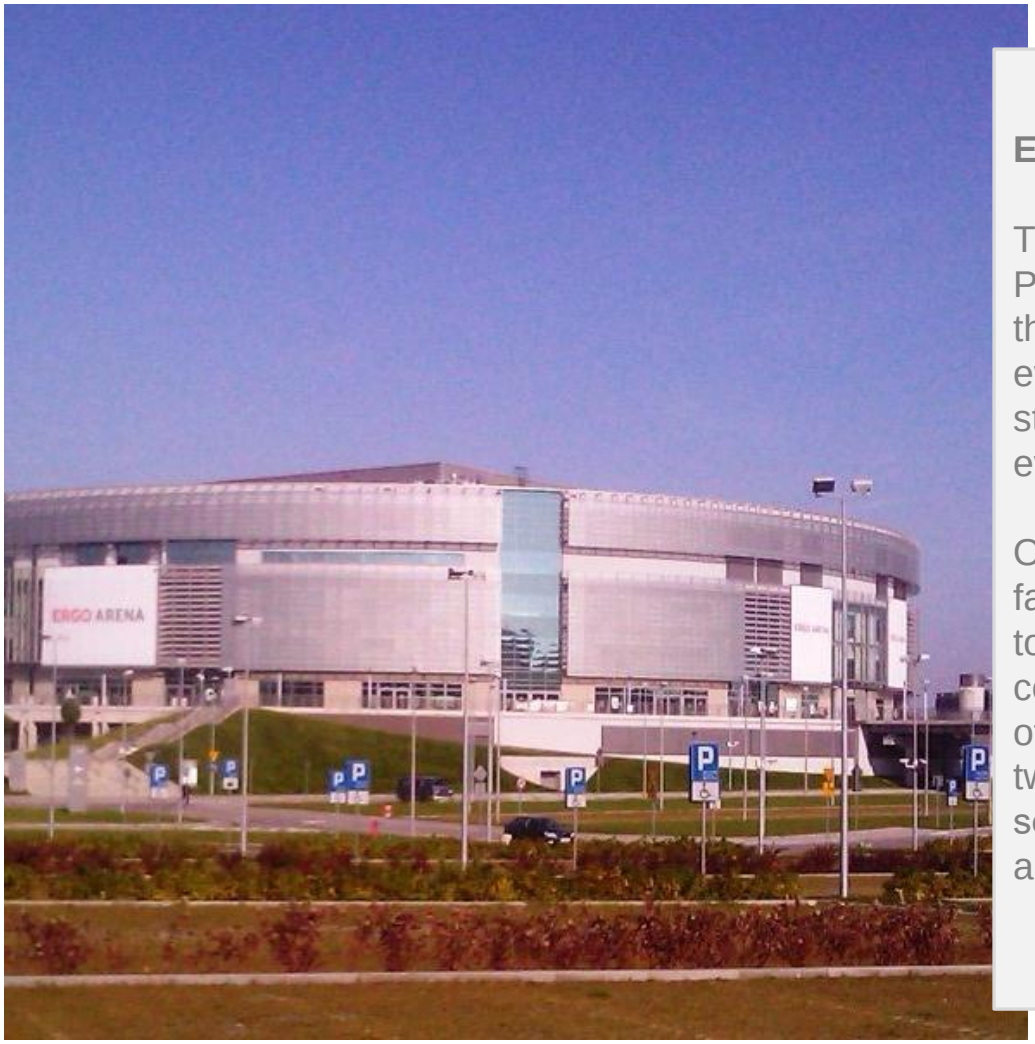
- Sports Hall, Smederevo
- Sports Hall, Subotica
- Sports Hall, Indjija
- Sports Hall, Senta

References – Sports halls

Slovenia

- Sports Hall Golovec, Celje
- Sports centre Koper
- Sports centre Kranj
- Sports Hall Velenje
- Ice Hall Zalog, Ljubljana
- Ice Hall Maribor
- Sports Hall Nova Gorica
- Fitness centre Sunny Studio, Lj.

References – ErgoArena, Gdansk



Ergo Arena, Sopot-Gdańsk, Poland

The multi-purpose hall of Ergo Arena in Poland, which will have its official opening this year, can seat 11.409 people for sporting events, and up to 15.000 people, including standing areas, for concerts and other events.

One of the unique aspects of this sporting facility is that the boundary between the towns Sopot and Gdańsk runs right down its centre, meaning that technically, the people of Poland can watch the same event live in two different towns. Presenting an ideal solution for this building's ventilation needs are **Lindab OD-8 swirl diffusers**.

References – Sports halls

Greece
- Olympic Hyppodrome, Athens
- Stadium for Teakwondo, Athens

Netherlands
- Sportsaal, Rotterdam

Russia
- Ice Palace Cherepovci
- Ice Palace Ioshkar Ola
- Sports-rehabilitation center, Kazan
- Ice palace, Moscow
- Bowling center, Moscow
- Cultural sport center, Krasnoyarsk

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Thank you!