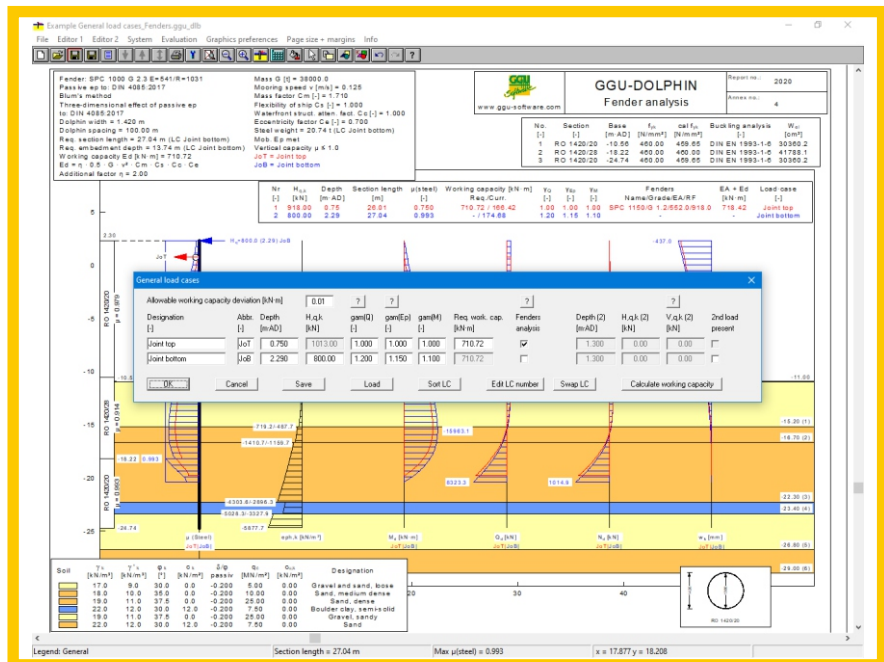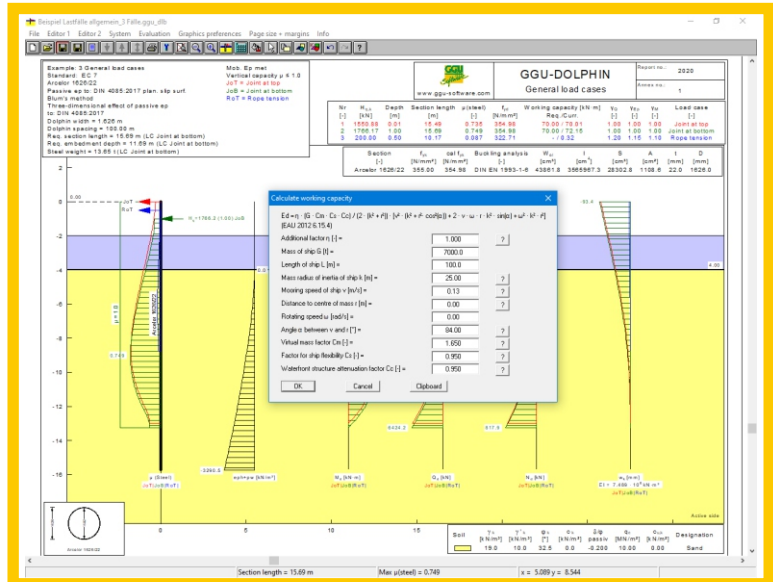**Program Details**

Description

GGU-DOLPHIN – *Analysis and design of dolphins according to EAU 2012.*

Capabilities:

- *Analysis using Blum's method or p-y method (modulus of subgrade reaction method with non-linear spring characteristics)*
- *Analysis using partial safety factors to EC 7*
- *Determine the required working capacity using a variety of equations*
- *Comparative analysis of several load cases in a single computation or analysis of selected load cases*
- *Fender analysis by determining the optimum fender*
- *Analysis using different sections for a dolphin pile*
- *Analysis using a selected section or by determining the optimum section*
- *Graphic-aided optimisation of section length when analysising different sections*
- *Expandable fender database*
- *Steel analysis using EC 3*
- *Expandable database for sections*
- *Simulation of steel sections corrosion*
- *Buckling analysis with $f_{y,k}$ reduction or according to DIN EN 1993-1-6*
- *Analysis of sum V*
- *System input using absolute heights*
- *Definition of up to 10 load cases possible*
- *Soil properties can be selected from an expandable database of common soils*
- *Passive earth pressure calculation to DIN 4085:2017 or DIN 4085:2017 planar slip surfaces*
- *Three-dimensional passive earth pressure to DIN 4085:2017*
- *Consideration of seismic effects via altered earth pressure coefficients to EC 8*
- *Interface to the GGU-LATPILE (analysis and design of elastically bedded piles)*
- *Result presentation for earth pressure, moment, shear force, normal force and displacement in system graphics*
- *Analysis results can also be presented in different legends and as output table*
- *Visualisation of p = f(y) function curves in a legend*
- *Visualisation of the adopted section as a sketch in a legend*

