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## Optimum breakwater safety levels based on life-cycle cost optimization

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*Publication date:*  
2016

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Burcharth, H. F., Sørensen, J. D., & Kim, S.-W. (2016). *Optimum breakwater safety levels based on life-cycle cost optimization*. Department of Civil Engineering, Aalborg University. DCE Technical reports No. 204

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## APPENDIX TO AAU TECHNICAL REPORT ON BREAKWATER SAFETY LEVELS

### 13.3.16

#### **Appendix A1 Background note containing assumptions and formulae applied in optimizations analyses of rock and cube armoured rubble mound breakwaters**

##### **1. Objective**

To identify the optimum cost safety levels for rubble mound breakwater armored by rock and Cubes in shallow, moderate and deep water.

The study comprises the influence of the following parameters on the minimum cost safety level:

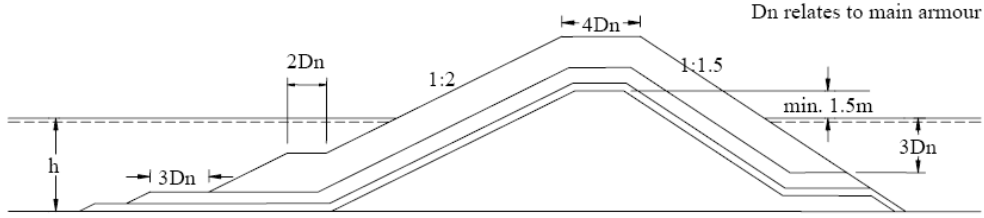
- Real interest rate
- Service lifetime of the breakwater
- Downtime costs due to malfunction of the breakwaters
- Repair policy
- Damage accumulation

##### **2. Procedure in numerical simulations for identification of minimum cost safety levels**

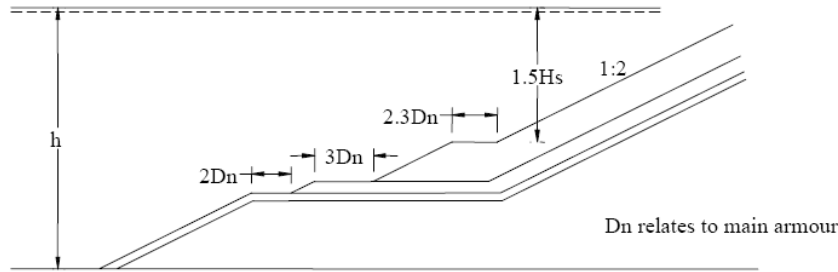
- 1) Select type of breakwater
- 2) Design geometries of the structure corresponding to the chosen  $H_s^T$  value (deterministic design is sufficient)
- 3) For each structure geometry calculate construction costs
- 4) Define repair policy and related cost of repair
- 5) Define down-time costs related to damage levels
- 6) Define a model for accumulation of damage
- 7) For each structure geometry use stochastic models for wave climate and structure response (damage) in Monte Carlo simulation of occurrence of damages within service life time (uncertainties included)
- 8) Calculate for each structure geometry the total capitalized costs for each simulation. Calculate the mean value and the related safety levels corresponding to defined design limit states
- 9) Identify the structure safety level corresponding to the minimum total costs

### 3. General assumptions

#### Cross sections



Shallow water cross section:  $h < 1.5 H_s + 2.7 D_n$



Deep water cross section:  $h \geq 1.5 H_s + 2.7 D_n$

Fig. 1. Shallow and deep water cross sections

#### Volume per meter for shallow water conditions

$$V_{armour} = a D_n [0.5 a D_n + 2 D_n + \beta \sqrt{1 + n_1^2} + 4 D_n] + 1/2 n_2 [(R_c + 3 D_n)^2 - (R_c + 3 D_n - a D_n)^2]$$

$$V_{filter1} = b D_n [(0.5 b + 3 + a + 2) D_n + \beta \sqrt{1 + n_1^2} + 4 D_n + (R_c + 3 D_n - a D_n) \sqrt{1 + n_2^2} + 3 D_n n_2]$$

$$V_{filter2} = \frac{c}{b} V_{filter1} + 2 c D_n^2 + c D_n \sqrt{(h - (3 + b) D_n)^2 (1 + n_2^2)}$$

$$V_{core} = 0.5 (n_1 + n_2) \beta^2 + 4 D_n \beta + (h - (3 + b + c) D_n) (a + b) \sqrt{1 + n_2^2} D_n$$

where  $\beta = R_c + D - (a + b + c) D_n$ , front slop 1:  $n_1$ , back slop 1:  $n_2$ , armour, first filter, and second filter layers heights are  $a D_n, b D_n, c D_n$ , respectively. When  $D_n < 1.75 m$  then filter 2 is omitted, i.e. filter 2 is substituted by core material. The total volume of the core is then,  $V_{filter2} + V_{core}$

*Volume per meter for deep water conditions*

$$V_{armour} = a D_n [0.5 a D_n + 2 D_n + \beta \sqrt{1 + n_1^2} + 4 D_n] + 1/2 n_2 [(R_c + 3 D_n)^2 - (R_c + 3 D_n - a D_n)^2]$$

$$V_{filter1} = b D_n [(0.5 b + 3 + a + 2) D_n + \beta \sqrt{1 + n_1^2} + 4 D_n + (R_c + 3 D_n - a D_n) \sqrt{1 + n_2^2} + 3 D_n n_2]$$

$$V_{filter2} = V_{filter2}^{shallow} + 1.5 [h - 1.5 H_s - (1.7 + b + c) D_n] c D_n$$

$$V_{core} = V_{core}^{shallow} + [(12.4 + b) D_n + (1 - n_1) 0.5 l] l$$

where  $\beta = R_c + 1.5 H_s$ ,  $l = h - 1.5 H_s - (1.7 + b + c) D_n$  and  $\beta = h + R_c - (a + b + c) D_n$  in calculation of  $V_{core}^{shallow}$

*Filter 1 (Quarry rock)*

$$\text{Mass } M_{F1} = \frac{M_A}{15} \sim \frac{M_A}{7} \cong 0.1 M_A \quad \text{Mass density, } \rho_s = 2.65 t / m^3$$

$$D_{n50} = \left( \frac{M_{F1}}{\rho_s} \right)^{1/3}$$

*Filter 2 (Quarry rock)*

$$\text{Mass } M_{F2} = 0.1 M_{F1} \cong 0.01 M_A \quad \text{Mass density, } \rho_s = 2.65 t / m^3$$

$$D_{n50} = \left( \frac{M_{F2}}{\rho_s} \right)^{1/3}$$

*Free board  $R_c$*

$R_c$  is determined such that the transmitted wave height due to overtopping in a sea with return period equal to structure life time  $T_L$  is 0.50 m.

Minimum  $R_c$  is  $1.50 m + t_A + t_{F1} + t_{F2} = 1.50 m + 1.963 H$  due to construction road on top of core.

Case 1, rock armour:  $D_{n50} = 0.312 H_s$ ,  $s_{om} = 0.03$ ,  $s_{op} = 0.02$

Wave transmission formula by van der Meer and d'Angremond(1991) for Rock armoured Low-crested, submerged, and reef breakwaters

$$C_t = \frac{H_{s,t}}{H_s} = (0.031 \frac{H_s}{D_{n50}} - 0.24) \frac{R_c}{D_{n50}} + b \quad (0.075 \leq C_t \leq 0.75 \text{ for conventional structures})$$

$$\text{where } b = -5.42 s_{op} + 0.0323 \frac{H_s}{D_{n50}} - 0.0017 \left( \frac{B}{D_{n50}} \right)^{1.84} + 0.51$$

$$R_c = \max \left( \begin{array}{l} 1.071 H_s^{T_L} - 2.217 H_{s,t} (m), \min R_c \quad \text{for } s_{op} = 0.02 \\ 0.831 H_s^{T_L} - 2.217 H_{s,t} (m), \min R_c \quad \text{for } s_{op} = 0.04 \end{array} \right)$$

.

Case 2 and 3, cube armour:  $D_{n50} = 0.28 H_s$ ,  $s_{om} = 0.025$ ,  $s_{op} = 0.02 (\sim 0.016)$

d'Angremond et al.(1996) suggested this formula for  $B / H_{s,i} < 8$

$$C_t = -0.40 \frac{R_c}{H_{s,i}} + 0.64 \left( \frac{B}{H_{s,i}} \right)^{-0.31} (1 - e^{-0.50 \xi_{op}}) \quad (0.075 \leq C_t \leq 0.8)$$

where

$$\xi = \tan \alpha / \sqrt{s_{op}}, \quad \tan \alpha = 0.5$$

$$C_t = \frac{H_{s,t}}{H_{s,i}} = -0.40 \frac{R_c}{H_{s,i}} + \begin{cases} 0.502, \text{ for } s_{op} = 0.02 \\ 0.432, \text{ for } s_{op} = 0.04 \end{cases}$$

Therefore,

$$R_c = \max \left( \begin{array}{l} 1.26 H_s^{T_L} - 2.50 H_{s,t} (m), \min R_c \quad \text{for } s_{op} = 0.02 \\ 1.08 H_s^{T_L} - 2.50 H_{s,t} (m), \min R_c \quad \text{for } s_{op} = 0.04 \end{array} \right)$$

Note that the freeboards  $R_c$  in all Cases are determined by the set minimum level of +1.5 m for the top of the core material to be used as construction road.

#### *Limit state and repair policy*

Repairs are assumed to take place immediately after the damage limit for repair is exceed.

Table 1. Repair policy as function of damage levels

Damage levels	$S$ (rock)	$N_{od}$ (cubes)	Estimated $D$	Repair policy
Initial	2	0	2 %	No repair
Serviceability (minor damage, only to armor)	5	0.8	5 %	Repair armor
Repairable (major damage, armor + filter 1)	8	2.0	15 %	Repair armor + filter 1
Ultimate (failure)	13	3.0	30 %	Repair armor + filter 1 and 2

\*  $D$  is the relative number of displaced units (US Army, 2006)

Linear regression is applied to evaluate the damage levels between serviceability damage level and ultimate damage level. These equations are the relationship between  $S$  or  $N_{od}$  and  $D$ .

$$D = 0.0311S - 0.1031 \quad (R = 0.999)$$

$$D = 0.1126N_{od} - 0.0511 \quad (R = 0.99)$$

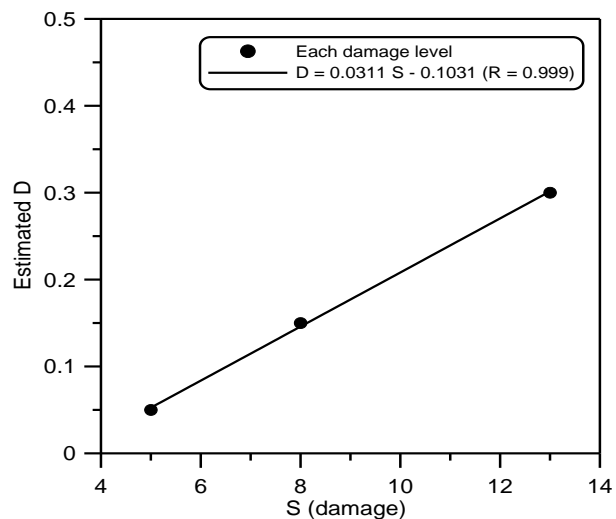


Fig. 2. The relationship between  $D$  and  $S$  for rock

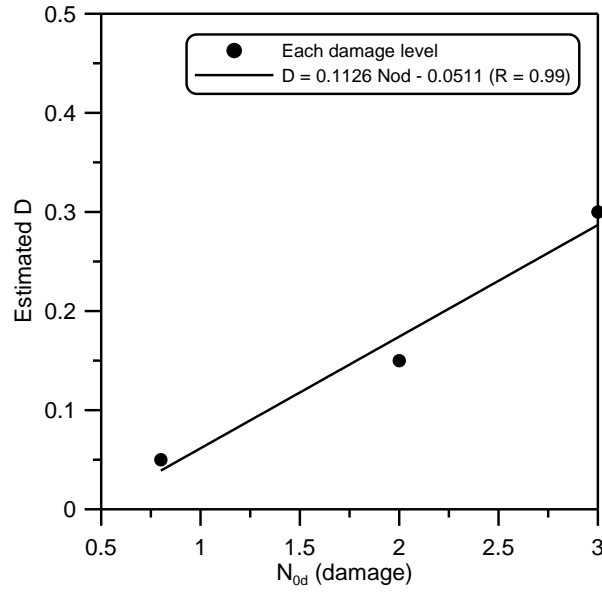


Fig. 3. The relationship between  $D$  and  $N_{od}$  for cubes

### Costs of repair

#### $D = 5\%$

Cost of repair of minor damage,  $C_{R1} = (1 + K)DC_{I,armor}R$ ,

in which  $C_{I,armor}$  is the initial construction cost of the main armor layer,  $R=3.0$  is a factor signifying high cost of repair, and  $K=0.3$  is a factor signifying mobilization costs. The chosen values of  $R$  and  $K$  are estimates, but can vary considerably from case to case.

#### $D = 15\%$

Cost of repair of major damage,  $C_{R2} = (C_{I,armor} + C_{I,filter1} + KC_{I,armor})DR$ , where  $C_{I,filter1}$  is the initial construction cost of filter 1.

#### $D = 30\%$

Cost of repair after a failure,  $C_{R3} = (C_{I,armor} + C_{I,filter1} + C_{I,filter2} + KC_{I,armor})DR$ , where  $C_{I,filter2}$  is the initial construction cost of filter 2.

### Downtime costs

When  $D \geq 15\%$  is added downtime costs given as 200,000 EUR/day in 3 months. The relative short duration of 3 months is justified only for outer breakwaters with no berths

along the harbour side of the structure. The downtime costs are related to 1 km length of breakwater.

### *Structure length*

Calculations performed for a structure length of 1 km and damage is assumed to take place over the whole length of the breakwater.

### *Stability formulae*

Rock armour (plunging wave,  $\xi_m < \xi_{mc}$ ,  $P=0.4$ ,  $N_z=1000$ ,  $\tan \alpha=0.5$ )

$$N_s = \frac{H_s}{\Delta D_n} = 6.2 S^{0.2} P^{0.18} N_z^{-0.1} s_{om}^{0.25} \tan \alpha^{-0.5} \quad \text{Van der Meer (1988a)}$$

Cube armour

$$N_s = \frac{H_s}{\Delta D_n} = \left( 6.7 \frac{N_{od}^{0.4}}{N_z^{0.3}} + 1.0 \right) s_{om}^{-0.1} \quad \text{Van der Meer (1988b)}$$

This formula is valid for the slope of structure 1:1.5 so the formula has been modified by Hudson equation analogy to cover the slope of structure 1:2.

$$N_s = \frac{H_s}{\Delta D_n} = \left( \frac{2}{1.5} \right)^{1/3} \left( 6.7 \frac{N_{od}^{0.4}}{N_z^{0.3}} + 1.0 \right) s_{om}^{-0.1}$$

### *Damage accumulation model*

The damage was accumulated until to be damaged the serviceability, repair, or ultimate limit state. If the damage was occurred, the structures were repaired immediately. We performed the two cases which are with and without considering damage accumulation model. Regardless of the damage accumulation, the number of waves in one storm was generated in 1000 waves. The damage that is less than a damage of serviceability limit state is neglected in case of no damage accumulation. After that, we can only explain the damage accumulation model. There are several damage accumulation models. Now, the modified Melby and Kobayashi's (1998) model was decided in this calculation.



$$S = \left( \frac{H_s}{6.2 P^{0.18} s_{om}^{0.25} \tan \alpha^{-0.5} \Delta D_{n50}} \right)^5 N_z^{0.5}$$

This equation can be used to calculate the damage level  $S$  due to the incident waves with constant  $H_s$  starting from  $S=0$  at  $t=0(N_z=0)$ . To calculate the cumulative damage level in real situations of  $H_s$  and  $N_z$ , the damage level  $S_i$  was expressed as

$$S_i = S_{i-1} + \left( \frac{H_{s,i}}{6.2 P^{0.18} s_{om}^{0.25} \tan \alpha^{-0.5} \Delta D_{n50}} \right)^5 (N_{z,i}^{0.5} - N_{z,i-1}^{0.5})$$

where  $S_{i-1}$  = known damage level at  $N_z = N_{z,i-1}$ . We assumed that each storm was generated in the  $N_z = 1000$ .

For the Cubes, the relative damage level  $N_{od,i}$  can expressed as

$$N_{od,i} = N_{od,i-1} + \left( \frac{\left( \frac{1.5}{2} \right)^{1/3} \frac{H_{s,i}}{\Delta D_n} s_{om}^{0.1} - 1.0}{6.7} \right)^{2.5} (N_{z,i}^{0.75} - N_{z,i-1}^{0.75})$$

#### 4. Formulation of total cost functions

The optimum design is determined using the optimization problem formulated assuming no rebuilding in case of failure. No benefits, costs related to loss of life and cost of decommissioning at the end of service lifetime are included.

$$\min_T C(T) = C_I(T) + \sum_{t=1}^{T_L} \{C_{R_1}(T)P_{R_1}(t) + C_{R_2}(T)P_{R_2}(t) + C_F(T)P_F(t)\} \frac{1}{(1+r)^t}$$

where

$T$  return period used for deterministic design

$T_L$  design life time

$C_I(T)$  initial costs (building costs)

$C_{R_1}(T)$  cost of repair for minor damage

$P_{R_1}(T)$  probability of minor damage in year  $t$

$C_{R_2}(T)$  cost of repair for major damage

$P_{R_2}(T)$  probability of major damage in year  $t$

$C_F(T)$  cost of failure including downtime costs

$P_F(T)$  probability of failure in year  $t$

$r$  real rate of interest

## 5. Characteristics of design variables in stochastic model

*Rock armour, slope 1:2*

The Van der Meer formula (1988a) is used. The limit state equation is written:

$$g = S - \left( \frac{X_{H_s} H_s}{Z 6.2 P^{0.18} s_{om}^{0.25} \tan \alpha^{-0.5} \Delta D_{n50}} \right)^5 N_z^{0.5}$$

where the parameters are describes in Table 2.

*Cubes, slope 1:2*

The van der Meer formula is used, but modified to slope 1:2. The limit state equation is written:

$$g = N_{0d} - \left( \frac{\frac{1}{Z} \left( \frac{1.5}{2} \right)^{1/3} \frac{X_{H_s} H_s}{\Delta D_n} s_{om}^{0.1} - 1.0}{6.7} \right)^{2.5} N_z^{0.75}$$

where the parameters are describes in Table 3.

