



Structural Analysis & Design Software

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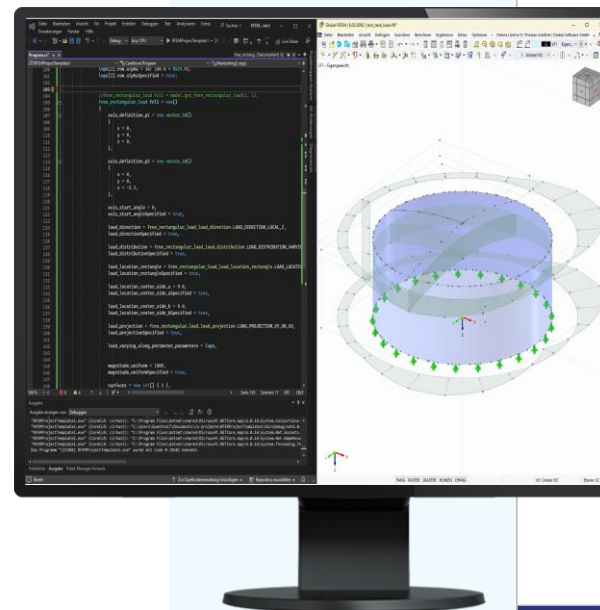


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Webinar

Generating Wind Loads on Dome with Circular Base using C# Library



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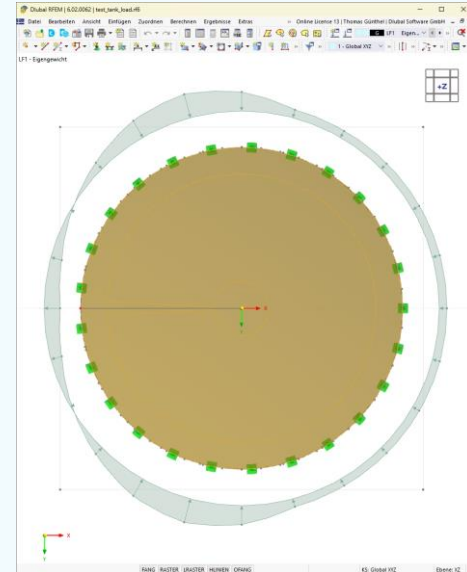


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CONTENTS

- 01 What is Webservice & API?
- 02 Installation and first steps using the API
- 03 Basics for wind loading acc. to EN 1991-1-4
- 04 C# program for wind load application





Why Webservice & API?