- *Adopted standard, program name and version can be included in the General legend*
- *User-designed output sheet*
- *Print or copy screen sections, e.g. for transfer to a word processor*
- *Integrated Mini-CAD system for additional annotation of graphics*

GGU-DOLPHIN
General load cases
www.ggu-software.com

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Req. section length = 34.74 m (LC Load case 1)
Req. embedment depth = 14.74 m (LC Load case 1)
Steel weight = 107.69 t (LC Load case 1)
Mob. Ep met
Vertical capacity $\mu \le 1.0$
LF1 = Load case 1
Lf2 = Load case 2

Rudolph et al. Geotechnik 2011 Issue 4 Page 243 ff
Passive ep to: DIN 4085-2017
Blum's method
Three-dimensional effect of passive ep
to: DIN 4085:2017
Dolphin width = 2.800 m
Dolphin spacing = 100.00 m

Nr [-]	$H_{0,k}$ [kN]	Depth [m·AD]	Section length [m]	μ(steel) [-]	Working capacity [kN·m] Req./Curr.
1	3731.00	2.00	34.74	0.512	- / 426.46
2	1620.00	5.00	32.27	0.342	- / 95.47

No. [-]	Section [-]	Base [m·AD]	f_{yk} [N/mm²]	cal f_{yk} [N/mm²]	Buckling analysis [-]	W_{el} [cm³]
1	RO 2800/34	0.00	355.00	354.87	DIN EN 1993-1-6	201851.9
2	RO 2800/34	-4.00	355.00	354.87	DIN EN 1993-1-6	201851.9
3	RO 2800/42	-10.00	450.00	449.87	DIN EN 1993-1-6	247209.2
4	RO 2800/50	-16.00	450.00	450.00	DIN EN 1993-1-6	291771.9
5	RO 2800/53	-29.69	485.00	485.00	DIN EN 1993-1-6	308280.0
6	RO 2800/50	-29.74	450.00	450.00	DIN EN 1993-1-6	291771.9

γ_Q [-]	γ_{Ep} [-]	γ_M [-]	Load-case [-]
1.00	1.00	1.00	Load case 1
1.20	1.15	1.10	Load case 2

Soil	Depth [m·AD]	γ_k [kN/m³]	γ'_k [kN/m³]	φ_k [°]	c_k [kN/m²]	δ/φ passiv	q_c [MN/m²]	$c_{u,k}$ [kN/m²]
	-18.50	19.0	9.0	0.0	200.0	-0.500	10.00	0.00
	-22.00	18.0	8.0	0.0	75.0	-0.500	10.00	0.00
	-34.00	19.0	9.0	28.0	0.0	-0.500	10.00	0.00
	<-34.00	21.0	11.0	37.5	0.0			

Designation
Clay-silt alternating layers
Clay
Sand-silt-clay alternating layers
Dense to very dense sand

Top of dolphin = 5.00 m·AD

RO 2800/34 — 2732 / 2800

Chart labels: w_k [mm] LF1|Lf2 ; N_d [kN] LF1|Lf2 ; Q_d [kN] LF1|Lf2 ; M_d [kN·m] LF1|Lf2 ; eph,k [kN/m²] ; μ (Steel) LF1|Lf2

Chart values: -270.6 ; 2131.1 ; -68539.2 ; 17874.6 ; -1120.0 ; -2048.2/-823.2 ; -1447.2/-1216.6 ; -4629.9 ; H_q=3731.0 (2.00) LF1 ; 0.512 ; μ = 1.0

Left column: 5.00 RO 2800/34 μ = 0.167 ; 0.00 ; -4.00 RO 2800/34 μ = 0.338 ; -10.00 RO 2800/42 μ = 0.413 ; -16.00 RO 2800/50 μ = 0.512 ; RO 2800/53 μ = 0.462 ; -29.74

Depth markers: -15.00 ; -18.50 (1) ; -22.00 (2) ; -34.00 (3)