Table 2. Parameters of design variables for rock armour, slope 1:2

Variables	Description	Distribution	Expected value	Standard deviation
$S$	critical damage level	see Table 1		
$H_s$	annual maximum significant wave height	Weibull	Various	
$X_{H_s}$	model uncertainty wave height	Normal	1	0.1
$Z$	model uncertainty	Normal	1	0.0645
$\Delta$	model parameter	Normal	1.57	0.06
$N_z$	Number of waves in one storm	1000		
$s_{om}$	wave steepness	Normal	0.030	0.006
$D_n$	armor size	Normal	$0.35H_s^T$	COV=0.05
$H_s^T$	design wave height with return period $T$ years			
$\rho$	armor density	$2.65 \text{ ton} / \text{m}^3$		

Table 3. Parameters of design variables for cubes, slope 1:2

Variables	Description	Distribution	Expected value	Standard deviation
$N_{od}$	critical damage level	See Table 1		
$H_s$	annual maximum significant wave height	Weibull	Various	
$X_{H_s}$	model uncertainty wave height	Normal	1	0.1
$Z$	model uncertainty	Normal	1	0.1
$\Delta$	model parameter	Normal	1.33	0.03
$N_z$	Number of waves in one storm	1000		
$S_{om}$	wave steepness	Normal	<b>0.025</b>	<b>0.005</b>
$D_n$	armor size	Normal	$0.28H_s^T$	COV=0.01
$H_s^T$	design wave height with return period $T$ years			
$\rho$	armor density	$2.40 \text{ ton} / \text{m}^3$		

## 6. Case studies

Table 4. Case study data

Case	Water depth	Armor density	Wave climate	Stability formula	Built-in unit prices core/filter 2/filter 1/armor in EURO/ $\text{m}^3$
1	10 m	$2.65 \text{ t} / \text{m}^3$	Follonica	van der Meer (1988a)	10/ 16/ 20/ 40
2	15 m	$2.40 \text{ t} / \text{m}^3$	Follonica	van der Meer (1988b)	10/ 16/ 20/ 40
3	30 m	$2.40 \text{ t} / \text{m}^3$	Sines	van der Meer (1988b)	5/ 10/ 25/ 35

There is limitation of wave height in the Case 1 due to limited water depth. We assumed that the bottom slope is 1: 50 – 1:100 so that the maximum significant wave height will be  $0.55h$ .

Table 5. Distribution parameters for  $H_s$  - data samples (PIANC, 1992)

Site	Total number	Average number per year	Weibull		Exp.
	$N$	$\lambda$	$\alpha$	$\beta$	$H_s'$
Follonica	46	5.94	1.14	0.58	2.69
Sines	15	1.25	1.78	2.53	7.10

Weibull distributed annual maximum wave height

$$F(H_s) = \left[ 1 - \exp \left( - \left( \frac{H_s - H_s'}{\beta} \right)^\alpha \right) \right]^\lambda$$

$T$  -year maximum wave height

$$[F(H_s)]^T = F(H_s)^T = \left[ 1 - \exp \left( - \left( \frac{H_s - H_s'}{\beta} \right)^\alpha \right) \right]^{\lambda T}$$

*Deterministic design*

Rock armour

$$P=0.4, N_z=1000, \cot \alpha=2, \Delta=1.57,$$

$$S = \left( \frac{H_s}{5.84 D_{n50} s_{om}^{0.25}} \right)^5 = 4 \quad (\xi_m < \xi_{mc})$$

$$\frac{H_s}{D_{n50}} = 4^{0.2} 5.84 s_{om}^{0.25} = 7.706 s_{om}^{0.25}$$

$$D_{n50} = 0.312 H_s \quad (s_{om} = 0.03)$$

The stochastic parameters are that wave steepness is  $\bar{s}_{om}=0.030$  and the standard deviation is **0.006**. Therefore, the mean value is used in the calculation of cost optimization. But, the relationship between the significant wave height and diameter of rock armour is not changed due to the conservative deterministic design.

$$D_n = 0.312 H_s^T \quad (\bar{s}_{om} = 0.030)$$

where  $T$  is the return period of wave height. The return period is used from 5 years to 1000 years (i.e. 5, 10, 25, 50, 100, 200, 400, 500, 1000) in the cost optimization.

Cube armour

$$N_z = 1000, \quad \cot \alpha = 2, \quad \Delta = 1.33,$$

$$N_{od} = \left( \frac{\left( \frac{1.5}{2} \right)^{1/3} \frac{H_s}{\Delta D_n} s_{om}^{0.1} - 1.0}{6.7} \right)^{2.5} N_z^{0.75} = 0.8$$

$$\frac{H_s}{D_n} = 1.33 \cdot 1.1 \left( 6.7 \frac{0.8^{0.4}}{1000^{0.3}} + 1 \right) s_{om}^{-0.1} = 2.592 s_{om}^{-0.1}$$

$$D_n = 0.27 H_s \quad (\bar{s}_{om} = 0.025)$$

Mass density of sea water and concrete armour units ranges from 1.03 to 1.025 and from 2.3 to 2.4 respectively. Therefore, in this calculation of cost optimization for cubes armour unit, the relationship between the significant wave height and diameter of cubes is expressed as

$$D_n = 0.28 H_s^T \quad (\bar{s}_{om} = 0.025)$$

where  $T$  is the return period of wave height. The return period is used from 5 years to 1000 years (i.e. 5, 10, 25, 50, 100, 200, 400, 500, 1000) in the cost optimization.

### References given in Appendix A1

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**Appendix A2 Raw data sheets for the optimizations analyses of rock and cube armoured rubble mound breakwaters**

**A2.1 Rock armour**

SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.02 DOWNTIME COSTS INCLUDED

No damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	5064.	57099.	36807.	108532.	8.8733	4.4052	2.4263	
10.	4.67	1.456	8.18	10284.	3228.	30328.	14389.	58230.	5.1356	2.3150	0.9437	
25.	5.07	1.580	10.46	11216.	1734.	11922.	3654.	28525.	2.4880	0.8953	0.2377	
50.	5.36	1.671	12.36	11920.	1050.	5471.	1372.	19813.	1.4034	0.4070	0.0875	
100.	5.64	1.760	14.44	12775.	577.	2315.	414.	16082.	0.7437	0.1714	0.0262	
200.	5.92	1.847	16.70	13500.	287.	916.	147.	14849.	0.3511	0.0670	0.0091	
400.	6.20	1.933	19.15	14233.	142.	369.	48.	14792.	0.1638	0.0267	0.0029	
500.	6.28	1.961	19.98	14471.	106.	240.	28.	14845.	0.1215	0.0174	0.0017	
1000.	6.56	2.046	22.68	15218.	47.	89.	13.	15367.	0.0509	0.0065	0.0007	

Damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	10081.	37733.	21117.	78492.	21.3594	2.9127	1.3678	
10.	4.67	1.456	8.18	10284.	6605.	18932.	8731.	44552.	12.9459	1.4413	0.5633	
25.	5.07	1.580	10.46	11216.	3736.	7904.	2642.	25498.	6.6758	0.5930	0.1702	
50.	5.36	1.671	12.36	11920.	2392.	3862.	979.	19153.	4.0191	0.2861	0.0623	
100.	5.64	1.760	14.44	12775.	1464.	1849.	397.	16485.	2.3739	0.1362	0.0246	
200.	5.92	1.847	16.70	13500.	885.	821.	155.	15360.	1.3610	0.0596	0.0096	
400.	6.20	1.933	19.15	14233.	490.	321.	40.	15084.	0.7239	0.0233	0.0024	
500.	6.28	1.961	19.98	14471.	408.	251.	28.	15159.	0.5932	0.0181	0.0017	
1000.	6.56	2.046	22.68	15218.	207.	85.	10.	15521.	0.2869	0.0060	0.0006	



SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.05 DOWNTIME COSTS INCLUDED

No damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	2984.	33653.	21713.	67911.	8.8733	4.4052	2.4263	
10.	4.67	1.456	8.18	10284.	1904.	17852.	8496.	38536.	5.1356	2.3150	0.9437	
25.	5.07	1.580	10.46	11216.	1022.	7041.	2147.	21426.	2.4880	0.8953	0.2377	
50.	5.36	1.671	12.36	11920.	621.	3230.	813.	16584.	1.4034	0.4070	0.0875	
100.	5.64	1.760	14.44	12775.	341.	1364.	243.	14724.	0.7437	0.1714	0.0262	
200.	5.92	1.847	16.70	13500.	169.	540.	87.	14296.	0.3511	0.0670	0.0091	
400.	6.20	1.933	19.15	14233.	84.	219.	28.	14564.	0.1638	0.0267	0.0029	
500.	6.28	1.961	19.98	14471.	63.	143.	17.	14694.	0.1215	0.0174	0.0017	
1000.	6.56	2.046	22.68	15218.	27.	51.	8.	15305.	0.0509	0.0065	0.0007	

Damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	5880.	22317.	12534.	50292.	21.3594	2.9127	1.3678	
10.	4.67	1.456	8.18	10284.	3826.	11241.	5170.	30521.	12.9459	1.4413	0.5633	
25.	5.07	1.580	10.46	11216.	2140.	4693.	1551.	19600.	6.6758	0.5930	0.1702	
50.	5.36	1.671	12.36	11920.	1354.	2300.	579.	16153.	4.0191	0.2861	0.0623	
100.	5.64	1.760	14.44	12775.	817.	1102.	235.	14928.	2.3739	0.1362	0.0246	
200.	5.92	1.847	16.70	13500.	485.	490.	91.	14565.	1.3610	0.0596	0.0096	
400.	6.20	1.933	19.15	14233.	262.	190.	24.	14709.	0.7239	0.0233	0.0024	
500.	6.28	1.961	19.98	14471.	217.	148.	17.	14854.	0.5932	0.0181	0.0017	
1000.	6.56	2.046	22.68	15218.	107.	51.	6.	15383.	0.2869	0.0060	0.0006	

SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.08 DOWNTIME COSTS INCLUDED

No damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	2028.	22877.	14767.	49233.	8.8733	4.4052	2.4263	
10.	4.67	1.456	8.18	10284.	1295.	12124.	5781.	29483.	5.1356	2.3150	0.9437	
25.	5.07	1.580	10.46	11216.	695.	4792.	1455.	18157.	2.4880	0.8953	0.2377	
50.	5.36	1.671	12.36	11920.	423.	2200.	556.	15099.	1.4034	0.4070	0.0875	
100.	5.64	1.760	14.44	12775.	233.	927.	165.	14100.	0.7437	0.1714	0.0262	
200.	5.92	1.847	16.70	13500.	115.	366.	60.	14041.	0.3511	0.0670	0.0091	
400.	6.20	1.933	19.15	14233.	57.	150.	19.	14459.	0.1638	0.0267	0.0029	
500.	6.28	1.961	19.98	14471.	43.	98.	12.	14624.	0.1215	0.0174	0.0017	
1000.	6.56	2.046	22.68	15218.	19.	34.	6.	15277.	0.0509	0.0065	0.0007	

Damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	3951.	15223.	8576.	37311.	21.3594	2.9127	1.3678	
10.	4.67	1.456	8.18	10284.	2553.	7699.	3534.	24069.	12.9459	1.4413	0.5633	
25.	5.07	1.580	10.46	11216.	1412.	3215.	1053.	16896.	6.6758	0.5930	0.1702	
50.	5.36	1.671	12.36	11920.	883.	1579.	396.	14778.	4.0191	0.2861	0.0623	
100.	5.64	1.760	14.44	12775.	526.	758.	160.	14219.	2.3739	0.1362	0.0246	
200.	5.92	1.847	16.70	13500.	308.	335.	62.	14204.	1.3610	0.0596	0.0096	
400.	6.20	1.933	19.15	14233.	162.	129.	17.	14541.	0.7239	0.0233	0.0024	
500.	6.28	1.961	19.98	14471.	134.	101.	12.	14718.	0.5932	0.0181	0.0017	
1000.	6.56	2.046	22.68	15218.	65.	36.	4.	15323.	0.2869	0.0060	0.0006	

SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.02 NO DOWNTIME COSTS INCLUDED

No damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	5064.	6787.	9069.	30481.	8.8733	4.4052	2.4263	
10.	4.67	1.456	8.18	10284.	3228.	3910.	3598.	21020.	5.1356	2.3150	0.9437	
25.	5.07	1.580	10.46	11216.	1734.	1676.	944.	15570.	2.4880	0.8953	0.2377	

50.	5.36	1.671	12.36	11920.	1050.	817.	369.	14156.	1.4034	0.4070	0.0875
100.	5.64	1.760	14.44	12775.	577.	358.	117.	13828.	0.7437	0.1714	0.0262
200.	5.92	1.847	16.70	13500.	287.	149.	43.	13978.	0.3511	0.0670	0.0091
400.	6.20	1.933	19.15	14233.	142.	63.	16.	14454.	0.1638	0.0267	0.0029
500.	6.28	1.961	19.98	14471.	106.	41.	9.	14628.	0.1215	0.0174	0.0017
1000.	6.56	2.046	22.68	15218.	47.	16.	4.	15285.	0.0509	0.0065	0.0007

Damage accumulation

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	10081.	4392.	5424.	29458.	21.3594	2.9127	1.3678
10.	4.67	1.456	8.18	10284.	6605.	2396.	2283.	21568.	12.9459	1.4413	0.5633
25.	5.07	1.580	10.46	11216.	3736.	1101.	704.	16756.	6.6758	0.5930	0.1702
50.	5.36	1.671	12.36	11920.	2392.	572.	267.	15151.	4.0191	0.2861	0.0623
100.	5.64	1.760	14.44	12775.	1464.	285.	115.	14639.	2.3739	0.1362	0.0246
200.	5.92	1.847	16.70	13500.	885.	133.	47.	14564.	1.3610	0.0596	0.0096
400.	6.20	1.933	19.15	14233.	490.	55.	12.	14790.	0.7239	0.0233	0.0024
500.	6.28	1.961	19.98	14471.	408.	44.	9.	14933.	0.5932	0.0181	0.0017
1000.	6.56	2.046	22.68	15218.	207.	15.	3.	15444.	0.2869	0.0060	0.0006

SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.05 NO DOWNTIME COSTS INCLUDED

No damage accumulation

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	2984.	4000.	5349.	21894.	8.8733	4.4052	2.4263
10.	4.67	1.456	8.18	10284.	1904.	2301.	2126.	16614.	5.1356	2.3150	0.9437
25.	5.07	1.580	10.46	11216.	1022.	990.	555.	13783.	2.4880	0.8953	0.2377
50.	5.36	1.671	12.36	11920.	621.	482.	219.	13242.	1.4034	0.4070	0.0875
100.	5.64	1.760	14.44	12775.	341.	211.	69.	13397.	0.7437	0.1714	0.0262
200.	5.92	1.847	16.70	13500.	169.	88.	25.	13782.	0.3511	0.0670	0.0091
400.	6.20	1.933	19.15	14233.	84.	37.	9.	14363.	0.1638	0.0267	0.0029
500.	6.28	1.961	19.98	14471.	63.	25.	5.	14564.	0.1215	0.0174	0.0017
1000.	6.56	2.046	22.68	15218.	27.	9.	3.	15258.	0.0509	0.0065	0.0007

Damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	5880.	2598.	3222.	21262.	21.3594	2.9127	1.3678	
10.	4.67	1.456	8.18	10284.	3826.	1423.	1351.	16883.	12.9459	1.4413	0.5633	
25.	5.07	1.580	10.46	11216.	2140.	654.	413.	14422.	6.6758	0.5930	0.1702	
50.	5.36	1.671	12.36	11920.	1354.	341.	158.	13773.	4.0191	0.2861	0.0623	
100.	5.64	1.760	14.44	12775.	817.	170.	68.	13830.	2.3739	0.1362	0.0246	
200.	5.92	1.847	16.70	13500.	485.	79.	27.	14091.	1.3610	0.0596	0.0096	
400.	6.20	1.933	19.15	14233.	262.	32.	7.	14535.	0.7239	0.0233	0.0024	
500.	6.28	1.961	19.98	14471.	217.	26.	5.	14720.	0.5932	0.0181	0.0017	
1000.	6.56	2.046	22.68	15218.	107.	9.	2.	15337.	0.2869	0.0060	0.0006	

SERIES 12 FOLLONICA WAVES 50 YEAR RATE 0.08 NO DOWNTIME COSTS INCLUDED

No damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	2028.	2720.	3637.	17946.	8.8733	4.4052	2.4263	
10.	4.67	1.456	8.18	10284.	1295.	1562.	1447.	14587.	5.1356	2.3150	0.9437	
25.	5.07	1.580	10.46	11216.	695.	674.	376.	12961.	2.4880	0.8953	0.2377	
50.	5.36	1.671	12.36	11920.	423.	329.	149.	12821.	1.4034	0.4070	0.0875	
100.	5.64	1.760	14.44	12775.	233.	144.	47.	13198.	0.7437	0.1714	0.0262	
200.	5.92	1.847	16.70	13500.	115.	60.	17.	13692.	0.3511	0.0670	0.0091	
400.	6.20	1.933	19.15	14233.	57.	26.	6.	14322.	0.1638	0.0267	0.0029	
500.	6.28	1.961	19.98	14471.	43.	17.	4.	14535.	0.1215	0.0174	0.0017	
1000.	6.56	2.046	22.68	15218.	19.	6.	2.	15245.	0.0509	0.0065	0.0007	

Damage accumulation

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-RLS	P-ULS
5.	4.35	1.356	6.60	9561.	3951.	1773.	2206.	17491.	21.3594	2.9127	1.3678	
10.	4.67	1.456	8.18	10284.	2553.	975.	923.	14734.	12.9459	1.4413	0.5633	
25.	5.07	1.580	10.46	11216.	1412.	448.	280.	13356.	6.6758	0.5930	0.1702	
50.	5.36	1.671	12.36	11920.	883.	234.	108.	13146.	4.0191	0.2861	0.0623	
100.	5.64	1.760	14.44	12775.	526.	117.	46.	13465.	2.3739	0.1362	0.0246	
200.	5.92	1.847	16.70	13500.	308.	55.	18.	13880.	1.3610	0.0596	0.0096	
400.	6.20	1.933	19.15	14233.	162.	22.	5.	14422.	0.7239	0.0233	0.0024	
500.	6.28	1.961	19.98	14471.	134.	18.	4.	14627.	0.5932	0.0181	0.0017	
1000.	6.56	2.046	22.68	15218.	65.	6.	1.	15291.	0.2869	0.0060	0.0006	