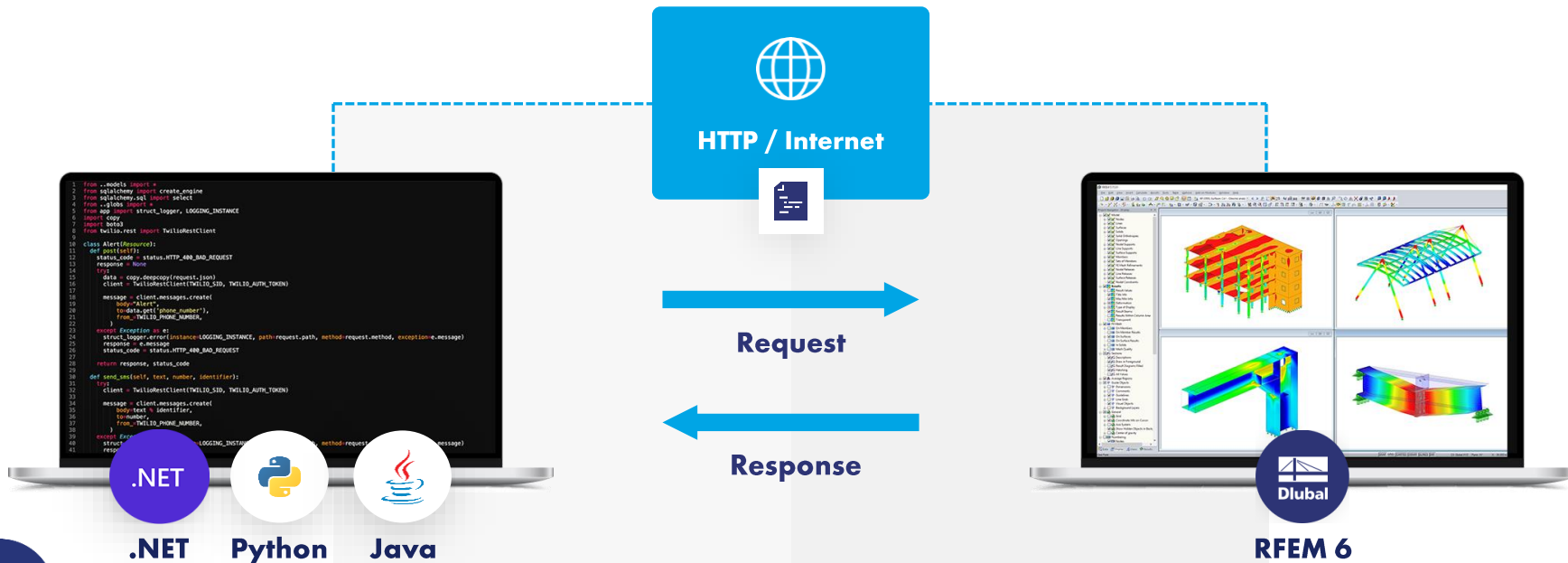
- **Use the power of RFEM 6 beyond its graphical interface**
- **Easy way**
 - ➔ to create an application on top of RFEM6
 - ➔ to plug-in RFEM6 to your chain of application
 - ➔ to extend / reinforce RFEM6 with your own design checks
- **Usage of libraries and functions**
- **All objects in RFEM 6 are accessible**
 - ➔ Geometrical data
 - ➔ Loads
 - ➔ Supports
 - ➔ Results

```
j = 4*number_  
while i <= nu  
    k = j + (  
    Member(k+  
    Member(k+  
    Member(k+  
    Member(k+  
    i += 1
```

```
# Diagonals o  
j += 4*(numbe  
if number_fra  
    Member(j+  
    Member(j+  
    Member(i
```



What is Webservice & API?





— Webservice libraries



SOAP

Simple Object Access Protocol

**Python High Level
Library for
RFEM/RSTAB/RSECTION**



SOAP

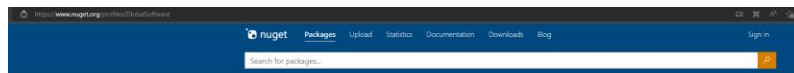
Simple Object Access Protocol

**C# Low Level
Library for
RFEM/RSTAB/RSECTION**






Where to find the C# library?

- [NuGet Gallery | DlubalSoftware](#)



