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Serbia

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Replacement Of Rotary Equipment And Installations In Pancevo Oil Refinery



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1 CLIMATIC DATA

Elevation of the available areas for the plants 75.6 m above sea level.

1.1 Wind

Basic wind velocity ($v_{b,0}$) in Meteorological Station Banatski Karlovac is 22.6 m/s and the prevailing wind directions throughout the year are northwestern and southeastern.

For the calculation of wind effects on building structures, according to the standard SRPS EN 1991-1-4-4 Eurocode 1, the significant value is - the fundamental value of the basic wind speed defined as a 10-minute average wind speed with an annual probability of exceeding 0.02, independent of wind direction, at a height of 10 m from the ground above the plain open earth terrain.

Considering the plain terrain and the distance of about 37 kilometers, it is estimated that for the area of the complex "Refinery" Pancevo, measurements and registration of wind direction and speed at the Meteorological Station Banatski Karlovac are represented.

Available wind data, 10-minute average wind speed in the observation period, from 50 to 59 minutes per hour, for the period 1986-2019 were used. Gumbel's model of extreme theory was applied to the time series of maximum 10-minute average wind speeds.

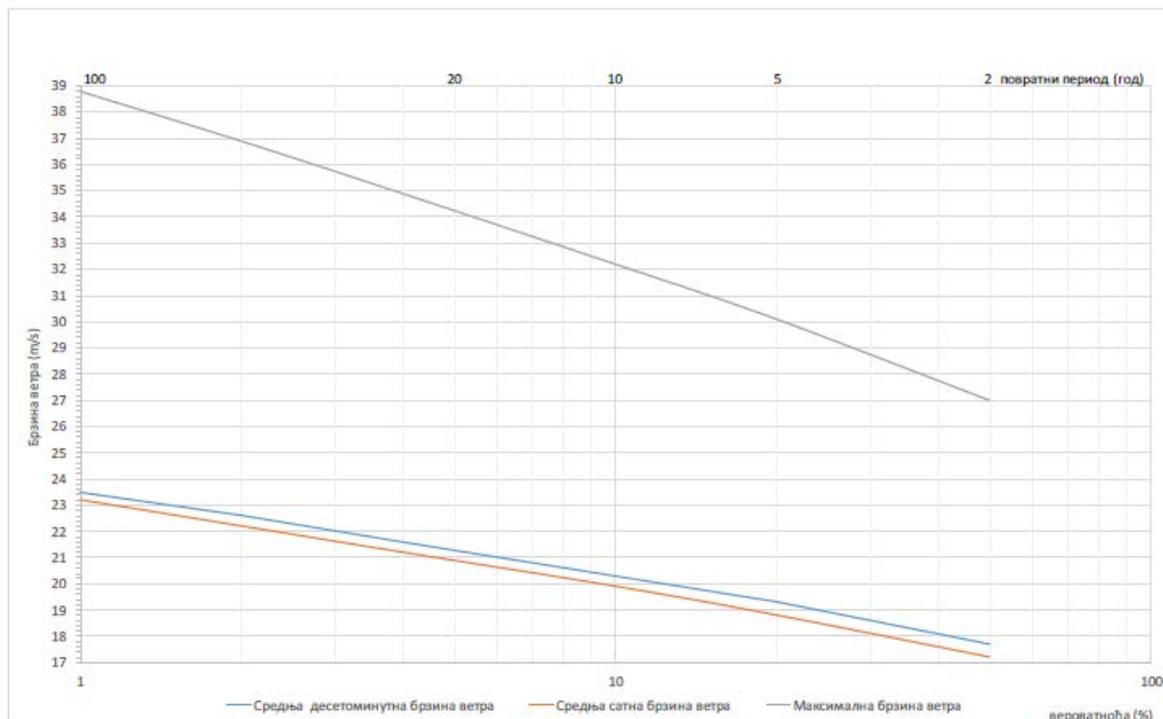
Also, the calculation of the average hourly wind speed and the maximum wind speed is given. The calculation of wind effects is presented in tables and graphs (Table 1.1-1, Graph 1.1-1).

Table 1.1-1. Wind action calculation

Probability of overcoming (%)	1	2	4	10	20	50
Return period (year)	100	50	25	10	5	2
Calculated 10-min average wind speed (m/s)	23.5	22.6	21.6	20.3	19.3	17.7
Standard deviation	1.16	1.00	0.84	0.63	0.47	0.28
Calculated hourly average wind speed (m/s)	23.2	22.2	21.2	19.9	18.8	17.2
Standard deviation	1.18	1.02	0.85	0.64	0.48	0.28
Calculated maximum wind speed ветра (m/s)	38.8	36.9	34.9	32.2	30.1	27.0
Standard deviation	2.35	2.02	1.70	1.27	0.95	0.56

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Graph 1.1-1: Return period and probability of wind influence



1.2 Air Temperature

Maximum recorded	45°C
Minimum recorded	-28°C
Normal ambient	11°C
Ambient air wet bulb	24 °C

1.3 Relative Humidity

Mean daily maximum	100%
Mean daily minimum	30%
Average monthly humidity	78%
Design maximum	84%

1.4 Rainfall

Average annual	622.5 mm
Annual Frequency day (Over 1 mm)	80 days/year
Maximum recorded in 1 hr	50 mm
Design rainfall	80 mm/h

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1.5 Snowfall

Design snow loading See below.

Snow load calculation

For the calculation of the load of the building structure with snow, according to the standard SRPS EN 1991-1-3 Eurocode 1, the value 5k is important - the characteristic value of the snow load on the ground, which is defined as the value of snow load based on the annual probability of exceeding 0.02, excluding exceptional snow loads.