A2.2 Cube armour

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE  
0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	7037.	23602.	17370.	61607.	11.8974	1.7830	1.1482	
10.	4.67	1.307	5.35	14098.	4177.	12022.	7999.	38296.	6.6450	0.8973	0.5226	
25.	5.07	1.418	6.85	14725.	2119.	4894.	2822.	24559.	3.1388	0.3613	0.1820	
50.	5.36	1.500	8.09	15316.	1286.	2607.	1346.	20555.	1.8050	0.1896	0.0854	
100.	5.64	1.579	9.45	16038.	818.	1448.	678.	18981.	1.0803	0.1043	0.0429	
200.	5.92	1.658	10.93	16763.	502.	771.	311.	18346.	0.6273	0.0549	0.0192	
400.	6.20	1.735	12.53	17494.	318.	413.	142.	18368.	0.3790	0.0291	0.0087	
500.	6.28	1.760	13.08	17946.	259.	326.	115.	18646.	0.3092	0.0232	0.0069	
1000.	6.56	1.836	14.85	18694.	166.	178.	60.	19098.	0.1888	0.0126	0.0035	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	9952.	32830.	24395.	81168.	23.9866	3.6024	2.3371	
10.	4.67	1.307	5.35	14499.	5847.	16457.	10867.	47669.	13.2576	1.7867	1.0277	
25.	5.07	1.418	6.85	15138.	3012.	6913.	3906.	28968.	6.3659	0.7426	0.3657	
50.	5.36	1.500	8.09	15609.	1824.	3651.	1879.	22964.	3.6736	0.3878	0.1732	
100.	5.64	1.579	9.45	16073.	1127.	2026.	930.	20155.	2.1742	0.2122	0.0848	
200.	5.92	1.658	10.93	16763.	685.	1021.	408.	18876.	1.2511	0.1060	0.0366	
400.	6.20	1.735	12.53	17494.	429.	563.	216.	18703.	0.7432	0.0582	0.0190	
500.	6.28	1.760	13.08	17946.	357.	454.	155.	18912.	0.6242	0.0469	0.0137	
1000.	6.56	1.836	14.85	18694.	219.	235.	74.	19222.	0.3640	0.0241	0.0065	

SERIES 23 SINES WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50861.	20313.	28488.	24328.	123990.	8.4590	1.4891	0.8950	
10.	11.35	3.177	76.99	56993.	15832.	16455.	12026.	101305.	5.4535	0.7859	0.3994	
25.	12.16	3.406	94.80	60740.	9552.	7651.	4522.	82465.	3.0660	0.3495	0.1437	
50.	12.71	3.560	108.30	62391.	6421.	4506.	2408.	75726.	2.0305	0.2026	0.0756	
100.	13.23	3.703	121.91	65530.	4612.	2769.	1394.	74305.	1.3633	0.1200	0.0418	
200.	13.71	3.838	135.67	68533.	3286.	1751.	779.	74350.	0.9208	0.0727	0.0227	
400.	14.16	3.965	149.60	69263.	2235.	1035.	445.	72977.	0.6303	0.0434	0.0129	
500.	14.30	4.005	154.13	71033.	2087.	958.	388.	74466.	0.5655	0.0387	0.0108	
1000.	14.73	4.124	168.31	70973.	1380.	596.	223.	73172.	0.3851	0.0244	0.0063	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55938.	33630.	42199.	36721.	168488.	17.0394	2.9883	1.7853	
10.	11.35	3.177	76.99	59389.	23233.	23266.	17087.	122974.	10.9629	1.5768	0.7943	
25.	12.16	3.406	94.80	62425.	13724.	10839.	6553.	93541.	6.1979	0.7124	0.2977	
50.	12.71	3.560	108.30	64362.	9192.	6420.	3528.	83503.	4.0557	0.4134	0.1563	
100.	13.23	3.703	121.91	66021.	6287.	3788.	1794.	77890.	2.7416	0.2400	0.0792	
200.	13.71	3.838	135.67	68705.	4505.	2436.	1141.	76787.	1.8671	0.1496	0.0484	
400.	14.16	3.965	149.60	71435.	3221.	1530.	662.	76848.	1.2714	0.0912	0.0272	
500.	14.30	4.005	154.13	70686.	2705.	1210.	477.	75078.	1.1020	0.0729	0.0204	
1000.	14.73	4.124	168.31	72588.	1897.	738.	287.	75511.	0.7556	0.0441	0.0118	

#### ACCUMULATION OF DAMAGE

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE  
0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	11994.	17132.	10486.	53211.	26.0748	1.2958	0.6952	
10.	4.67	1.307	5.35	14098.	7457.	7766.	4157.	33478.	15.8081	0.5795	0.2722	
25.	5.07	1.418	6.85	14725.	4164.	2936.	1342.	23165.	8.5385	0.2156	0.0865	
50.	5.36	1.500	8.09	15316.	2677.	1483.	612.	20088.	5.3102	0.1080	0.0389	
100.	5.64	1.579	9.45	16038.	1763.	792.	316.	18908.	3.3519	0.0569	0.0196	
200.	5.92	1.658	10.93	16763.	1169.	421.	145.	18498.	2.1307	0.0299	0.0090	
400.	6.20	1.735	12.53	17494.	754.	224.	71.	18543.	1.3130	0.0156	0.0043	
500.	6.28	1.760	13.08	17946.	643.	183.	63.	18835.	1.1254	0.0130	0.0038	
1000.	6.56	1.836	14.85	18694.	409.	97.	27.	19228.	0.6862	0.0067	0.0016	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	16852.	23852.	14766.	69460.	52.2357	2.6153	1.4171	
10.	4.67	1.307	5.35	14499.	10465.	10452.	5567.	40984.	31.7692	1.1360	0.5289	
25.	5.07	1.418	6.85	15138.	5880.	4078.	1939.	27035.	17.2613	0.4378	0.1805	
50.	5.36	1.500	8.09	15609.	3813.	2001.	842.	22264.	10.9558	0.2123	0.0769	
100.	5.64	1.579	9.45	16073.	2477.	1055.	418.	20024.	6.9422	0.1101	0.0381	
200.	5.92	1.658	10.93	16763.	1653.	608.	224.	19247.	4.4738	0.0633	0.0200	
400.	6.20	1.735	12.53	17494.	1071.	304.	102.	18971.	2.8150	0.0313	0.0085	
500.	6.28	1.760	13.08	17946.	932.	252.	88.	19218.	2.4628	0.0259	0.0075	
1000.	6.56	1.836	14.85	18694.	598.	147.	49.	19489.	1.5296	0.0147	0.0042	

SERIES 23 SINES WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50230.	28863.	25164.	19787.	124045.	14.3163	1.3308	0.7368	
10.	11.35	3.177	76.99	56703.	24633.	13703.	9141.	104180.	10.3298	0.6609	0.3041	
25.	12.16	3.406	94.80	61459.	17337.	6347.	3627.	88770.	6.8065	0.2871	0.1124	
50.	12.71	3.560	108.30	63925.	12809.	3531.	1822.	82087.	4.9745	0.1557	0.0553	
100.	13.23	3.703	121.91	64531.	9192.	2007.	887.	76617.	3.7220	0.0881	0.0270	
200.	13.71	3.838	135.67	66440.	6894.	1260.	533.	75126.	2.7677	0.0540	0.0159	
400.	14.16	3.965	149.60	71196.	5613.	766.	292.	77867.	2.0636	0.0313	0.0081	
500.	14.30	4.005	154.13	71128.	5055.	670.	233.	77086.	1.8858	0.0272	0.0065	
1000.	14.73	4.124	168.31	70656.	3580.	400.	154.	74790.	1.4095	0.0165	0.0043	



100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	57774.	52727.	39307.	33190.	182998.	28.8780	2.6966	1.5315	
10.	11.35	3.177	76.99	58367.	35474.	19320.	12954.	126115.	20.9794	1.3330	0.6167	
25.	12.16	3.406	94.80	62472.	24075.	8712.	5003.	100262.	13.7518	0.5708	0.2237	
50.	12.71	3.560	108.30	62805.	16988.	4926.	2503.	87222.	10.2878	0.3242	0.1139	
100.	13.23	3.703	121.91	67134.	13500.	2949.	1411.	84994.	7.6031	0.1829	0.0593	
200.	13.71	3.838	135.67	68156.	10072.	1782.	729.	80738.	5.8065	0.1099	0.0314	
400.	14.16	3.965	149.60	71112.	7748.	1013.	400.	80273.	4.3447	0.0612	0.0165	
500.	14.30	4.005	154.13	71229.	6978.	910.	323.	79440.	3.9720	0.0541	0.0133	
1000.	14.73	4.124	168.31	72703.	5326.	582.	230.	78841.	3.0454	0.0347	0.0091	

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE  
0.05

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	4148.	13906.	10247.	41900.	11.8974	1.7830	1.1482	
10.	4.67	1.307	5.35	14098.	2462.	7099.	4706.	28365.	6.6450	0.8973	0.5226	
25.	5.07	1.418	6.85	14725.	1249.	2878.	1656.	20508.	3.1388	0.3613	0.1820	
50.	5.36	1.500	8.09	15316.	758.	1541.	795.	18410.	1.8050	0.1896	0.0854	
100.	5.64	1.579	9.45	16038.	482.	855.	397.	17772.	1.0803	0.1043	0.0429	
200.	5.92	1.658	10.93	16763.	296.	453.	183.	17695.	0.6273	0.0549	0.0192	
400.	6.20	1.735	12.53	17494.	188.	245.	84.	18011.	0.3790	0.0291	0.0087	
500.	6.28	1.760	13.08	17946.	153.	190.	68.	18357.	0.3092	0.0232	0.0069	
1000.	6.56	1.836	14.85	18694.	98.	105.	36.	18932.	0.1888	0.0126	0.0035	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	4651.	15340.	11403.	45385.	23.9866	3.6024	2.3371	
10.	4.67	1.307	5.35	14499.	2732.	7693.	5085.	30009.	13.2576	1.7867	1.0277	
25.	5.07	1.418	6.85	15138.	1409.	3224.	1810.	21581.	6.3659	0.7426	0.3657	
50.	5.36	1.500	8.09	15609.	853.	1708.	882.	19052.	3.6736	0.3878	0.1732	
100.	5.64	1.579	9.45	16073.	524.	949.	434.	17980.	2.1742	0.2122	0.0848	
200.	5.92	1.658	10.93	16763.	321.	477.	192.	17753.	1.2511	0.1060	0.0366	
400.	6.20	1.735	12.53	17494.	201.	261.	103.	18059.	0.7432	0.0582	0.0190	
500.	6.28	1.760	13.08	17946.	166.	209.	72.	18393.	0.6242	0.0469	0.0137	
1000.	6.56	1.836	14.85	18694.	102.	108.	34.	18939.	0.3640	0.0241	0.0065	

SERIES 23 SINES WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50861.	11972.	16805.	14369.	94006.	8.4590	1.4891	0.8950	
10.	11.35	3.177	76.99	56993.	9329.	9710.	7063.	83096.	5.4535	0.7859	0.3994	
25.	12.16	3.406	94.80	60740.	5627.	4515.	2650.	73532.	3.0660	0.3495	0.1437	
50.	12.71	3.560	108.30	62391.	3785.	2657.	1415.	70247.	2.0305	0.2026	0.0756	
100.	13.23	3.703	121.91	65530.	2722.	1628.	823.	70703.	1.3633	0.1200	0.0418	
200.	13.71	3.838	135.67	68533.	1934.	1037.	457.	71961.	0.9208	0.0727	0.0227	
400.	14.16	3.965	149.60	69263.	1319.	605.	261.	71447.	0.6303	0.0434	0.0129	
500.	14.30	4.005	154.13	71033.	1229.	570.	227.	73059.	0.5655	0.0387	0.0108	
1000.	14.73	4.124	168.31	70973.	815.	354.	131.	72272.	0.3851	0.0244	0.0063	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55938.	15705.	19745.	17147.	108535.	17.0394	2.9883	1.7853	
10.	11.35	3.177	76.99	59389.	10860.	10871.	8021.	89140.	10.9629	1.5768	0.7943	
25.	12.16	3.406	94.80	62425.	6420.	5048.	3058.	76952.	6.1979	0.7124	0.2977	
50.	12.71	3.560	108.30	64362.	4300.	3002.	1658.	73323.	4.0557	0.4134	0.1563	
100.	13.23	3.703	121.91	66021.	2930.	1778.	841.	71571.	2.7416	0.2400	0.0792	
200.	13.71	3.838	135.67	68705.	2109.	1146.	529.	72489.	1.8671	0.1496	0.0484	
400.	14.16	3.965	149.60	71435.	1499.	711.	307.	73951.	1.2714	0.0912	0.0272	
500.	14.30	4.005	154.13	70686.	1268.	569.	214.	72737.	1.1020	0.0729	0.0204	
1000.	14.73	4.124	168.31	72588.	889.	341.	135.	73953.	0.7556	0.0441	0.0118	

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	7026.	10102.	6196.	36923.	26.0748	1.2958	0.6952	
10.	4.67	1.307	5.35	14098.	4348.	4598.	2453.	25497.	15.8081	0.5795	0.2722	
25.	5.07	1.418	6.85	14725.	2406.	1745.	793.	19668.	8.5385	0.2156	0.0865	
50.	5.36	1.500	8.09	15316.	1534.	881.	360.	18091.	5.3102	0.1080	0.0389	
100.	5.64	1.579	9.45	16038.	998.	471.	187.	17694.	3.3519	0.0569	0.0196	
200.	5.92	1.658	10.93	16763.	655.	249.	86.	17753.	2.1307	0.0299	0.0090	
400.	6.20	1.735	12.53	17494.	418.	135.	43.	18089.	1.3130	0.0156	0.0043	
500.	6.28	1.760	13.08	17946.	353.	107.	38.	18445.	1.1254	0.0130	0.0038	
1000.	6.56	1.836	14.85	18694.	222.	58.	16.	18990.	0.6862	0.0067	0.0016	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	7817.	11187.	6912.	39906.	52.2357	2.6153	1.4171	
10.	4.67	1.307	5.35	14499.	4828.	4892.	2604.	26824.	31.7692	1.1360	0.5289	
25.	5.07	1.418	6.85	15138.	2683.	1913.	917.	20650.	17.2613	0.4378	0.1805	
50.	5.36	1.500	8.09	15609.	1719.	943.	398.	18668.	10.9558	0.2123	0.0769	
100.	5.64	1.579	9.45	16073.	1101.	502.	196.	17871.	6.9422	0.1101	0.0381	
200.	5.92	1.658	10.93	16763.	720.	285.	105.	17874.	4.4738	0.0633	0.0200	
400.	6.20	1.735	12.53	17494.	457.	144.	51.	18146.	2.8150	0.0313	0.0085	
500.	6.28	1.760	13.08	17946.	395.	118.	41.	18501.	2.4628	0.0259	0.0075	
1000.	6.56	1.836	14.85	18694.	247.	70.	24.	19036.	1.5296	0.0147	0.0042	

SERIES 23 SINES WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50230.	16845.	14858.	11695.	93628.	14.3163	1.3308	0.7368	
10.	11.35	3.177	76.99	56703.	14326.	8069.	5392.	84489.	10.3298	0.6609	0.3041	
25.	12.16	3.406	94.80	61459.	10014.	3751.	2145.	77369.	6.8065	0.2871	0.1124	
50.	12.71	3.560	108.30	63925.	7342.	2084.	1062.	74413.	4.9745	0.1557	0.0553	
100.	13.23	3.703	121.91	64531.	5228.	1194.	526.	71478.	3.7220	0.0881	0.0270	
200.	13.71	3.838	135.67	66440.	3895.	751.	315.	71401.	2.7677	0.0540	0.0159	
400.	14.16	3.965	149.60	71196.	3138.	449.	171.	74955.	2.0636	0.0313	0.0081	
500.	14.30	4.005	154.13	71128.	2817.	397.	139.	74481.	1.8858	0.0272	0.0065	
1000.	14.73	4.124	168.31	70656.	1975.	237.	94.	72962.	1.4095	0.0165	0.0043	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	57774.	24361.	18447.	15558.	116141.	28.8780	2.6966	1.5315	
10.	11.35	3.177	76.99	58367.	16310.	9055.	6041.	89772.	20.9794	1.3330	0.6167	
25.	12.16	3.406	94.80	62472.	10969.	4090.	2358.	79890.	13.7518	0.5708	0.2237	
50.	12.71	3.560	108.30	62805.	7669.	2320.	1179.	73973.	10.2878	0.3242	0.1139	
100.	13.23	3.703	121.91	67134.	6022.	1388.	674.	75219.	7.6031	0.1829	0.0593	
200.	13.71	3.838	135.67	68156.	4454.	845.	341.	73795.	5.8065	0.1099	0.0314	
400.	14.16	3.965	149.60	71112.	3376.	470.	186.	75144.	4.3447	0.0612	0.0165	
500.	14.30	4.005	154.13	71229.	3019.	434.	155.	74836.	3.9720	0.0541	0.0133	
1000.	14.73	4.124	168.31	72703.	2274.	270.	112.	75360.	3.0454	0.0347	0.0091	

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE  
0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	2819.	9448.	6971.	32837.	11.8974	1.7830	1.1482	
10.	4.67	1.307	5.35	14098.	1673.	4834.	3194.	23798.	6.6450	0.8973	0.5226	
25.	5.07	1.418	6.85	14725.	850.	1951.	1121.	18646.	3.1388	0.3613	0.1820	
50.	5.36	1.500	8.09	15316.	515.	1049.	541.	17422.	1.8050	0.1896	0.0854	
100.	5.64	1.579	9.45	16038.	328.	583.	269.	17218.	1.0803	0.1043	0.0429	
200.	5.92	1.658	10.93	16763.	202.	307.	123.	17395.	0.6273	0.0549	0.0192	
400.	6.20	1.735	12.53	17494.	128.	167.	58.	17847.	0.3790	0.0291	0.0087	
500.	6.28	1.760	13.08	17946.	104.	127.	47.	18224.	0.3092	0.0232	0.0069	
1000.	6.56	1.836	14.85	18694.	66.	71.	24.	18856.	0.1888	0.0126	0.0035	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	2971.	9787.	7284.	34032.	23.9866	3.6024	2.3371	
10.	4.67	1.307	5.35	14499.	1744.	4914.	3247.	24405.	13.2576	1.7867	1.0277	
25.	5.07	1.418	6.85	15138.	900.	2057.	1148.	19243.	6.3659	0.7426	0.3657	
50.	5.36	1.500	8.09	15609.	545.	1093.	566.	17812.	3.6736	0.3878	0.1732	
100.	5.64	1.579	9.45	16073.	334.	607.	276.	17290.	2.1742	0.2122	0.0848	
200.	5.92	1.658	10.93	16763.	205.	305.	123.	17397.	1.2511	0.1060	0.0366	
400.	6.20	1.735	12.53	17494.	129.	165.	66.	17854.	0.7432	0.0582	0.0190	
500.	6.28	1.760	13.08	17946.	106.	132.	45.	18230.	0.6242	0.0469	0.0137	
1000.	6.56	1.836	14.85	18694.	65.	68.	22.	18850.	0.3640	0.0241	0.0065	