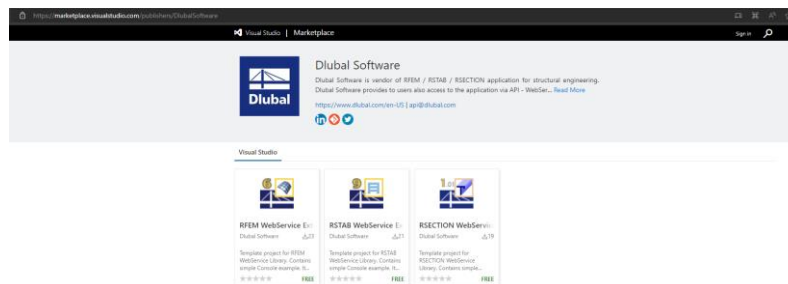
DlubalSoftware

-  **Dlubal.RFEMWebServiceLibrary** by DlubalSoftware
703 total downloads | last updated 13 days ago | Latest version: 6.2.34 | RFEM WebService Dlubal
C# library for development of tools based on RFEM WebService technology
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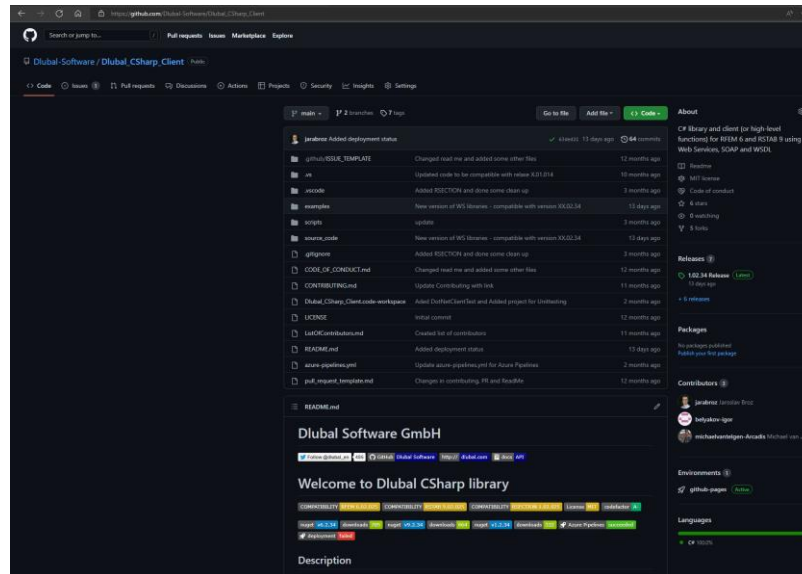
- [Publisher Dlubal Software – Visual Studio Marketplace](#)





Where to find the source code of the C# library?

- [Dlupal-Software/Dlupal_CSharp_Client](https://github.com/Dlupal-Software/Dlupal_CSharp_Client): C# library and client (or high-level functions) for RFEM 6 and RSTAB 9 using Web Services, SOAP and WSDL (github.com)





Wind load analysis according to EN 1991-1-4 7.9

- **Following elements are given:**

- diameter d
- velocity pressure q_p
- reduction factor $\psi_\lambda(\lambda)$

(Fig. 7.36 / Tab. 7.16)

- **Following elements are determined:**

- Reynolds number $Re(d, q_p)$
- external pressure coefficient c_{p0} (Reynolds number Re , peripheral angle α)
- position of stall $\alpha_A(Re)$
- position of minimum pressure $\alpha_{min}(Re)$
- reduction factor $\psi_{\lambda\alpha}(\psi_\lambda, \alpha, \alpha_A, \alpha_{min})$

(Eq. 7.15)

(Fig. 7.27)

(Tab. 7.12)

(Tab. 7.12)

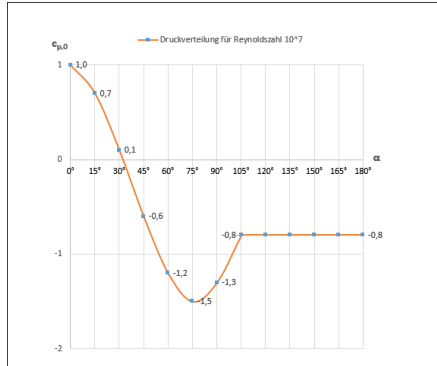
(Eq. 7.17)



Wind load analysis according to EN 1991-1-4 7.9

Breite b	15,00 m	
Höhe h	4,00 m	
Schlankheit A=b/h	3,75	[1] 7.13
Abminderungsfaktor ψ_s	0,65	[1] Bild 7.36
Geschwindigkeitsdruck q_p	0,70 kN/m ²	[1] 4.5

α	$c_{p,0}$	$\psi_{s,0}$	$c_{p,e}$	w_e
0°	1,0	1,00	1,00	0,70 kN/m ²
15°	0,7	1,00	0,70	0,49 kN/m ²
30°	0,1	1,00	0,10	0,07 kN/m ²
45°	-0,6	1,00	-0,60	-0,42 kN/m ²
60°	-1,2	1,00	-1,20	-0,84 kN/m ²
75°	-1,5	1,00	-1,50	-1,05 kN/m ²
90°	-1,3	0,90	-1,17	-0,82 kN/m ²
105°	-0,8	0,65	-0,52	-0,36 kN/m ²
120°	-0,8	0,65	-0,52	-0,36 kN/m ²
135°	-0,8	0,65	-0,52	-0,36 kN/m ²
150°	-0,8	0,65	-0,52	-0,36 kN/m ²
165°	-0,8	0,65	-0,52	-0,36 kN/m ²
180°	-0,8	0,65	-0,52	-0,36 kN/m ²