At meteorological stations, the height of the snow cover and its density are measured. From the height and density of the snow cover, the load on the ground is calculated. For the formation of a series of annual maximums of the weight of the snow cover, the available data from the Meteorological Station Banatski Karlovac, for the period 1975-2019 were used.

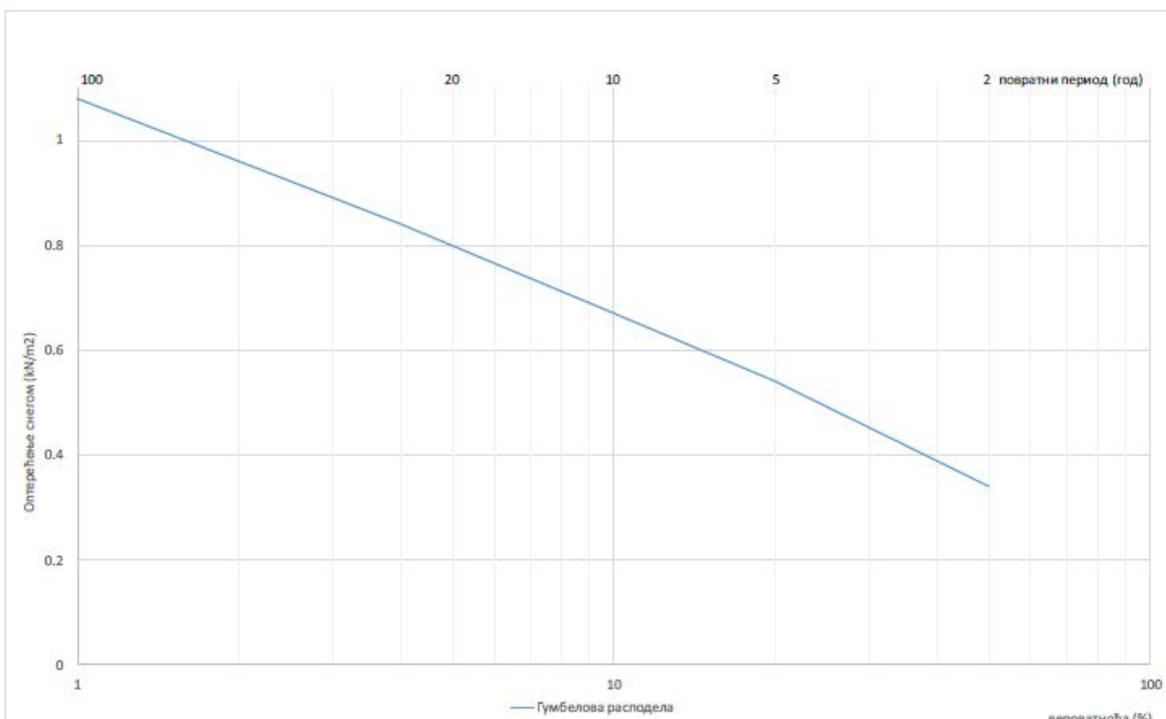
Gumbel's model of extreme theory was used for the calculation.

The calculation of snow load is shown in tables and graphs (Table 1.1-2, Graph 1.1-2).

Table 1.1-2. Calculation of snow load

Probability of overcoming (%)	1	2	4	10	20	50
Returnperiod (year)	100	50	25	10	5	2
Characteristic value of snow load (kN/m ²)	1.08	0.96	0.84	0.67	0.54	0.34
Standard deviation	0.12	0.1	0.09	0.07	0.05	0.03

Graph 1.1-2: Return period and probability of snow load



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1.6 Barometric Pressure

Maximum 1031 mbar (0.7 % of the time a year, may occur in November-December)
Average 1013 mbar

1.7 Solar Heat

Mid-day Solar heat flux, minimum Not Available
Mid-day Solar heat flux, maximum Not Available
Mid-day Solar heat flux, average Not Available

1.8 Atmosphere

- a) Extreme moisture (tropical climate): NO
- b) Marine exposure (salt spray): NO
- c) Sandstorms: NO
- d) Copper-attacking fumes (ammonia, sulphur, etc.): NA
- e) Exposure to conductive or corrosive dusts (carbon, iron oxide, ammonium nitrates or phosphates, etc.): NA
- f) Exposure to corrosive agents (nitric or sulphuric acids, chlorine, caustic, etc.): NO
- g) Exposure to other pollutants originating from surrounding industrial plant: NA
- h) Winterization required: YES

1.9 Earthquake

Seismic Zone (Region): VIII MCS
PGA on soil type A: 0.11g for 475 years (return period)
PGA on soil type A: 0.08g for 95 years (return period)
Ground Type: C (t.b.c. by soil investigations)
Soil Factor S: 1.15
Importance Class: III
Importance Factor g_I 1.2
Damping Correction Factor h 1 (for 5% viscous damping)
Spectrum type 1

1.10 Miscellaneous Site Data

Maximum freezing depth (cm)	42,0 (1992/1993)
Average freezing depth (cm)	20,7

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1.11 Flood Condition

The maximum 100 years flood level is not available.

1.12 Soil

Soil data are reported in the Geotechnical Elaborate (Br. 21-10/65, dated 26.10.21).

SRPS EN 1997-1 - Eurocode 7: Geotechnical design - Part 1: General rules

SRPS EN 1997-1/NA - Eurocode 7: Geotechnical design — Part 1: General rules — National Annex

SRPS EN 1997-2- Eurocode 7 - Geotechnical design - Part 2: Ground investigation

SRPS EN 1997-2/NA- Eurocode 7 - Geotechnical design - Part 2: Ground investigation—
National Annex