SERIES 23 SINES WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.08

50 years lifetimes

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50861.	8137.	11429.	9786.	80213.	8.4590	1.4891	0.8950	
10.	11.35	3.177	76.99	56993.	6339.	6605.	4788.	74726.	5.4535	0.7859	0.3994	
25.	12.16	3.406	94.80	60740.	3823.	3074.	1795.	69432.	3.0660	0.3495	0.1437	
50.	12.71	3.560	108.30	62391.	2573.	1806.	959.	67728.	2.0305	0.2026	0.0756	
100.	13.23	3.703	121.91	65530.	1852.	1103.	560.	69045.	1.3633	0.1200	0.0418	
200.	13.71	3.838	135.67	68533.	1312.	707.	309.	70862.	0.9208	0.0727	0.0227	
400.	14.16	3.965	149.60	69263.	898.	407.	175.	70743.	0.6303	0.0434	0.0129	
500.	14.30	4.005	154.13	71033.	834.	390.	153.	72410.	0.5655	0.0387	0.0108	
1000.	14.73	4.124	168.31	70973.	555.	242.	88.	71858.	0.3851	0.0244	0.0063	

100 years lifetime

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55938.	10019.	12618.	10939.	89516.	17.0394	2.9883	1.7853
10.	11.35	3.177	76.99	59389.	6938.	6932.	5141.	78400.	10.9629	1.5768	0.7943
25.	12.16	3.406	94.80	62425.	4101.	3212.	1952.	71690.	6.1979	0.7124	0.2977
50.	12.71	3.560	108.30	64362.	2748.	1918.	1064.	70092.	4.0557	0.4134	0.1563
100.	13.23	3.703	121.91	66021.	1869.	1142.	540.	69572.	2.7416	0.2400	0.0792
200.	13.71	3.838	135.67	68705.	1349.	738.	336.	71128.	1.8671	0.1496	0.0484
400.	14.16	3.965	149.60	71435.	952.	452.	194.	73033.	1.2714	0.0912	0.0272
500.	14.30	4.005	154.13	70686.	813.	367.	133.	71998.	1.1020	0.0729	0.0204
1000.	14.73	4.124	168.31	72588.	569.	217.	86.	73460.	0.7556	0.0441	0.0118

SERIES 13 FOLLONICA WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	4743.	6874.	4228.	29444.	26.0748	1.2958	0.6952
10.	4.67	1.307	5.35	14098.	2921.	3139.	1671.	21829.	15.8081	0.5795	0.2722
25.	5.07	1.418	6.85	14725.	1601.	1196.	540.	18061.	8.5385	0.2156	0.0865
50.	5.36	1.500	8.09	15316.	1012.	605.	244.	17177.	5.3102	0.1080	0.0389
100.	5.64	1.579	9.45	16038.	652.	323.	128.	17140.	3.3519	0.0569	0.0196
200.	5.92	1.658	10.93	16763.	423.	170.	59.	17415.	2.1307	0.0299	0.0090
400.	6.20	1.735	12.53	17494.	267.	93.	30.	17884.	1.3130	0.0156	0.0043
500.	6.28	1.760	13.08	17946.	225.	73.	26.	18270.	1.1254	0.0130	0.0038
1000.	6.56	1.836	14.85	18694.	139.	40.	11.	18884.	0.6862	0.0067	0.0016

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	4953.	7164.	4419.	30527.	52.2357	2.6153	1.4171	
10.	4.67	1.307	5.35	14499.	3043.	3131.	1664.	22338.	31.7692	1.1360	0.5289	
25.	5.07	1.418	6.85	15138.	1674.	1227.	592.	18631.	17.2613	0.4378	0.1805	
50.	5.36	1.500	8.09	15609.	1061.	608.	256.	17535.	10.9558	0.2123	0.0769	
100.	5.64	1.579	9.45	16073.	672.	326.	125.	17197.	6.9422	0.1101	0.0381	
200.	5.92	1.658	10.93	16763.	434.	184.	67.	17448.	4.4738	0.0633	0.0200	
400.	6.20	1.735	12.53	17494.	271.	94.	35.	17893.	2.8150	0.0313	0.0085	
500.	6.28	1.760	13.08	17946.	233.	76.	26.	18282.	2.4628	0.0259	0.0075	
1000.	6.56	1.836	14.85	18694.	143.	45.	16.	18899.	1.5296	0.0147	0.0042	

SERIES 23 SINES WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50230.	11328.	10117.	7974.	79649.	14.3163	1.3308	0.7368	
10.	11.35	3.177	76.99	56703.	9596.	5485.	3670.	75454.	10.3298	0.6609	0.3041	
25.	12.16	3.406	94.80	61459.	6661.	2559.	1465.	72143.	6.8065	0.2871	0.1124	
50.	12.71	3.560	108.30	63925.	4848.	1421.	718.	70912.	4.9745	0.1557	0.0553	
100.	13.23	3.703	121.91	64531.	3427.	819.	360.	69136.	3.7220	0.0881	0.0270	
200.	13.71	3.838	135.67	66440.	2537.	516.	216.	69709.	2.7677	0.0540	0.0159	
400.	14.16	3.965	149.60	71196.	2025.	304.	115.	73641.	2.0636	0.0313	0.0081	
500.	14.30	4.005	154.13	71128.	1813.	270.	96.	73307.	1.8858	0.0272	0.0065	
1000.	14.73	4.124	168.31	70656.	1259.	162.	67.	72144.	1.4095	0.0165	0.0043	



100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	57774.	15374.	11815.	9959.	94922.	28.8780	2.6966	1.5315	
10.	11.35	3.177	76.99	58367.	10244.	5794.	3856.	78260.	20.9794	1.3330	0.6167	
25.	12.16	3.406	94.80	62472.	6835.	2621.	1518.	73445.	13.7518	0.5708	0.2237	
50.	12.71	3.560	108.30	62805.	4740.	1493.	760.	69798.	10.2878	0.3242	0.1139	
100.	13.23	3.703	121.91	67134.	3687.	890.	438.	72151.	7.6031	0.1829	0.0593	
200.	13.71	3.838	135.67	68156.	2708.	547.	218.	71630.	5.8065	0.1099	0.0314	
400.	14.16	3.965	149.60	71112.	2028.	300.	119.	73559.	4.3447	0.0612	0.0165	
500.	14.30	4.005	154.13	71229.	1805.	282.	102.	73417.	3.9720	0.0541	0.0133	
1000.	14.73	4.124	168.31	72703.	1345.	171.	75.	74294.	3.0454	0.0347	0.0091	

SERIES 13 FOLLONICA WAVES NO DOWNTIME COSTS NO DAMAGE ACCUMULATION  
RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	7037.	3239.	4246.	28121.	11.8974	1.7830	1.1482	
10.	4.67	1.307	5.35	14098.	4177.	1761.	2037.	22073.	6.6450	0.8973	0.5226	
25.	5.07	1.418	6.85	14725.	2119.	772.	748.	18363.	3.1388	0.3613	0.1820	
50.	5.36	1.500	8.09	15316.	1286.	434.	368.	17404.	1.8050	0.1896	0.0854	
100.	5.64	1.579	9.45	16038.	818.	256.	191.	17302.	1.0803	0.1043	0.0429	
200.	5.92	1.658	10.93	16763.	502.	143.	91.	17499.	0.6273	0.0549	0.0192	
400.	6.20	1.735	12.53	17494.	318.	81.	43.	17936.	0.3790	0.0291	0.0087	
500.	6.28	1.760	13.08	17946.	259.	64.	36.	18305.	0.3092	0.0232	0.0069	
1000.	6.56	1.836	14.85	18694.	166.	36.	19.	18915.	0.1888	0.0126	0.0035	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	9952.	4593.	6076.	34611.	23.9866	3.6024	2.3371	
10.	4.67	1.307	5.35	14499.	5847.	2456.	2805.	25608.	13.2576	1.7867	1.0277	
25.	5.07	1.418	6.85	15138.	3012.	1111.	1051.	20311.	6.3659	0.7426	0.3657	
50.	5.36	1.500	8.09	15609.	1824.	616.	520.	18568.	3.6736	0.3878	0.1732	
100.	5.64	1.579	9.45	16073.	1127.	358.	264.	17822.	2.1742	0.2122	0.0848	
200.	5.92	1.658	10.93	16763.	685.	190.	119.	17756.	1.2511	0.1060	0.0366	
400.	6.20	1.735	12.53	17494.	429.	110.	66.	18099.	0.7432	0.0582	0.0190	
500.	6.28	1.760	13.08	17946.	357.	89.	48.	18440.	0.6242	0.0469	0.0137	
1000.	6.56	1.836	14.85	18694.	219.	48.	23.	18985.	0.3640	0.0241	0.0065	

SERIES 23 SINES WAVES NO DOWNTIME COSTS NO DAMMAGE ACCUMULATION  
RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50861.	20313.	11466.	14087.	96727.	8.4590	1.4891	0.8950	
10.	11.35	3.177	76.99	56993.	15832.	7469.	7475.	87768.	5.4535	0.7859	0.3994	
25.	12.16	3.406	94.80	60740.	9552.	3657.	2885.	76834.	3.0660	0.3495	0.1437	
50.	12.71	3.560	108.30	62391.	6421.	2190.	1548.	72549.	2.0305	0.2026	0.0756	
100.	13.23	3.703	121.91	65530.	4612.	1400.	917.	72460.	1.3633	0.1200	0.0418	
200.	13.71	3.838	135.67	68533.	3286.	917.	521.	73256.	0.9208	0.0727	0.0227	
400.	14.16	3.965	149.60	69263.	2235.	542.	298.	72337.	0.6303	0.0434	0.0129	
500.	14.30	4.005	154.13	71033.	2087.	512.	265.	73897.	0.5655	0.0387	0.0108	
1000.	14.73	4.124	168.31	70973.	1380.	316.	152.	72821.	0.3851	0.0244	0.0063	

100 years life time

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55938.	33630.	18766.	22731.	131065.	17.0394	2.9883	1.7853	
10.	11.35	3.177	76.99	59389.	23233.	10897.	10851.	104370.	10.9629	1.5768	0.7943	
25.	12.16	3.406	94.80	62425.	13724.	5259.	4223.	85631.	6.1979	0.7124	0.2977	
50.	12.71	3.560	108.30	64362.	9192.	3182.	2300.	79036.	4.0557	0.4134	0.1563	
100.	13.23	3.703	121.91	66021.	6287.	1908.	1173.	75389.	2.7416	0.2400	0.0792	
200.	13.71	3.838	135.67	68705.	4505.	1265.	762.	75236.	1.8671	0.1496	0.0484	
400.	14.16	3.965	149.60	71435.	3221.	817.	450.	75922.	1.2714	0.0912	0.0272	
500.	14.30	4.005	154.13	70686.	2705.	638.	321.	74350.	1.1020	0.0729	0.0204	
1000.	14.73	4.124	168.31	72588.	1897.	396.	194.	75076.	0.7556	0.0441	0.0118	

SERIES 13 FOLLONICA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION  
RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	11994.	2333.	2542.	30468.	26.0748	1.2958	0.6952	
10.	4.67	1.307	5.35	14098.	7457.	1128.	1048.	23731.	15.8081	0.5795	0.2722	
25.	5.07	1.418	6.85	14725.	4164.	460.	352.	19700.	8.5385	0.2156	0.0865	
50.	5.36	1.500	8.09	15316.	2677.	245.	168.	18407.	5.3102	0.1080	0.0389	
100.	5.64	1.579	9.45	16038.	1763.	138.	90.	18029.	3.3519	0.0569	0.0196	
200.	5.92	1.658	10.93	16763.	1169.	77.	43.	18052.	2.1307	0.0299	0.0090	
400.	6.20	1.735	12.53	17494.	754.	44.	21.	18313.	1.3130	0.0156	0.0043	
500.	6.28	1.760	13.08	17946.	643.	35.	20.	18644.	1.1254	0.0130	0.0038	
1000.	6.56	1.836	14.85	18694.	409.	20.	9.	19132.	0.6862	0.0067	0.0016	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	16852.	3313.	3652.	37806.	52.2357	2.6153	1.4171	
10.	4.67	1.307	5.35	14499.	10465.	1547.	1421.	27932.	31.7692	1.1360	0.5289	
25.	5.07	1.418	6.85	15138.	5880.	650.	520.	22188.	17.2613	0.4378	0.1805	
50.	5.36	1.500	8.09	15609.	3813.	335.	232.	19988.	10.9558	0.2123	0.0769	
100.	5.64	1.579	9.45	16073.	2477.	184.	119.	18853.	6.9422	0.1101	0.0381	
200.	5.92	1.658	10.93	16763.	1653.	112.	66.	18594.	4.4738	0.0633	0.0200	
400.	6.20	1.735	12.53	17494.	1071.	59.	31.	18655.	2.8150	0.0313	0.0085	
500.	6.28	1.760	13.08	17946.	932.	49.	28.	18955.	2.4628	0.0259	0.0075	
1000.	6.56	1.836	14.85	18694.	598.	30.	16.	19338.	1.5296	0.0147	0.0042	

SERIES 23 SINES WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	50230.	28863.	9946.	11357.	100396.	14.3163	1.3308	0.7368	
10.	11.35	3.177	76.99	56703.	24633.	6162.	5668.	93166.	10.3298	0.6609	0.3041	
25.	12.16	3.406	94.80	61459.	17337.	3063.	2341.	84200.	6.8065	0.2871	0.1124	
50.	12.71	3.560	108.30	63925.	12809.	1754.	1197.	79684.	4.9745	0.1557	0.0553	
100.	13.23	3.703	121.91	64531.	9192.	996.	576.	75295.	3.7220	0.0881	0.0270	
200.	13.71	3.838	135.67	66440.	6894.	638.	352.	74324.	2.7677	0.0540	0.0159	
400.	14.16	3.965	149.60	71196.	5613.	410.	199.	77418.	2.0636	0.0313	0.0081	
500.	14.30	4.005	154.13	71128.	5055.	358.	158.	76699.	1.8858	0.0272	0.0065	
1000.	14.73	4.124	168.31	70656.	3580.	210.	104.	74550.	1.4095	0.0165	0.0043	

100 years lifetime

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	57774.	52727.	18107.	21160.	149769.	28.8780	2.6966	1.5315
10.	11.35	3.177	76.99	58367.	35474.	8848.	8131.	110820.	20.9794	1.3330	0.6167
25.	12.16	3.406	94.80	62472.	24075.	4221.	3243.	94011.	13.7518	0.5708	0.2237
50.	12.71	3.560	108.30	62805.	16988.	2375.	1605.	83774.	10.2878	0.3242	0.1139
100.	13.23	3.703	121.91	67134.	13500.	1505.	940.	83080.	7.6031	0.1829	0.0593
200.	13.71	3.838	135.67	68156.	10072.	914.	484.	79625.	5.8065	0.1099	0.0314
400.	14.16	3.965	149.60	71112.	7748.	537.	270.	79667.	4.3447	0.0612	0.0165
500.	14.30	4.005	154.13	71229.	6978.	482.	218.	78907.	3.9720	0.0541	0.0133
1000.	14.73	4.124	168.31	72703.	5326.	311.	158.	78498.	3.0454	0.0347	0.0091

SERIES 13 FOLLONICA WAVES NO DOWNTIME COSTS NO DAMAGE ACCUMULATION  
RATE 0.05

50 years lifetime

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	4170.	1931.	2543.	22242.	11.9547	1.8022	1.1629
10.	4.67	1.307	5.35	14098.	2479.	1040.	1193.	18810.	6.6862	0.8971	0.5198
25.	5.07	1.418	6.85	14725.	1244.	458.	438.	16865.	3.1324	0.3658	0.1814
50.	5.36	1.500	8.09	15316.	763.	259.	216.	16554.	1.8184	0.1922	0.0847
100.	5.64	1.579	9.45	16038.	472.	145.	101.	16755.	1.0574	0.1001	0.0383
200.	5.92	1.658	10.93	16763.	294.	81.	53.	17191.	0.6263	0.0526	0.0184
400.	6.20	1.735	12.53	17494.	184.	48.	27.	17753.	0.3730	0.0285	0.0095
500.	6.28	1.760	13.08	17946.	156.	38.	22.	18162.	0.3162	0.0236	0.0072
1000.	6.56	1.836	14.85	18694.	100.	21.	10.	18824.	0.1915	0.0119	0.0032

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	4604.	2127.	2808.	23529.	23.7650	3.5777	2.3104	
10.	4.67	1.307	5.35	14499.	2736.	1149.	1298.	19682.	13.2637	1.7839	1.0187	
25.	5.07	1.418	6.85	15138.	1395.	519.	493.	17545.	6.3156	0.7407	0.3651	
50.	5.36	1.500	8.09	15609.	853.	289.	251.	17001.	3.6667	0.3893	0.1773	
100.	5.64	1.579	9.45	16073.	522.	163.	125.	16883.	2.1557	0.2067	0.0847	
200.	5.92	1.658	10.93	16763.	319.	89.	58.	17230.	1.2529	0.1065	0.0385	
400.	6.20	1.735	12.53	17494.	198.	51.	31.	17774.	0.7410	0.0578	0.0196	
500.	6.28	1.760	13.08	17946.	166.	43.	26.	18181.	0.6254	0.0483	0.0147	
1000.	6.56	1.836	14.85	18694.	103.	23.	11.	18831.	0.3635	0.0239	0.0061	