Ermittlung der Reynoldszahl:

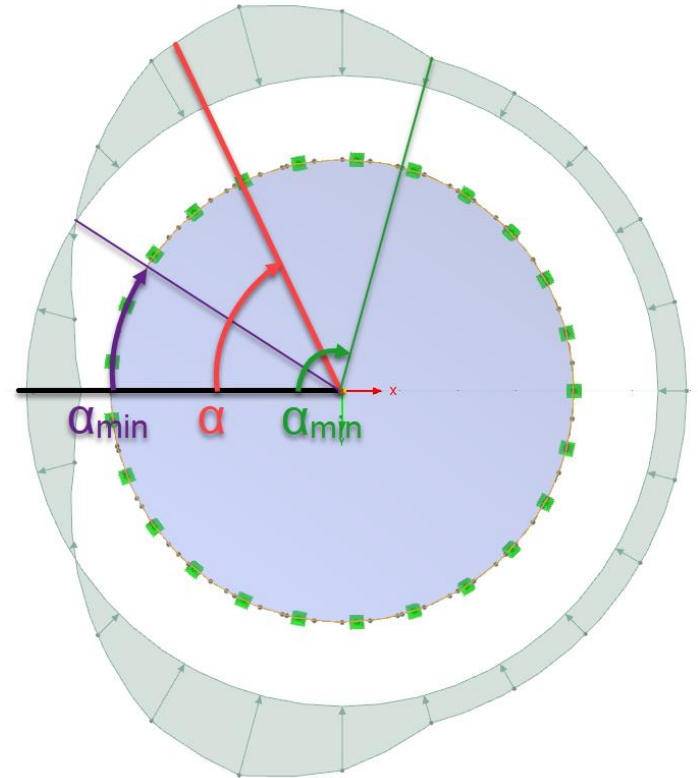
$$Re = \frac{b \cdot v(z_e)}{v}$$

$$Re = \frac{b \cdot \sqrt{2 \cdot q_p}}{\sqrt{\rho}}$$

$$Re = \frac{15m \cdot \sqrt{2 \cdot 0,7 \frac{kN}{m^2} \cdot 10^3}}{1,25 \frac{kg}{m^3}}$$

$$Re = \frac{15 \cdot 10^{-6} \frac{m^2}{s}}{s}$$

$$Re = 3,35 \cdot 10^7$$





— Knowledge Base article about analysis according to EN 1991-1-4 7.9

- <https://www.dlubal.com/en-US/support-and-learning/support/knowledge-base/001392>



The image displays a C# program for applying wind loads in RFEM, alongside its 3D visualization. The code defines a free rectangular load on a circular structure.

```
281 // Init free rectangular load
282 free_rectangular_load w1 = new() // wall load
283 {
284     axis_definition_p1 = new vector_3d()
285     {
286         x = center.x,
287         y = center.y,
288         z = 0,
289     },
290     axis_definition_p2 = new vector_3d()
291     {
292         x = center.x,
293         y = center.y,
294         z = -1,
295     },
296     axis_start_angle = Math.PI,
297     axis_start_angleSpecified = true,
298     load_direction = free_rectangular_load_load_direction_LOAD_DIRECTION_LOCAL_Z,
299     load_directionSpecified = true,
300     load_distribution = free_rectangular_load_load_distribution_LOAD_DISTRIBUTION_VARYING,
301     load_distributionSpecified = true,
302     load_location_rectangle = free_rectangular_load_load_location_rectangle_LOAD_LOCATION_RECTANGLE,
303     load_location_rectangleSpecified = true,
304     load_location_center_side_a = diameter+1,
305     load_location_center_side_aSpecified = true,
306     load_location_center_side_b = diameter + 1,
307     load_location_center_side_bSpecified = true,
308     load_location_center_x = center.x,
309     load_location_center_xSpecified = true,
310     load_location_center_y = center.y,
311     load_location_center_ySpecified = true,
312     load_projection = free_rectangular_load_load_projection_LOAD_PROJECTION_XY_OR_UV,
313     load_projectionSpecified = true,
314     load_varying_along_perimeter_parameters = lvps,
315     magnitude_uniform = "q.p1000",
316     magnitude_uniformSpecified = true,
317     surfaces = new int[] { 2 },
318     no = 1,
319 };
320 // set load in RFEM
321 model.set_free_rectangular_load(1, w1);
322 catch (Exception ex)
323 {
324 }
```