SERIES 23 SINES WAVES NO DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.05  
50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55540.	14612.	8168.	9888.	88208.	8.4979	1.4962	0.8920	
10.	11.35	3.177	76.99	59001.	10127.	4767.	4804.	78700.	5.4726	0.7921	0.4039	
25.	12.16	3.406	94.80	63083.	6199.	2388.	1990.	73660.	3.1140	0.3590	0.1550	
50.	12.71	3.560	108.30	65932.	4308.	1489.	1043.	72771.	2.0555	0.2083	0.0775	
100.	13.23	3.703	121.91	68635.	3003.	915.	556.	73109.	1.3701	0.1200	0.0390	
200.	13.71	3.838	135.67	71224.	2103.	576.	324.	74227.	0.9258	0.0716	0.0222	
400.	14.16	3.965	149.60	73722.	1505.	377.	193.	75796.	0.6313	0.0451	0.0130	
500.	14.30	4.005	154.13	74509.	1369.	324.	156.	76358.	0.5680	0.0380	0.0103	
1000.	14.73	4.124	168.31	76907.	975.	210.	112.	78205.	0.3926	0.0236	0.0066	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	56796.	16087.	9019.	11063.	92965.	16.8944	2.9762	1.7995	
10.	11.35	3.177	76.99	60302.	11203.	5297.	5381.	82182.	10.9659	1.5943	0.8153	
25.	12.16	3.406	94.80	64435.	6812.	2635.	2149.	76031.	6.1516	0.7165	0.3036	
50.	12.71	3.560	108.30	67319.	4693.	1588.	1083.	74684.	4.0412	0.4045	0.1471	
100.	13.23	3.703	121.91	70055.	3340.	1017.	651.	75063.	2.7501	0.2472	0.0864	
200.	13.71	3.838	135.67	72675.	2348.	641.	365.	76030.	1.8513	0.1450	0.0459	
400.	14.16	3.965	149.60	75201.	1675.	421.	233.	77530.	1.2711	0.0892	0.0265	
500.	14.30	4.005	154.13	75997.	1486.	348.	171.	78003.	1.1170	0.0737	0.0198	
1000.	14.73	4.124	168.31	78423.	1073.	241.	109.	79847.	0.7812	0.0482	0.0124	

SERIES 13 FOLLONICA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE  
0.05 50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	7030.	1389.	1512.	23531.	26.0788	1.3052	0.6985	
10.	4.67	1.307	5.35	14098.	4330.	663.	612.	19704.	15.7291	0.5795	0.2709	
25.	5.07	1.418	6.85	14725.	2415.	278.	230.	17648.	8.5382	0.2206	0.0941	
50.	5.36	1.500	8.09	15316.	1558.	147.	105.	17126.	5.3710	0.1100	0.0408	
100.	5.64	1.579	9.45	16038.	994.	80.	47.	17158.	3.3299	0.0550	0.0172	
200.	5.92	1.658	10.93	16763.	650.	48.	29.	17490.	2.1122	0.0309	0.0098	
400.	6.20	1.735	12.53	17494.	417.	27.	15.	17954.	1.3125	0.0161	0.0051	
500.	6.28	1.760	13.08	17946.	349.	19.	9.	18323.	1.1172	0.0116	0.0029	
1000.	6.56	1.836	14.85	18694.	225.	12.	6.	18938.	0.6924	0.0071	0.0018	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	7854.	1548.	1689.	25081.	52.4574	2.6159	1.4011	
10.	4.67	1.307	5.35	14499.	4905.	753.	706.	20863.	32.1724	1.1740	0.5554	
25.	5.07	1.418	6.85	15138.	2689.	310.	246.	18383.	17.2958	0.4442	0.1807	
50.	5.36	1.500	8.09	15609.	1713.	160.	111.	17593.	10.9169	0.2174	0.0798	
100.	5.64	1.579	9.45	16073.	1115.	90.	59.	17338.	7.0250	0.1166	0.0391	
200.	5.92	1.658	10.93	16763.	715.	52.	28.	17558.	4.4464	0.0594	0.0179	
400.	6.20	1.735	12.53	17494.	460.	28.	15.	17997.	2.8240	0.0306	0.0088	
500.	6.28	1.760	13.08	17946.	391.	22.	12.	18371.	2.4420	0.0253	0.0071	
1000.	6.56	1.836	14.85	18694.	245.	13.	5.	18957.	1.5177	0.0130	0.0030	

SERIES 23 SINES WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05  
50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55540.	21153.	7363.	8450.	92507.	14.3788	1.3548	0.7544	
10.	11.35	3.177	76.99	59001.	15657.	4019.	3789.	82466.	10.3665	0.6709	0.3137	
25.	12.16	3.406	94.80	63083.	10581.	1913.	1445.	77022.	6.8248	0.2869	0.1112	
50.	12.71	3.560	108.30	65932.	7918.	1147.	760.	75757.	5.0144	0.1603	0.0557	
100.	13.23	3.703	121.91	68635.	5911.	691.	435.	75672.	3.7079	0.0915	0.0296	
200.	13.71	3.838	135.67	71224.	4499.	421.	225.	76369.	2.7721	0.0529	0.0152	
400.	14.16	3.965	149.60	73722.	3400.	268.	134.	77524.	2.0718	0.0320	0.0087	
500.	14.30	4.005	154.13	74509.	3110.	240.	122.	77980.	1.8857	0.0282	0.0074	
1000.	14.73	4.124	168.31	76907.	2357.	148.	53.	79465.	1.4159	0.0163	0.0032	



100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	56796.	23521.	8185.	9387.	97889.	28.9148	2.7027	1.5112	
10.	11.35	3.177	76.99	60302.	17580.	4460.	4163.	86504.	21.0267	1.3437	0.6231	
25.	12.16	3.406	94.80	64435.	11807.	2119.	1583.	79945.	13.8146	0.5740	0.2223	
50.	12.71	3.560	108.30	67319.	8815.	1231.	796.	78161.	10.2396	0.3123	0.1066	
100.	13.23	3.703	121.91	70055.	6655.	751.	454.	77915.	7.6756	0.1796	0.0564	
200.	13.71	3.838	135.67	72675.	4985.	492.	260.	78412.	5.7231	0.1080	0.0310	
400.	14.16	3.965	149.60	75201.	3829.	294.	134.	79458.	4.3921	0.0630	0.0159	
500.	14.30	4.005	154.13	75997.	3453.	256.	125.	79831.	3.9767	0.0551	0.0138	
1000.	14.73	4.124	168.31	78423.	2628.	165.	67.	81282.	3.0224	0.0330	0.0078	

SERIES 13 FOLLONICA WAVES NO DOWNTIME COSTS NO DAMAGE ACCUMULATION  
RATE 0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	2804.	1294.	1708.	19405.	11.8431	1.7864	1.1516	
10.	4.67	1.307	5.35	14098.	1660.	696.	784.	17238.	6.5832	0.8851	0.5023	
25.	5.07	1.418	6.85	14725.	861.	322.	314.	16223.	3.1814	0.3755	0.1891	
50.	5.36	1.500	8.09	15316.	519.	175.	148.	16159.	1.8176	0.1924	0.0863	
100.	5.64	1.579	9.45	16038.	324.	100.	75.	16537.	1.0784	0.1023	0.0420	
200.	5.92	1.658	10.93	16763.	203.	58.	36.	17060.	0.6342	0.0553	0.0194	
400.	6.20	1.735	12.53	17494.	130.	35.	21.	17681.	0.3865	0.0311	0.0103	
500.	6.28	1.760	13.08	17946.	107.	27.	15.	18095.	0.3181	0.0236	0.0075	
1000.	6.56	1.836	14.85	18694.	65.	15.	7.	18782.	0.1863	0.0120	0.0034	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	2955.	1368.	1799.	20113.	23.8955	3.5934	2.3216	
10.	4.67	1.307	5.35	14499.	1741.	725.	825.	17791.	13.2380	1.7712	1.0160	
25.	5.07	1.418	6.85	15138.	883.	333.	309.	16663.	6.2688	0.7385	0.3628	
50.	5.36	1.500	8.09	15609.	552.	191.	165.	16516.	3.7258	0.3987	0.1818	
100.	5.64	1.579	9.45	16073.	340.	106.	76.	16596.	2.1856	0.2094	0.0845	
200.	5.92	1.658	10.93	16763.	204.	58.	37.	17062.	1.2539	0.1080	0.0391	
400.	6.20	1.735	12.53	17494.	125.	30.	16.	17664.	0.7304	0.0554	0.0167	
500.	6.28	1.760	13.08	17946.	106.	25.	14.	18091.	0.6210	0.0455	0.0142	
1000.	6.56	1.836	14.85	18694.	68.	15.	8.	18785.	0.3781	0.0255	0.0071	

SERIES 23 SINES WAVES NO DOWNTIME NO DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55540.	9971.	5565.	6801.	77878.	8.5275	1.4982	0.9019	
10.	11.35	3.177	76.99	59001.	6771.	3199.	3224.	72195.	5.4138	0.7846	0.3998	
25.	12.16	3.406	94.80	63083.	4186.	1631.	1371.	70271.	3.0997	0.3602	0.1553	
50.	12.71	3.560	108.30	65932.	2923.	980.	726.	70561.	2.0529	0.2038	0.0792	
100.	13.23	3.703	121.91	68635.	2063.	663.	414.	71775.	1.3786	0.1278	0.0437	
200.	13.71	3.838	135.67	71224.	1420.	384.	210.	73239.	0.9176	0.0708	0.0214	
400.	14.16	3.965	149.60	73722.	1025.	248.	112.	75108.	0.6316	0.0433	0.0109	
500.	14.30	4.005	154.13	74509.	929.	232.	124.	75793.	0.5684	0.0400	0.0115	
1000.	14.73	4.124	168.31	76907.	665.	137.	66.	77775.	0.3902	0.0226	0.0064	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	56796.	10327.	5717.	7004.	79843.	16.9824	2.9746	1.7746	
10.	11.35	3.177	76.99	60302.	7101.	3303.	3248.	73954.	10.8781	1.5507	0.7723	
25.	12.16	3.406	94.80	64435.	4365.	1675.	1379.	71854.	6.1780	0.7153	0.3039	
50.	12.71	3.560	108.30	67319.	3002.	1019.	703.	72043.	4.0474	0.4082	0.1472	
100.	13.23	3.703	121.91	70055.	2139.	648.	421.	73263.	2.7581	0.2431	0.0827	
200.	13.71	3.838	135.67	72675.	1487.	399.	240.	74800.	1.8394	0.1427	0.0456	
400.	14.16	3.965	149.60	75201.	1055.	260.	131.	76647.	1.2594	0.0870	0.0242	
500.	14.30	4.005	154.13	75997.	951.	222.	120.	77290.	1.1287	0.0770	0.0219	
1000.	14.73	4.124	168.31	78423.	683.	143.	71.	79320.	0.7790	0.0481	0.0123	

SERIES 13 FOLLONICA WAVES NO DOWNTIME DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13599.	4755.	951.	1036.	20342.	26.1271	1.3123	0.7037	
10.	4.67	1.307	5.35	14098.	2940.	451.	425.	17913.	15.9163	0.5761	0.2727	
25.	5.07	1.418	6.85	14725.	1611.	189.	143.	16667.	8.5569	0.2203	0.0890	
50.	5.36	1.500	8.09	15316.	1025.	103.	68.	16512.	5.3613	0.1112	0.0393	
100.	5.64	1.579	9.45	16038.	656.	55.	34.	16783.	3.3765	0.0558	0.0183	
200.	5.92	1.658	10.93	16763.	417.	32.	16.	17229.	2.0932	0.0299	0.0088	
400.	6.20	1.735	12.53	17494.	269.	18.	10.	17791.	1.3279	0.0158	0.0045	
500.	6.28	1.760	13.08	17946.	224.	15.	9.	18194.	1.1221	0.0123	0.0038	
1000.	6.56	1.836	14.85	18694.	141.	8.	4.	18847.	0.6913	0.0067	0.0017	

100 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	4.35	1.217	4.32	13990.	4986.	1003.	1089.	21069.	52.5520	2.6327	1.4191	
10.	4.67	1.307	5.35	14499.	3060.	468.	433.	18459.	31.8722	1.1400	0.5344	
25.	5.07	1.418	6.85	15138.	1671.	194.	155.	17159.	17.2338	0.4366	0.1755	
50.	5.36	1.500	8.09	15609.	1055.	102.	74.	16840.	10.8886	0.2148	0.0791	
100.	5.64	1.579	9.45	16073.	677.	55.	34.	16840.	6.9965	0.1107	0.0368	
200.	5.92	1.658	10.93	16763.	424.	32.	18.	17237.	4.4207	0.0577	0.0174	
400.	6.20	1.735	12.53	17494.	279.	20.	10.	17803.	2.8711	0.0322	0.0100	
500.	6.28	1.760	13.08	17946.	232.	15.	9.	18202.	2.4445	0.0275	0.0082	
1000.	6.56	1.836	14.85	18694.	144.	9.	4.	18852.	1.5330	0.0144	0.0037	

SERIES 23 SINES WAVES NO DOWNTIME DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

	TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	55540.	14231.	5055.	5809.	80635.	14.3886	1.3565	0.7583	
10.	11.35	3.177	76.99	59001.	10548.	2782.	2577.	74908.	10.4273	0.6759	0.3120	
25.	12.16	3.406	94.80	63083.	7015.	1303.	995.	72395.	6.8035	0.2878	0.1126	
50.	12.71	3.560	108.30	65932.	5179.	751.	482.	72344.	4.9823	0.1552	0.0539	
100.	13.23	3.703	121.91	68635.	3892.	470.	292.	73289.	3.7075	0.0917	0.0291	
200.	13.71	3.838	135.67	71224.	2858.	277.	154.	74514.	2.7267	0.0513	0.0147	
400.	14.16	3.965	149.60	73722.	2169.	179.	83.	76153.	2.0597	0.0322	0.0082	
500.	14.30	4.005	154.13	74509.	2000.	168.	81.	76757.	1.8821	0.0273	0.0070	
1000.	14.73	4.124	168.31	76907.	1503.	107.	41.	78558.	1.4157	0.0175	0.0039	

100 years lifetime

TDES	HS	DN	MASS	C-IN	C-SLS	C-RLS	C-ULS	C-TOT	P-SLS	P-LLS	P-ULS
5.	10.63	2.977	63.32	56796.	14863.	5241.	5993.	82893.	28.9100	2.6992	1.5083
10.	11.35	3.177	76.99	60302.	11039.	2861.	2626.	76827.	21.0220	1.3502	0.6198
25.	12.16	3.406	94.80	64435.	7299.	1329.	1009.	74072.	13.7797	0.5631	0.2151
50.	12.71	3.560	108.30	67319.	5400.	794.	546.	74059.	10.1778	0.3150	0.1098
100.	13.23	3.703	121.91	70055.	4061.	486.	308.	74909.	7.6503	0.1785	0.0577
200.	13.71	3.838	135.67	72675.	3059.	319.	172.	76225.	5.7801	0.1074	0.0310
400.	14.16	3.965	149.60	75201.	2280.	188.	87.	77756.	4.3600	0.0624	0.0157
500.	14.30	4.005	154.13	75997.	2085.	166.	79.	78328.	3.9967	0.0527	0.0130
1000.	14.73	4.124	168.31	78423.	1607.	119.	57.	80206.	3.0858	0.0352	0.0088

## **Appendix B1 Background note containing assumptions and formulae applied in optimizations analyses of berm breakwaters**

### **1. Objective**

To identify the safety levels corresponding to minimum lifetime costs of berm breakwaters. The analyses are performed solely for the Icelandic type berm breakwater.

### **2. Procedure in numerical simulations**

The procedure is the same as given for rock and cube armoured breakwaters, cf. Annex A1.

### **3. General assumptions**

#### *Failure modes and cross section*

The berm of the reshaping type is initially unstable but will reshape during normal and more severe wave conditions into more stable gentle s-curved slopes which change/adjust to the various sea states. Oblique waves over a certain threshold cause transport of stones along the structure which can cause problems in terms of lack of stones in some sections, Van der Meer and Veldman (1992) and Tomasicchio et al. (2013). The structures are designed for a maximum reshaping/recession of the berm in the design storm.

The non-reshaping type is designed for practically no erosion of the berm under more severe wave actions. Only for design storm conditions is some limited recession of the berm allowed. Before recession of the berm takes place, erosion of the front slope might take place if the berm level is

more than approximately half a significant wave height over SWL, see Sigurdarson and Van der Meer (2011) and Burcharth (2013).

The two failure modes recession  $R_{ec}$  and front slope erosion area  $A_e$  are illustrated in Fig. 1.

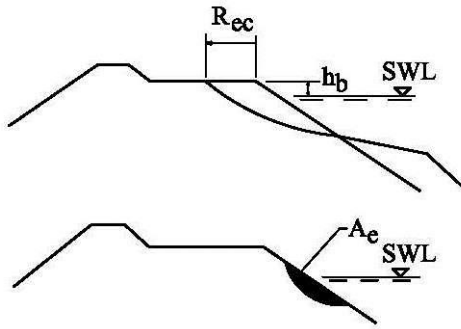


Fig. 1. Definition of the failure modes recession and front erosion

The recession  $R_{ec}$  of the berm shoulder shown in Fig. 1 is the only damage parameter used in the analyses. The parameterized cross section applied in the analyses is shown in Fig.2. Three classes of stones are considered although more classes are used in some berm breakwaters. This however has no importance because the damage calculated in the present analyses is related only to the recession of the berm and therefore only affecting the Class 1 berm stones. This on the other hand necessitates that the berm of Class 1 stone must be so deep that the eroded surface does not extend to the under-laying Class 2 stones. The nominal diameter  $D_{n50}$  of the three stone classes is for simplicity denoted  $D_1$ ,  $D_2$  and  $D_3$ .

If the recession exceeds the berm width the crest will be eroded and eventually large overtopping will erode the rear slope.

$$\text{Slopes } 1:1.5, R_c = 0.35 H_s S_{op}^{-1/3}, h' = \min[2.5 H_s, h - 0.3 D_1], D_2 = 0.8 D_1$$

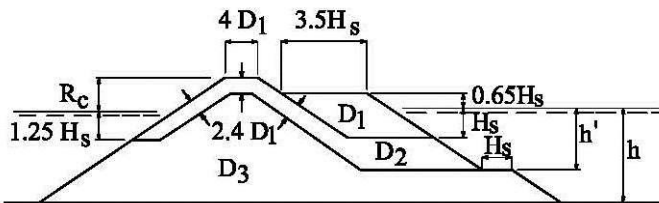


Fig.2. Parameterized Icelandic type berm breakwater. All slopes are 1:1.5

### Volumes

Cross sectional volumes ( $m^3/m$ )  $V_1$ ,  $V_2$ , and  $V_3$  refer to stone classes  $D_1$ ,  $D_2$  and  $D_3$ .  $D_2$  is set to  $0.8 D_1$ .

$$V_1 = 11.69 * H_s * D_1 - 7.21 * D_1^2 + 5.775 * H_s^2 - 11.69 * H_s * D_1 + 7.21 * D_1^2$$

$$V_2 = (2.75 * H_s + 0.35 H_s * s_{op}^{-1/3}) * 2.16 * D_1$$

$$\begin{aligned}
& + (0.525 * H_s * s_{op}^{-1/3} + 3.68 * D_1 - 0.375 * H_s) * (0.175 * H_s * s_{op}^{-1/3} - 0.125 * H_s) \\
& + (0.35 * H_s * s_{op}^{-1/3})^2 * 0.75 - 0.0625 * H_s^2 \\
& + (3.5 * H_s - 3.6 * D_1) * (0.65 H_s - 2 * D_1) \\
& + [ H_s * (0.525 * s_{op}^{-1/3} + 3) - 0.25 h' ] * h' - 2.34 * H_s * D_1 - (5.775 * H_s^2 - 11.69 * H_s * D_1 + 7.21 * D_1^2)
\end{aligned}$$

$$\begin{aligned}
V_3 = & (4.5 * H_s + 4 * D_1 + 1.5 * h' + 1.5 * h + 1.05 * H_s * s_{op}^{-1/3}) * (h - h') + 4.32 D_1 * (h' - 1.25 H_s) \\
& + (1.75 * h' + 0.0625 * H_s + 0.525 * H_s * s_{op}^{-1/3} - 0.33 D_1) * (h' + 0.25 * H_s) - 0.25 * (h' + 0.25 * H_s)
\end{aligned}$$

### Limit states and repair policy

Table 1 explains the applied limit state damage definitions and the related repair strategy.

Table 1. Limit state performance and related repair strategy

Limit state	Damage definition	Repair strategy
SLS	Recession reaches half of the berm width	Eroded volume replaced
RLS	Some erosion of crest and rear side	Eroded volume replaced plus extra volume
ULS	Recession exceeds the width of the berm	Eroded volume replaced

The repair strategy is in the cost optimization analyses related to recession as well as to the damage to the rear slope. As to the rear side damage Van der Meer and Veldman (1992) suggested on the basis of model tests with two different breakwater designs the following limits for rear side damage, also given in the PIANC WG 40 report (2003):

$$s_{op} R_{ec} / H_s = 0.25 \quad \text{Start of damage}$$

$$s_{op} R_{ec} / H_s = 0.21 \quad \text{Moderate damage}$$

$$s_{op} R_{ec} / H_s = 0.17 \quad \text{Severe damage}$$

Inserting  $R_{ec} = 0.35 H_s s_{op}^{-1/3}$  the criteria simplifies to ratios of  $H_s^y / H_s$  in which  $H_s^y$  is the y-years design return period  $H_s$  -value. This ratio is used in the criteria for repairs and failure given below.

Front slope erosion is not included as repairs are generally not necessary.

$R_{ec}$  is calculated for each storm.

If in storm n+1  $R_{ec}^{n+1} > R_{ec}^n$  take  $R_{ec}^{n+1}$ , otherwise disregard  $R_{ec}^{n+1}$ .

$R_{ec}$  is calculated for each storm. If in storm n+1  $R_{ec}^{n+1} > R_{ec}^n$  then  $R_{ec}^{n+1}$  is used, otherwise  $R_{ec}^{n+1}$  is disregarded

Repair takes place:

SLS R1. When total recession in storm n is larger than half of the initial berm width, i.e.

$$R_{ec} \geq 1.75 H_s^y$$

then the eroded volume of berm is taken as  $V_r^b = R_{ec} \cdot H_s^y$ , and the related costs

$$C_r^b = 1.5 U_{cl} \cdot V_r$$

RLS R2. If rear side and crest are eroded in a storm, i.e. when for unchanged  $S_{op}$ ,

$$1.44 H_s^y \leq H_s \leq 2.12 H_s^y$$

then the eroded + extra added volume is taken as  $V_r^c = 8 H_s^y \cdot D_1$ , and the related

costs

$$C_r^c = 1.5 U_{cl} \cdot V_r^c$$

ULS Failure FL occurs if

$$R_{ec}^{n+1} \geq 3.5 H_s^y$$

or  $H_s > 2.12 H_s^y$  (for unchanged  $S_{op}$ )

In both cases is the volume to replace taken as  $V_f = V_1 + 0.8 V_2$ , and the related costs are taken as  $C_f = 2.5 C_{cl} \cdot V_f$ .  $V_1$  and  $V_2$  are the volumes of the Class 1 and the Class 2 stones, respectively.

Downtime costs occur only in case of failure.

More relevant criteria for R2 and FL (based on overtopping discharge and rock size) than those given by the ratios of  $H_s^y/H_s$  have been investigated, but no convergence could be found in the scattered readily available information. More systematic model test results are needed in order to improve the criteria.

*Costs*

The quarry rock built-in unit prices are based on bids for the construction of the Sirevåg berm breakwater in Norway, regulated to the 2007 cost level, Sigurdarson et al. (2007). In the optimization analyses only the relative costs between the stone classes are important, not the actual



costs which vary from year to year. Table 2 gives the built-in unit prices for the various sizes of stones in EURO per m<sup>3</sup> bulk volume, i.e. stones plus voids.

Table 2. Bulk volume built-in unit prices for stones

Mean mass (t)	Unit price (EUR/m <sup>3</sup> )
0.1	10.1
0.6	14.7
2	15.0
6	18.9
13.3	23.5
23.3	27.0

To be applied in the optimization simulations are fitted the cost function shown in Fig. 3.

Stone mass (t)

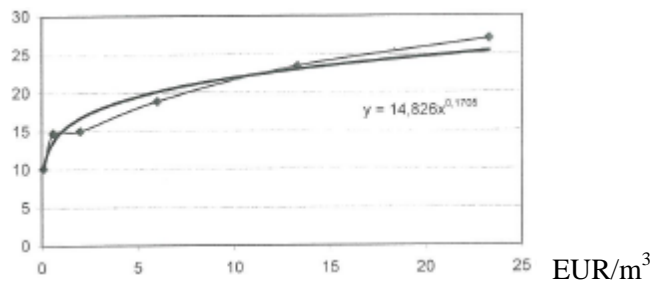


Fig.3. Built-in unit price cost function for stones

The built-in unit prices for stone Classes I and II are determined from the equation given in Fig. 3. The applied bulk volume built-in unit price for stone Class III (core material) is set to 10.1 EUR/m<sup>3</sup>.

For SLS and RLS repairs the unit prices are increased by 50%. For ULS repair the unit price is increased by 150%.

Downtime costs are set to 18.000 EURO/m breakwater for 1 km breakwater. Downtime costs are included only in case of failure

Construction costs (initial costs) of structure is given as  $C_i = U_{c1} V_1 + U_{c2} V_2 + U_{c3} V_3$ , where U are unit prices for the stone classes.

#### *Recession formulae*

Several formulae for estimation of the berm recession  $R_{ec}$  have been applied in the analyses.

Sigurdarson et al. (2007)

$$R_{ec} / D_1 = 0.037 (H_o T_o - S_c)^{1.34}, \quad R_{ec} / D_1 = 0 \text{ for } H_o T_o < S_c$$

(1)

with  $\mu(S_c) = 20$  and  $\sigma(S_c) = 20$ , both assumed Normally distributed

$$H_o = \frac{H_s}{\Delta D_1}$$

$$T_o = T_m \left( \frac{g}{D_1} \right)^{0.5} = 0.8 T_p \left( \frac{g}{D_1} \right)^{0.5} = 0.8 \left( \frac{2\pi H_s}{g s_{op}} \right)^{0.5} \left( \frac{g}{D_1} \right)^{0.5} = 0.8 \left( \frac{2\pi H_s}{s_{op} D_1} \right)^{0.5}$$

The only input parameters are wave height  $H_s$ , wave period  $T_m$ , rock and water mass densities,  $\rho_s$  and  $\rho_w$ , and  $D_1$ . The cross section geometrical parameters such as berm width, berm height, water depth and front slope are not included.  $D_1$  is the only geometrical parameter.

The formula is fitted to model tests with berm breakwaters with the berm crest level some metres above SWL. The data set contains values of  $R_{ec}/D_{n50}$  up to 33 and  $H_o T_o$  up to 170. The scatter of the data is very large as can be seen from the standard deviation of  $S_c$ .

Sigurdarson et al. (2008)

$$R_{ec} / D_1 = 0.032 (H_o T_{op} - S_c)^{1.5} \quad R_{ec} / D_1 = 0 \text{ for } H_o T_o < S_c \quad H_o T_{op} < 70$$

(2)

$\mu(S_c) = 35$  and  $\sigma(S_c) = 5$ , both assumed Normally distributed

The formula is calibrated to be valid for the Icelandic type of berm breakwaters with front slope 1:1.5 and

$R_{ec} / D_1 < 5$ . In the data set maximum  $H_o$  is 2.8 and maximum  $H_o T_{op}$  is 65.

Sigurdarson and Van der Meer (2013)

$$Rec_{av}/D_1 = 1.6 (H_o - 1)^{2.5} \quad Rec_{av}/D_1 = 0 \text{ for } H_o < 1$$

(3)

The formula is fitted to data with maximum  $H_o = 3$  and  $R_{ec} / D_{n50} < 14$ . The formula is a simplification of the formula (2). No scatter is given, but in the simulations an estimated standard deviation of  $\sigma = 0.3$  is used. This might be on the unsafe side as the scatter is large, partly because the formula is fitted to model tests in which the front slope in the initial profiles vary between 1: 1.3 and 1:1.5. A steeper front slope gives a larger  $Rec$  although the S-profile remains the same.

A more precise formula for the estimation of  $R_{ec}$  is given by Lykke Andersen and Burcharth (2010), updated in Lykke Andersen et al. (2014). The formula is fitted to all available data for mass berm breakwaters and Icelandic type berm breakwaters. Besides  $D_1$  it contains the following important geometrical parameters: Water depth  $h$ , height of berm  $h_b$  above SWL, front slope angle  $\alpha$ , angle of

incidence  $\beta$  of the waves. The other parameters are significant wave height  $H_s$ , wave period and wave steepness, number of waves  $N$ , and mass density of rock and water.

Applied to the berm breakwater geometry, shown in Fig. 2, the formula simplifies for perpendicular waves to

$$\frac{Rec}{D_{n50}} = A \left[ \frac{2.2 \cdot h^* - 1.2 \cdot h_s}{h^* - h_b} \cdot f_{H0} \cdot f_N - \frac{0.225(h^* - h_b)}{D1} \right] + B \quad (4)$$

$$\mu(A)=1 \quad , \quad \sigma(A)=0.15 \quad \quad \mu(B)=0 \quad , \quad \sigma(B)=1.4, \quad \text{Normally distributed}$$

$$H_0 = \frac{H_{m0}}{\Delta \cdot D1}$$

$$T_0 = \sqrt{\frac{g}{D_{n,50}}} \cdot T_{0,1}$$

$$f_{H0} = \min \begin{cases} -4.7 \cdot 10^{-5} (H_0 \sqrt{T_0})^4 + 1.6 \cdot 10^{-3} (H_0 \sqrt{T_0})^3 + 2.2 \cdot 10^{-2} (H_0 \sqrt{T_0})^2 + 3.8 \cdot 10^{-2} H_0 \sqrt{T_0} \\ 0.429 \cdot H_0 \sqrt{T_0} + 12.0 \end{cases}$$

$$h^* = \min \left( h ; \sqrt{4.44 f_{H0} \cdot f_N \cdot D1 \cdot [1.2 h_s - 2.2 h_b] + h_b^2} \right)$$

$$h_b = -0.65 \cdot H_{m0}$$

$$h_s = \min \begin{cases} 0.65 \cdot H_{m0} \cdot s_{0m}^{-0.3} \cdot f_N \\ h \end{cases}$$

$$f_N = \left( \frac{N}{3000} \right)^\varphi \quad \varphi = \begin{cases} 0.30 & \text{for } H_0 \sqrt{T_0} \leq 24 \\ 0.64 - 0.0143 H_0 \sqrt{T_0} & \text{for } 24 > H_0 \sqrt{T_0} > 40 \\ 0.07 & \text{for } H_0 \sqrt{T_0} \geq 40 \end{cases}$$

The formulae (1), (2), (3) and (4) predict quite different recession especially for high values of  $H_o$ . However, because the formulae 2 and 3 are valid only for  $H_o < \text{app. } 2.8$ , a comparison should be restricted to the lower  $H_o$  values.

Moreover, formula (4) predicts much less recession than the other formulae. As a result, formula (4) gives economical optimum designs with smaller rock sizes than the other formulae, cf. the tables with optimization results given in Appendix B2.

A significant difference between the formulae is that as opposed to formula (4), the formulae (1), (2) and (3) do not contain any parameter signifying the water depth. The validity of the formulae in shallow water is therefore unknown. However, an indication of the importance of the water depth is

seen from the simulations in that for shallow water conditions the formulae (1), (2) and (3) predict almost the same optimum design conditions in terms of  $H_o$  and D1 whereas formula (4), which includes water depth, predicts larger optimum  $H_o$  values and smaller D1 values and also lower lifetime costs. In deep water conditions all formulae predict almost identical optimum design conditions but formula (4) predicts lower lifetime costs.

#### 4. Formulation of total cost functions

See Appendix A1, Chapter 4.

#### 5. Characteristics of design variables in stochastic modelling

As to wave modelling see Appendix A1. Data for the other variables are given in Chapter 3 section on recession formulae.

##### Case studies

Cost optimization analyses are made for structures in 11 m and 20 m water depths. Table 3 gives an overview of the case study simulations. In each case study are identified the service lifetime costs of the berm breakwaters cross sections designed deterministically for  $H_s$  values corresponding to return periods  $T = 5, 25, 50, 100, 200,$  and  $400$  years, and  $H_o = N_s$ - values of 1.8, 2.0, 2.4, 2.8 and 3.2.

The deep water wave steepness is set to  $s_{op} = 0.035$  ( $s_{om} = 0.0484$ ) and the mass density of the stones to  $2.70 \text{ t/m}^3$ . Interest rate including inflation is 5% p.a. Structure service lifetime is 50 years. Downtime costs are set to 18.000 EURO/m breakwater for 1 km breakwater.

The raw data sheets for the simulations are given in Appendix B2.

Table 3. Case studies

Case study	Water depth (m)	Waves (see Table 11.1)	Formula
1.1	11	Follonica	Sigurdarson et al. (2007)
1.2	-	-	Sigurdarson et al. (2008)
1.3	-	-	Sigurdarson et al. (2013)
1.4	-	-	Lykke Andersen et al. (2014)
2.1	20	Baltic Sea	Sigurdarson et al. (2007)
2.2	-	-	Sigurdarson et al. (2008)
2,3	-	-	Sigurdarson et al. (2013)
2.4	-	-	Lykke Andersen et al. (2014)

## Appendix B2 Raw data sheets for the optimizations analyses of berm breakwaters

In the tables the following notation is used:

HSY =  $H_s^{T(\text{years})}$ , HOD =  $H_o$ , D1 = D1, CR1 = costs of R1, CR2 = costs of R2, CFL = costs of FL, CTOT = total lifetime costs. PR1, PR2 and PFL = Probability of R1, R2 and FL within 50 years lifetime of the structure, respectively. The lines correspond to wave return periods T = 5, 25, 50, 100, 200,400 and 1000 years.

CASE 1.1

Sigurdsson et al. 2007 E(SC)= 20.00 S(SC)= 20.00

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	1.80	1.48	9909.	442.	0.	0.
10352.	0.69770	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	1.80	1.73	12403.	60.	0.	0.
12463.	0.07070	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	13513.	25.	0.	0.
13538.	0.02890	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	1.80	1.92	14659.	7.	0.	0.
14666.	0.00680	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	1.80	2.02	15844.	0.	0.	0.
15844.	0.00030	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	1.80	2.11	17070.	0.	0.	0.
17070.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	1.80	2.23	18756.	0.	0.	0.
18756.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.00	1.33	9437.	850.	0.	80.
10366.	1.40440	0.00000	0.00630				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.00	1.55	11762.	158.	0.	0.
11920.	0.18320	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	12796.	73.	0.	0.
12869.	0.07720	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.00	1.73	13863.	33.	0.	0.
13895.	0.02990	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.00	1.82	14965.	13.	0.	0.
14978.	0.01000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.00	1.90	16105.	2.	0.	0.
16107.	0.00150	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.00	2.01	17671.	0.	0.	0.
17671.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.40	1.11	8716.	2593.	0.	1098.
12406.	4.62100	0.00000	0.08990				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.40	1.29	10786.	642.	0.	0.
11427.	0.79800	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	11704.	338.	0.	0.
12042.	0.37400	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.40	1.44	12651.	170.	0.	0.
12821.	0.17210	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.40	1.51	13628.	89.	0.	0.
13718.	0.08270	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.40	1.58	14638.	45.	0.	0.
14683.	0.03560	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.40	1.68	16024.	9.	0.	0.
16033.	0.00770	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.80	0.95	8186.	5695.	0.	3888.
17769.	10.83380	0.00000	0.33100				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.80	1.11	10071.	1697.	0.	201.
11969.	2.24180	0.00000	0.01530				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	10906.	1004.	0.	0.
11910.	1.17550	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.80	1.24	11766.	579.	0.	0.
12345.	0.61290	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.80	1.30	12653.	336.	0.	0.
12988.	0.31470	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.80	1.36	13568.	182.	0.	0.
13750.	0.15860	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.80	1.44	14824.	88.	0.	0.
14912.	0.06740	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	3.20	0.83	7778.	10627.	0.	9723.
28128.	21.52740	0.00000	0.85500				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	3.20	0.97	9521.	3632.	0.	1289.
14443.	5.12890	0.00000	0.09670				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	10292.	2266.	0.	383.
12941.	2.84040	0.00000	0.02750				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	3.20	1.08	11086.	1412.	0.	29.
12527.	1.56350	0.00000	0.00180				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	3.20	1.14	11904.	866.	0.	0.
12770.	0.85570	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	3.20	1.19	12747.	526.	0.	0.
13273.	0.46760	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	3.20	1.26	13904.	273.	0.	0.
14177.	0.21190	0.00000	0.00000				