The 3D visualization shows a circular structure with a brown central area and a green outer ring. The load is applied to the outer ring, represented by green squares. The coordinate system (x, y, z) is shown at the bottom left of the visualization.



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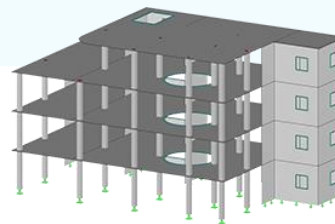
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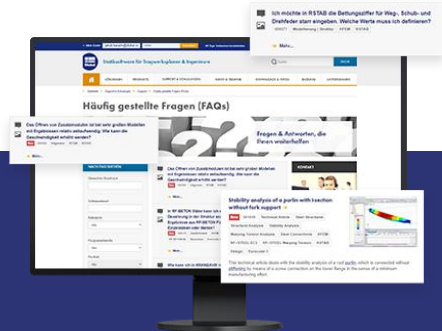
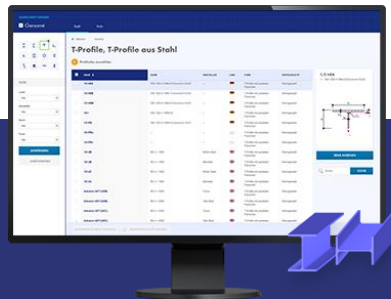
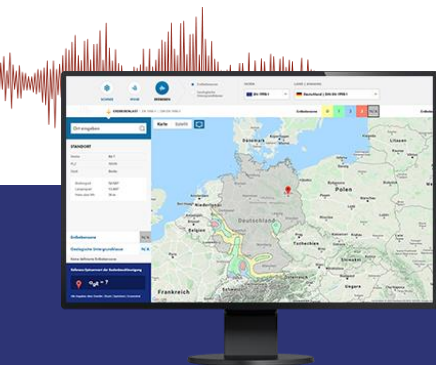
Models to Download

Dlubal Software provides an online tool with snow, wind and seismic zone maps.

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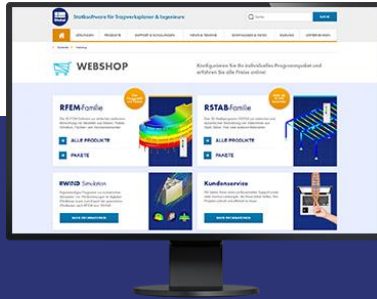
Youtube Channel - Webinars, Videos

Videos and webinars about the structural engineering software.



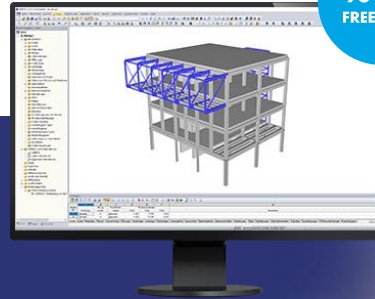
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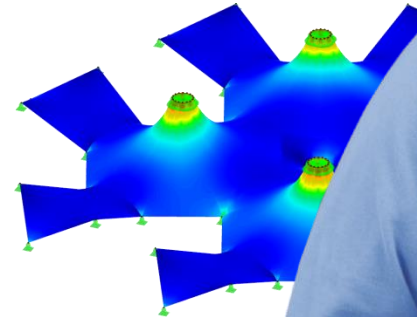
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