CASE 1.2

Sigurdsson et al. 2008 E(SC)= 35.00 S(SC)= 5.00

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	1.80	1.48	9909.	43.	0.	0.
9952.	0.06690	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	1.80	1.73	12403.	0.	0.	0.
12403.	0.00010	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	13513.	0.	0.	0.
13513.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	1.80	1.92	14659.	0.	0.	0.
14659.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	1.80	2.02	15844.	0.	0.	0.
15844.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	1.80	2.11	17070.	0.	0.	0.
17070.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	1.80	2.23	18756.	0.	0.	0.
18756.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.00	1.33	9437.	172.	0.	25.
9634.	0.27480	0.00000	0.00190				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.00	1.55	11762.	6.	0.	0.
11768.	0.00720	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	12796.	0.	0.	0.
12797.	0.00020	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.00	1.73	13863.	0.	0.	0.
13863.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.00	1.82	14965.	0.	0.	0.
14965.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.00	1.90	16105.	0.	0.	0.
16105.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.00	2.01	17671.	0.	0.	0.
17671.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.40	1.11	8716.	934.	0.	1850.
11500.	1.58380	0.00000	0.15070				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.40	1.29	10786.	184.	0.	0.
10970.	0.21960	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	11704.	84.	0.	0.
11788.	0.09180	0.00000	0.00000				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.40	1.44	12651.	25.	0.	0.
12676.	0.02490	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.40	1.51	13628.	3.	0.	0.
13632.	0.00330	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.40	1.58	14638.	0.	0.	0.
14638.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.40	1.68	16024.	0.	0.	0.
16024.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.80	0.95	8186.	3182.	0.	8408.
19776.	5.75740	0.00000	0.71060				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.80	1.11	10071.	821.	0.	923.
11815.	1.03300	0.00000	0.06740				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	10906.	483.	0.	154.
11542.	0.52310	0.00000	0.01100				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.80	1.24	11766.	255.	0.	3.
12023.	0.25160	0.00000	0.00020				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.80	1.30	12653.	136.	0.	0.
12788.	0.12920	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.80	1.36	13568.	59.	0.	0.
13627.	0.04820	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.80	1.44	14824.	9.	0.	0.
14833.	0.00710	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	3.20	0.83	7778.	8011.	0.	27080.
42869.	15.26650	0.00000	2.37850				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	3.20	0.97	9521.	2532.	0.	4139.
16191.	3.37590	0.00000	0.31720				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	10292.	1523.	0.	1809.
13624.	1.77200	0.00000	0.13540				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	3.20	1.08	11086.	925.	0.	637.
12648.	0.95830	0.00000	0.04610				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	3.20	1.14	11904.	588.	0.	96.
12587.	0.53090	0.00000	0.00580				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	3.20	1.19	12747.	334.	0.	0.
13082.	0.27990	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	3.20	1.26	13904.	152.	0.	0.
14056.	0.11920	0.00000	0.00000				

CASE 1.3

Sigurdsson et al. 2013 E(A)= 1.00 S(A)= 0.30



HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	1.80	1.48	9909.	93.	0.	9.
10011.	0.14480	0.00000	0.00080				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	1.80	1.73	12403.	2.	0.	0.
12405.	0.00250	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	13513.	0.	0.	0.
13513.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	1.80	1.92	14659.	0.	0.	0.
14659.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	1.80	2.02	15844.	0.	0.	0.
15844.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	1.80	2.11	17070.	0.	0.	0.
17070.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	1.80	2.23	18756.	0.	0.	0.
18756.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.00	1.33	9437.	276.	0.	303.
10016.	0.43180	0.00000	0.02200				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.00	1.55	11762.	28.	0.	0.
11790.	0.03390	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	12796.	7.	0.	0.
12803.	0.00680	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.00	1.73	13863.	0.	0.	0.
13863.	0.00040	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.00	1.82	14965.	0.	0.	0.
14965.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.00	1.90	16105.	0.	0.	0.
16105.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.00	2.01	17671.	0.	0.	0.
17671.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.40	1.11	8716.	1374.	0.	2914.
13003.	2.31650	0.00000	0.24050				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.40	1.29	10786.	310.	0.	152.
11248.	0.35790	0.00000	0.01100				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	11704.	159.	0.	31.
11895.	0.16390	0.00000	0.00170				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.40	1.44	12651.	69.	0.	4.
12724.	0.06550	0.00000	0.00010				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.40	1.51	13628.	24.	0.	0.
13653.	0.02260	0.00000	0.00000				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.40	1.58	14638.	7.	0.	0.
14645.	0.00530	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.40	1.68	16024.	0.	0.	0.
16025.	0.00010	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.80	0.95	8186.	4141.	0.	12835.
25163.	7.48240	0.00000	1.09220				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.80	1.11	10071.	1227.	0.	1956.
13254.	1.52050	0.00000	0.14010				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	10906.	700.	0.	708.
12314.	0.76570	0.00000	0.05030				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.80	1.24	11766.	416.	0.	228.
12410.	0.40260	0.00000	0.01590				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.80	1.30	12653.	223.	0.	43.
12919.	0.19900	0.00000	0.00230				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.80	1.36	13568.	130.	0.	6.
13705.	0.10410	0.00000	0.00020				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.80	1.44	14824.	45.	0.	0.
14870.	0.03170	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	3.20	0.83	7778.	9536.	0.	38241.
55555.	18.19390	0.00000	3.39410				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	3.20	0.97	9521.	3440.	0.	6989.
19949.	4.54500	0.00000	0.54150				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	10292.	2089.	0.	3146.
15528.	2.42330	0.00000	0.23110				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	3.20	1.08	11086.	1341.	0.	1636.
14063.	1.36290	0.00000	0.10930				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	3.20	1.14	11904.	844.	0.	743.
13491.	0.77140	0.00000	0.04900				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	3.20	1.19	12747.	527.	0.	303.
13577.	0.43350	0.00000	0.01770				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	3.20	1.26	13904.	278.	0.	61.
14244.	0.20210	0.00000	0.00300				

#### CASE 1.4

Lykke Andersen et al. 2014      E(A)= 1.00      S(A)= 0.15      E(B)= 0.00      S(B)= 1.40

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	1.80	1.48	9909.	8.	0.	0.
9917.	0.01330	0.00000	0.00000				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	1.80	1.73	12403.	3.	0.	0.
12405. 0.00270 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	13513.	1.	0.	0.
13514. 0.00050 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	1.80	1.92	14659.	0.	0.	0.
14659. 0.00020 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	1.80	2.02	15844.	0.	0.	0.
15844. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	1.80	2.11	17070.	0.	0.	0.
17070. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	1.80	2.23	18756.	0.	0.	0.
18756. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.00	1.33	9437.	13.	0.	0.
9450. 0.02350 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.00	1.55	11762.	1.	0.	0.
11763. 0.00120 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	12796.	0.	0.	0.
12796. 0.00040 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.00	1.73	13863.	0.	0.	0.
13863. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.00	1.82	14965.	0.	0.	0.
14965. 0.00010 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.00	1.90	16105.	0.	0.	0.
16105. 0.00010 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.00	2.01	17671.	0.	0.	0.
17671. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.40	1.11	8716.	80.	0.	0.
8795. 0.15170 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.40	1.29	10786.	3.	0.	0.
10788. 0.00420 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	11704.	2.	0.	0.
11707. 0.00230 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.40	1.44	12651.	0.	0.	0.
12651. 0.00060 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.40	1.51	13628.	0.	0.	0.
13628. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.40	1.58	14638.	0.	0.	0.
14638. 0.00000 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.40	1.68	16024.	0.	0.	0.
16024. 0.00000 0.00000 0.00000							

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	2.80	0.95	8186.	365.	0.	0.
8551.	0.73760	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	2.80	1.11	10071.	34.	0.	0.
10105.	0.04910	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	10906.	7.	0.	0.
10913.	0.01010	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	2.80	1.24	11766.	1.	0.	0.
11767.	0.00200	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	2.80	1.30	12653.	1.	0.	0.
12654.	0.00110	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	2.80	1.36	13568.	0.	0.	0.
13568.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	2.80	1.44	14824.	0.	0.	0.
14824.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.35	3.20	0.83	7778.	1175.	0.	17.
8970.	2.50830	0.00000	0.00230				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.07	3.20	0.97	9521.	146.	0.	0.
9667.	0.22250	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	10292.	51.	0.	0.
10344.	0.06990	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.64	3.20	1.08	11086.	20.	0.	0.
11106.	0.02210	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.92	3.20	1.14	11904.	4.	0.	0.
11908.	0.00460	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.20	3.20	1.19	12747.	0.	0.	0.
12748.	0.00060	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.56	3.20	1.26	13904.	0.	0.	0.
13904.	0.00020	0.00000	0.00000				

#### CASE 2.1

Sigurdsson et al. 2007  $E(SC) = 20.00$   $S(SC) = 20.00$

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	1.80	1.21	14633.	697.	144.	4890.
20365.	1.64230	0.29030	0.45530				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	1.80	1.61	19399.	325.	64.	1320.
21108.	0.36890	0.06160	0.08810				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	22645.	221.	45.	794.
23704.	0.18270	0.03080	0.04480				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	1.80	2.07	26852.	148.	31.	332.
27363.	0.08950	0.01640	0.01510				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	1.80	2.35	32239.	94.	19.	137.
32489. 0.04050 0.00720 0.00550							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	1.80	2.64	39010.	65.	0.	0.
39075. 0.02280 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	1.80	3.07	49232.	32.	0.	0.
49264. 0.00740 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.00	1.09	14288.	945.	74.	6689.
21996. 2.35640 0.17710 0.63760							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.00	1.45	18759.	414.	33.	1782.
20988. 0.50480 0.03680 0.12070							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	21790.	285.	20.	957.
23052. 0.25070 0.01570 0.05690							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.00	1.87	25708.	207.	15.	616.
26546. 0.13530 0.00990 0.02720							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.00	2.11	30714.	133.	10.	321.
31178. 0.06420 0.00450 0.01170							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.00	2.38	37020.	92.	0.	50.
37163. 0.03030 0.00000 0.00170							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.00	2.76	46540.	50.	0.	0.
46590. 0.01140 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.40	0.91	13764.	1610.	20.	11111.
26504. 4.46270 0.06120 1.09790							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.40	1.20	17786.	686.	7.	3101.
21580. 0.91280 0.01040 0.23170							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	20489.	467.	5.	1723.
22684. 0.46770 0.00500 0.10630							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.40	1.56	23967.	328.	5.	931.
25231. 0.23250 0.00310 0.04800							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.40	1.76	28392.	231.	2.	466.
29091. 0.12000 0.00150 0.02020							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.40	1.98	33971.	152.	0.	267.
34391. 0.06060 0.00000 0.00820							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.40	2.30	42435.	105.	0.	0.
42540. 0.02840 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.80	0.78	13382.	2719.	5.	17112.
33218. 8.23870 0.02130 1.75910							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.80	1.03	17076.	1016.	2.	4817.
22912. 1.47580 0.00410 0.36820							

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	19540.	729.	2.	2845.
23116.	0.76580	0.00220	0.18540				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.80	1.33	22694.	505.	1.	1466.
24666.	0.38170	0.00120	0.07930				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.80	1.51	26695.	350.	1.	923.
27968.	0.19690	0.00070	0.03920				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.80	1.70	31723.	250.	0.	509.
32482.	0.10170	0.00000	0.01830				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.80	1.97	39428.	133.	0.	112.
39673.	0.04090	0.00000	0.00390				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	3.20	0.68	13089.	4738.	2.	25024.
42853.	15.84970	0.00890	2.63140				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	3.20	0.90	16531.	1465.	1.	7037.
25034.	2.28110	0.00190	0.57430				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	18810.	1021.	0.	4094.
23926.	1.14420	0.00080	0.28080				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	3.20	1.17	21717.	715.	1.	2211.
24643.	0.58560	0.00070	0.12880				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	3.20	1.32	25390.	494.	1.	1384.
27269.	0.30260	0.00030	0.06410				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	3.20	1.49	29994.	352.	0.	741.
31087.	0.15700	0.00000	0.02860				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	3.20	1.73	37113.	232.	0.	388.
37732.	0.07000	0.00000	0.01220				

CASE 2.2

Sigurdsson et al. 2008 E(SC)= 35.00 S(SC)= 5.00

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	1.80	1.21	14633.	287.	142.	4832.
19894.	0.64120	0.28070	0.44700				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	1.80	1.61	19399.	128.	63.	1343.
20932.	0.14200	0.06240	0.08690				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	22645.	87.	40.	800.
23571.	0.07170	0.02910	0.04330				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	1.80	2.07	26852.	56.	27.	284.
27219.	0.03440	0.01460	0.01450				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	1.80	2.35	32239.	50.	28.	109.
32426.	0.02090	0.01110	0.00390				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	1.80	2.64	39010.	28.	0.	0.
39038.	0.00950	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	1.80	3.07	49232.	0.	0.	0.
49232.	0.00010	0.00000	0.00000				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.00	1.09	14288.	422.	36.	7228.
21974.	0.99960	0.08380	0.68860				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.00	1.45	18759.	191.	17.	2053.
21020.	0.22500	0.01980	0.14170				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	21790.	118.	8.	1042.
22958.	0.10600	0.00830	0.05990				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.00	1.87	25708.	91.	9.	590.
26397.	0.05640	0.00590	0.03010				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.00	2.11	30714.	56.	4.	329.
31103.	0.02530	0.00190	0.01150				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.00	2.38	37020.	54.	0.	32.
37106.	0.01670	0.00000	0.00080				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.00	2.76	46540.	9.	0.	0.
46549.	0.00270	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.40	0.91	13764.	869.	0.	14234.
28867.	2.29000	0.00000	1.41080				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.40	1.20	17786.	381.	0.	3874.
22040.	0.48930	0.00000	0.28780				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	20489.	258.	0.	2248.
22996.	0.24300	0.00000	0.14050				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.40	1.56	23967.	176.	0.	1296.
25439.	0.12060	0.00000	0.06920				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.40	1.76	28392.	128.	0.	665.
29185.	0.06350	0.00000	0.02690				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.40	1.98	33971.	83.	0.	402.
34456.	0.03130	0.00000	0.01300				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.40	2.30	42435.	72.	0.	11.
42518.	0.01880	0.00000	0.00040				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.80	0.78	13382.	1617.	0.	25307.
40305.	4.65960	0.00000	2.60420				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.80	1.03	17076.	688.	0.	7330.
25094.	0.96030	0.00000	0.55670				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	19540.	473.	0.	4021.
24034.	0.47510	0.00000	0.26910				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.80	1.33	22694.	336.	0.	2453.
25484.	0.23850	0.00000	0.13080				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.80	1.51	26695.	228.	0.	1256.
28178.	0.12580	0.00000	0.05590				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.80	1.70	31723.	146.	0.	892.
32761.	0.05990	0.00000	0.02930				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.80	1.97	39428.	99.	0.	365.
39892.	0.02450	0.00000	0.00970				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	3.20	0.68	13089.	3088.	0.	40750.
56927.	9.66940	0.00000	4.31880				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	3.20	0.90	16531.	1106.	0.	11525.
29162.	1.64970	0.00000	0.93170				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	18810.	768.	0.	6516.
26094.	0.83050	0.00000	0.45570				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	3.20	1.17	21717.	545.	0.	3986.
26248.	0.42890	0.00000	0.22940				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	3.20	1.32	25390.	362.	0.	2202.
27954.	0.21150	0.00000	0.10490				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	3.20	1.49	29994.	256.	0.	1364.
31614.	0.11550	0.00000	0.05200				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	3.20	1.73	37113.	177.	0.	615.
37904.	0.05130	0.00000	0.01840				

### CASE 2.3

Sigurdsson et al. 2013  $E(A) = 1.00$   $S(A) = 0.30$

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	1.80	1.21	14633.	358.	126.	5368.
20485.	0.81290	0.24530	0.50030				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	1.80	1.61	19399.	155.	55.	1538.
21146.	0.17370	0.05480	0.09830				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	22645.	106.	36.	852.
23638.	0.08210	0.02500	0.04590				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	1.80	2.07	26852.	69.	23.	480.
27424.	0.04110	0.01150	0.02140				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	1.80	2.35	32239.	60.	26.	181.
32506.	0.02350	0.00860	0.00600				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	1.80	2.64	39010.	35.	0.	27.
39072.	0.01140	0.00000	0.00050				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	1.80	3.07	49232.	3.	0.	0.
49235.	0.00080	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.00	1.09	14288.	517.	51.	8017.
22873.	1.24080	0.12070	0.76500				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.00	1.45	18759.	239.	22.	2265.
21285.	0.28320	0.02680	0.15550				



HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	21790.	152.	13.	1320.
23275. 0.13180 0.01060 0.07600							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.00	1.87	25708.	108.	12.	678.
26506. 0.06890 0.00720 0.03350							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.00	2.11	30714.	70.	8.	379.
31170. 0.02970 0.00320 0.01380							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.00	2.38	37020.	44.	0.	114.
37178. 0.01510 0.00000 0.00330							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.00	2.76	46540.	22.	0.	0.
46562. 0.00530 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.40	0.91	13764.	1023.	8.	15515.
30309. 2.70250 0.02530 1.55170							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.40	1.20	17786.	440.	3.	4406.
22635. 0.56750 0.00560 0.31910							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	20489.	306.	1.	2519.
23317. 0.29100 0.00230 0.15500							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.40	1.56	23967.	203.	2.	1309.
25480. 0.13950 0.00140 0.06700							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.40	1.76	28392.	143.	1.	770.
29305. 0.07120 0.00040 0.03110							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.40	1.98	33971.	96.	0.	483.
34550. 0.03570 0.00000 0.01710							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.40	2.30	42435.	70.	0.	90.
42596. 0.01780 0.00000 0.00230							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.80	0.78	13382.	1922.	2.	27839.
43145. 5.61340 0.00750 2.84520							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.80	1.03	17076.	759.	0.	7618.
25454. 1.05770 0.00100 0.59060							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	19540.	524.	0.	4501.
24565. 0.53800 0.00030 0.30180							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.80	1.33	22694.	373.	0.	2567.
25634. 0.27450 0.00030 0.13880							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.80	1.51	26695.	274.	0.	1503.
28472. 0.14370 0.00030 0.06590							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.80	1.70	31723.	181.	0.	820.
32724. 0.07480 0.00000 0.02960							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.80	1.97	39428.	125.	0.	336.
39889. 0.03180 0.00000 0.01030							

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	3.20	0.68	13089.	4050.	1.	46255.
63395.	12.93500	0.00460	4.83850				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	3.20	0.90	16531.	1230.	0.	12499.
30261.	1.87150	0.00060	1.01300				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	18810.	866.	0.	7474.
27150.	0.93940	0.00030	0.51140				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	3.20	1.17	21717.	605.	0.	4444.
26765.	0.48130	0.00000	0.25070				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	3.20	1.32	25390.	417.	0.	2579.
28386.	0.24050	0.00010	0.11780				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	3.20	1.49	29994.	287.	0.	1658.
31938.	0.12500	0.00000	0.06000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	3.20	1.73	37113.	175.	0.	795.
38083.	0.05300	0.00000	0.02260				

CASE 2.4

Lykke Andersen et al. 2014 E(A)= 1.00 S(A)= 0.15 E(B)= 0.00 S(B)= 1.40

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	1.80	1.21	14633.	179.	268.	1954.
17034.	0.41930	0.54200	0.17850				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	1.80	1.61	19399.	66.	114.	400.
19978.	0.08040	0.11320	0.02720				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	1.80	1.83	22645.	41.	80.	166.
22932.	0.03430	0.05530	0.01020				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	1.80	2.07	26852.	27.	56.	2.
26937.	0.01750	0.02920	0.00010				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	1.80	2.35	32239.	9.	34.	0.
32282.	0.00430	0.01270	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	1.80	2.64	39010.	1.	0.	0.
39011.	0.00050	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	1.80	3.07	49232.	0.	0.	0.
49232.	0.00000	0.00000	0.00000				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.00	1.09	14288.	274.	209.	2716.
17487.	0.65260	0.48340	0.25630				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.00	1.45	18759.	114.	93.	546.
19512.	0.14210	0.10860	0.03570				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.00	1.64	21790.	70.	68.	200.
22129.	0.06430	0.05780	0.01220				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.00	1.87	25708.	47.	47.	12.
25814.	0.03060	0.02920	0.00050				
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.00	2.11	30714.	23.	31.	0.
30768.	0.01040	0.01390	0.00000				

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.00	2.38	37020.	3.	0.	0.
37023. 0.00130 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.00	2.76	46540.	0.	0.	0.
46540. 0.00010 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.40	0.91	13764.	471.	81.	5033.
19349. 1.24070 0.24900 0.49250							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.40	1.20	17786.	234.	50.	900.
18969. 0.30670 0.07570 0.06730							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.40	1.37	20489.	156.	38.	429.
21112. 0.14950 0.04320 0.02640							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.40	1.56	23967.	102.	33.	100.
24202. 0.07320 0.02650 0.00600							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.40	1.76	28392.	55.	24.	3.
28474. 0.02950 0.01380 0.00010							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.40	1.98	33971.	19.	0.	0.
33990. 0.00800 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.40	2.30	42435.	1.	0.	0.
42436. 0.00030 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	2.80	0.78	13382.	780.	23.	7959.
22144. 2.21700 0.09020 0.81520							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	2.80	1.03	17076.	394.	23.	1758.
19251. 0.55300 0.04210 0.13290							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	2.80	1.17	19540.	281.	21.	710.
20551. 0.28450 0.02920 0.04450							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	2.80	1.33	22694.	197.	22.	193.
23107. 0.14240 0.02140 0.00990							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	2.80	1.51	26695.	105.	15.	34.
26849. 0.05950 0.01140 0.00170							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	2.80	1.70	31723.	56.	0.	2.
31781. 0.02430 0.00000 0.00010							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	2.80	1.97	39428.	12.	0.	0.
39440. 0.00410 0.00000 0.00000							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	3.55	3.20	0.68	13089.	1251.	31.	11081.
25452. 3.79410 0.15280 1.15640							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	4.71	3.20	0.90	16531.	621.	21.	2351.
19525. 0.93310 0.04960 0.18840							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	5.36	3.20	1.03	18810.	437.	18.	936.
20202. 0.47910 0.03120 0.06510							

HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.08	3.20	1.17	21717.	306.	20.	240.
22283. 0.24770 0.02470 0.01470							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	6.88	3.20	1.32	25390.	190.	13.	63.
25655. 0.11750 0.01180 0.00230							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	7.75	3.20	1.49	29994.	101.	0.	14.
30109. 0.04720 0.00000 0.00040							
HSY,H0D,D1,CI,CR1,CR2,CFL,CTOT,PR1,PR2,PFL	9.00	3.20	1.73	37113.	43.	0.	0.
37156. 0.01440 0.00000 0.00000							

## **Appendix C1 Background note containing assumptions and formulae applied in optimizations analyses of Accropode armoured breakwaters**

### **1. Objective**

To identify the minimum cost safety levels for rubble mound breakwaters in shallow, moderate and deep water armoured with Accropodes, and to investigate the partial safety factors corresponding to the minimum costs.

The study comprises the influence of the following parameters on the minimum cost safety level:

- Real interest rate
- Service lifetime of the breakwater
- Downtime costs due to malfunction of the breakwaters
- Repair policy
- Damage accumulation

### **2. Procedure in numerical simulations for identification of minimum cost safety levels**

As given in Appendix A1 for conventional rubble mound breakwaters.

### **3. General assumptions**

*Cross section*

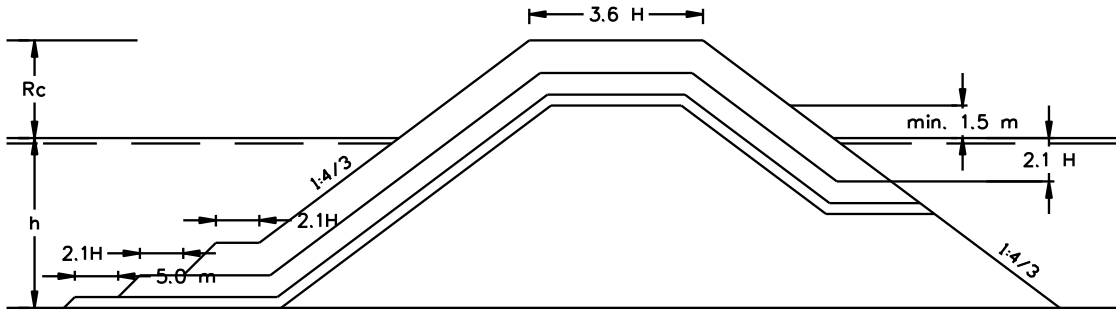


Fig. 1. Typical cross-section without superstructure for Accropode-armoured breakwater

Accropode data:

$$\text{Block height } H, \quad \text{Volume } V_A = 0.34H^3, \quad D_{nA} = V_A^{1/3} = 0.6980H$$

$$\text{Mass } M_A = \rho_A 0.34H^3, \quad \rho_A = 2.40t/m^3$$

Filter 1 (quarry rock)

$$\text{Mass } M_{F1} = \frac{M_A}{15} \sim \frac{M_A}{7} \cong 0.1M_A, \quad \text{Mass density, } \rho_s = 2.65t/m^3$$

$$D_{n50} = \left( \frac{M_{F1}}{\rho_s} \right)^{1/3} = \left( \frac{0.1 \cdot 0.34H^3 \cdot 2.40}{2.65} \right)^{1/3} = 0.314H, \quad t_{F1} = 2D_{n50} = 0.627H$$

Filter 2 (quarry rock)

$$\text{Mass } M_{F2} = 0.1M_{F1} \cong 0.01M_A, \quad \text{Mass density, } \rho_s = 2.65t/m^3$$

$$D_{n50} = \left( \frac{M_{F1}}{\rho_s} \right)^{1/3} = \left( \frac{0.01 \cdot 0.34H^3 \cdot 2.40}{2.65} \right)^{1/3} = 0.146H, \quad t_{F2} = 3D_{n50} = 0.437H$$

*Bulk volumes per meter*

$$\text{Accropode layer } BV_A = 0.9H \left( 5.762H + \frac{10}{3}R_C + \frac{5}{3}h \right)$$

$$\text{Filter 1} \quad BV_{F1} = 0.6269 H \left( 9.547 H + \frac{10}{3} R_C + \frac{5}{3} h \right)$$

$$\text{Filter 2} \quad BV_{F2} = 0.4365 H (5.00(m) + 9.487 H + \frac{10}{3} R_C + \frac{5}{3} h)$$

$$\text{Core} \quad BV_C = \frac{4}{3} (R_C^2 + h^2) - 9.689 H^2 - 2.945 R_C H + \frac{8}{3} R_C h + 0.3273 H h$$

*Free board  $R_C$*

$R_C$  is determined such that the transmitted wave height due to overtopping in a sea with return period equal to structure life time  $T_L$  is 0.50 m

Minimum  $R_C$  is  $1.50m + t_A + t_{F1} + t_{F2} = 1.50m + 1.963H$  due to construction road on top of core.

$$R_C = \max \left( \begin{array}{l} 1.090 H_s^{T_L} - 1.155(m), \min R_C \quad \text{for } s_{op} = 0.02 \\ 0.840 H_s^{T_L} - 1.155(m), \min R_C \quad \text{for } s_{op} = 0.04 \end{array} \right)$$

Note that the freeboards  $R_C$  in all cases are determined by the set minimum level of +1.5 m for the top of the core material to be used as construction road.

Wave steepness  $s_{op} = 0.035$  is used in all simulations. This assure that with armour front slope 1:1.33 the validity range of the applied armour stability formula,  $3.5 < \xi_m < 4.5$  will be respected. If  $s_{op} = 0.02$  ( $s_{om} = 0.02 \cdot 1.5625 = 0.031$ ), then,  $\xi_m = 4.92 > 4.5$ , i.e. a little outside the validity range of the formula..

JONSWAP spectra with peak enhancement factor  $\gamma = 3.3$  are applied.

$$T_m/T_p = 0.8, s_{om}/s_{op} = (T_p/T_m)^2 = (1/0.8)^2, s_{om} = 1.5625 s_{op}$$

*Limit state and repair policy*

Repairs are assumed to take place immediately after the damage limit for repair is exceeded.

Table 1. Repair policy as function of damage levels and limit states

Damage levels/limit state	Estimated $D$	Repair policy
---------------------------	---------------	---------------

Initial	2 %	No repair
Serviceability / SLS (minor damage, only to armor)	5 %	Repair armor
Repairable / RLS (major damage, armor + filter 1)	15 %	Repair armor + filter 1
Ultimate / ULS (failure)	30 %	Repair armor + filter 1 and 2

\*  $D$  is the relative number of displaced units (CEM, 2006)

### *Costs of repair*

$D = 5 \%$ , SLS

$$\text{Cost of repair of minor damage, } C_{R1} = (1+K)DC_{I,armor}R, \quad (1)$$

in which  $C_{I,armor}$  is the initial construction cost of the main armor layer,  $R=3.0$  is a factor signifying high cost of repair, and  $K=0.3$  is a factor signifying mobilization costs. The chosen values of  $R$  and  $K$  are estimates, but can vary considerably from case to case.

$D = 15 \%$ , RLS

$$\text{Cost of repair of major damage, } C_{R2} = (C_{I,armor} + C_{I,filter1} + KC_{I,armor})DR, \quad (2)$$

where  $C_{I,filter1}$  is the initial construction cost of filter 1.

$D = 30 \%$ , ULS

$$\text{Cost of repair after a failure, } C_{R3} = (C_{I,armor} + C_{I,filter1} + C_{I,filter2} + KC_{I,armor})DR, \quad (3)$$

where  $C_{I,filter2}$  is the initial construction cost of filter 2.

### *Downtime costs*

When  $D \geq 15\%$  is added downtime costs given as 200,000 EUR/day in 3 months. The relative short duration of 3 months is justified only for outer breakwaters with no berths along the harbour side of the structure. The downtime costs are related to 1 km length of breakwater.

### Structure length

Calculations performed for a structure length of 1 km and damage is assumed to take place over the whole length of the breakwater.

### Stability formula

The stability formula of Burcharth et al. (1998) is applied

$$N_s = \frac{H_s}{\Delta D_n} = A(D^{0.2} + 7.70) \quad (4)$$

where the mean of  $A$  is 0.46 and the coefficient of variation is  $0.02 + 0.05(1 - D)^6$ .  $D$  is the relative number of units displaced more than distance  $D_n$ .

Valid for:

- Irregular, head-on waves
- Breaking and nonbreaking wave conditions
- One layer of Accropodes on slope 1:1.33 placed in accordance with SOGREAH recommendations on filter layer and conventional quarry rock run
- $3.5 < \xi_m < 4.5$  (minimum stability range)
- No influence of number of waves were found except after start of failure

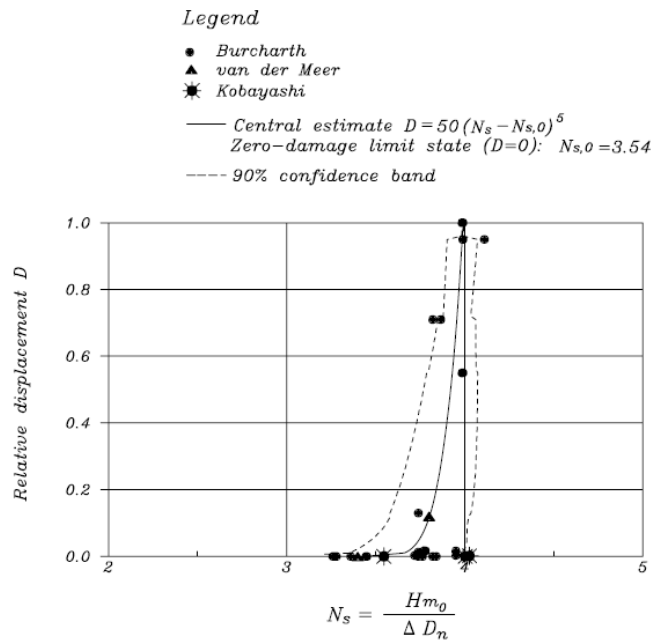


Fig. 2. Stability of Accropode armour on slope 1:1.33. Range for minimum stability,  $\xi_p = 3.5 - 4.5$  corresponding to wave steepness,  $s_{op} = 0.03 - 0.05$ . Burcharth et al. (1998)



### Damage accumulation and calculation

Simulations are performed with and without damage accumulation.

$$D = \left( \frac{N_s}{A} - 7.70 \right)^5 \quad \text{Range of damage, } 0 \leq D \leq 1.0 \quad (5)$$

As the mean value of damage level,  $D$  is greater than 0.0,  $N_s$  should be more 3.542 as shown in Fig. 2. Stability results with and without application of damage accumulation are almost identical.

### 4. Formulation of total cost functions

The optimum design is determined using the optimization problem formulated assuming no rebuilding in case of failure. No benefits, costs related to loss of life and cost of decommissioning at the end of service lifetime are included.

$$\min_T C(T) = C_I(T) + \sum_{t=1}^{T_L} \{ C_{R_1}(T) P_{R_1}(t) + C_{R_2}(T) P_{R_2}(t) + C_F(T) P_F(t) \} \frac{1}{(1+r)^t} \quad (6)$$

where

$T$  return period used for deterministic design

$T_L$  design life time

$C_I(T)$  initial costs (building costs)

$C_{R_1}(T)$  cost of repair for minor damage

$P_{R_1}(T)$  probability of minor damage in year  $t$

$C_{R_2}(T)$  cost of repair for major damage

$P_{R_2}(T)$  probability of major damage in year  $t$

$C_F(T)$  cost of failure including downtime costs

$P_F(T)$  probability of failure in year  $t$

$r$  real rate of interest

## 5. Characteristics of design variables in stochastic model

Limit state function for stability of Accropode armor, slope 1:1.33

$$g = D - \left( \frac{X_{H_s} H_s}{A \Delta D_n} - 7.70 \right)^5 \quad (7)$$

where the parameters are described in Table 2.

Table 2. Parameters of design variables

Variables	Description	Distribution	Expected value	Standard deviation
$D$	critical damage level	see Table 1		
$H_s$	annual maximum significant wave height	Weibull	Various	
$X_{H_s}$	model uncertainty wave height	Normal	1	0.1
$\Delta$	model parameter	Normal	1.341	0.03
$D_n$	armor size	Noraml	various	COV=0.01
$A$	Empirical coefficient	Normal	0.46	COV= $0.02+0.05(1-D)^6$
$H_s^T$	design wave height with return period $T$ years			
$W = \rho D_n^3$	Weight of armor			
$\rho$	armor density	2.40 ton/m <sup>3</sup>		

- Random variables:  $H_s$ ,  $A$ ,  $X_{H_s}$ ,  $\Delta$ ,  $D_n$

## 6. Case studies

Table 3. Case study data

Case	Water depth	Armor density	Wave (see Table 4)	Stability formula	Built-in unit prices core/filter 1/filter 2/armor in EURO/ m <sup>3</sup>
1	10 m	Accropode 2.4 t/m <sup>3</sup>	Follonica	Burcharth (1998)	15/20/30/ 80 or 160*
2	20 m		North sea		
3	20 m		Bilbao		

\* It was used in the costs of repair doubled (i.e. 160) corresponding to the fact that almost twice the number of Accropodes must be replaced due to the interlocking

Table 4. Distribution parameters for  $H_s$  - data samples (PIANC, 1992)

Site	Total number	Average number per year	Weibull		Exp.
	$N$	$\lambda$	$\alpha$	$\beta$	$H_s'$
Follonica	46	5.94	1.14	0.58	2.69
North sea	30	1.88	1.28	1.48	5.70
Bilbao	50	4.17	1.39	1.06	4.90

Weibull distribution

$$\text{Annual maximum wave height } F(H_s) = \left[ 1 - \exp \left( - \left( \frac{H_s - H_s'}{\beta} \right)^\alpha \right) \right]^\lambda \quad (8a)$$

$$T\text{-year maximum wave height } [F(H_s)]^T = F(H_s)^T = \left[ 1 - \exp \left( - \left( \frac{H_s - H_s'}{\beta} \right)^\alpha \right) \right]^{\lambda T} \quad (8b)$$

### *Deterministic design*

Determination of  $D_n$  by formula 
$$N_s = \frac{H_s}{\Delta D_n} = A(D^{0.2} + 7.70) \quad (9)$$

For each  $N_s$  – value of 2.2, 2.5, 2.7 and 2.9,  $H_s$  – values corresponding to return periods  $R = 5, 25, 50, 100, 200$  and 400 years are calculated the  $D_n$  – value, in total 24 values.

$$D_n = \frac{H_s^R}{\Delta N_s} \quad (10)$$

### *Cost optimization*

Fig. 3 shows the flow chart of cost optimization of an Accropode-armored breakwater. First, using the extremal wave height distribution function given by Eq. (8a) a preliminary return period and a stability number are picked up and the corresponding significant wave height and armour diameter are calculated. Then the breakwater is designed according to the conventional deterministic design method and the initial construction cost is calculated. The values of  $A$ ,  $\Delta$ , and  $D_n$  are randomly selected based on their statistical characteristics given in Table 2. These values are assumed to be constant during the lifetime of the breakwater. The designed breakwater is subjected to simulated storm waves over  $T_L$  years. A Poisson distribution with the occurrence rate  $\lambda$  is used to determine the number of storms in each year. For each simulated storm, the damage and corresponding repair and downtime costs are calculated. The costs are accumulated to find the total lifetime cost. The process of  $T_L$ -year cycles is repeated 100,000 times, and the total lifetime costs are added up to yield the expected total cost. This process is repeated for 24 combinations of different return periods and stability numbers. Finally, the significant wave height and armour diameter that yield the minimum total cost are searched.

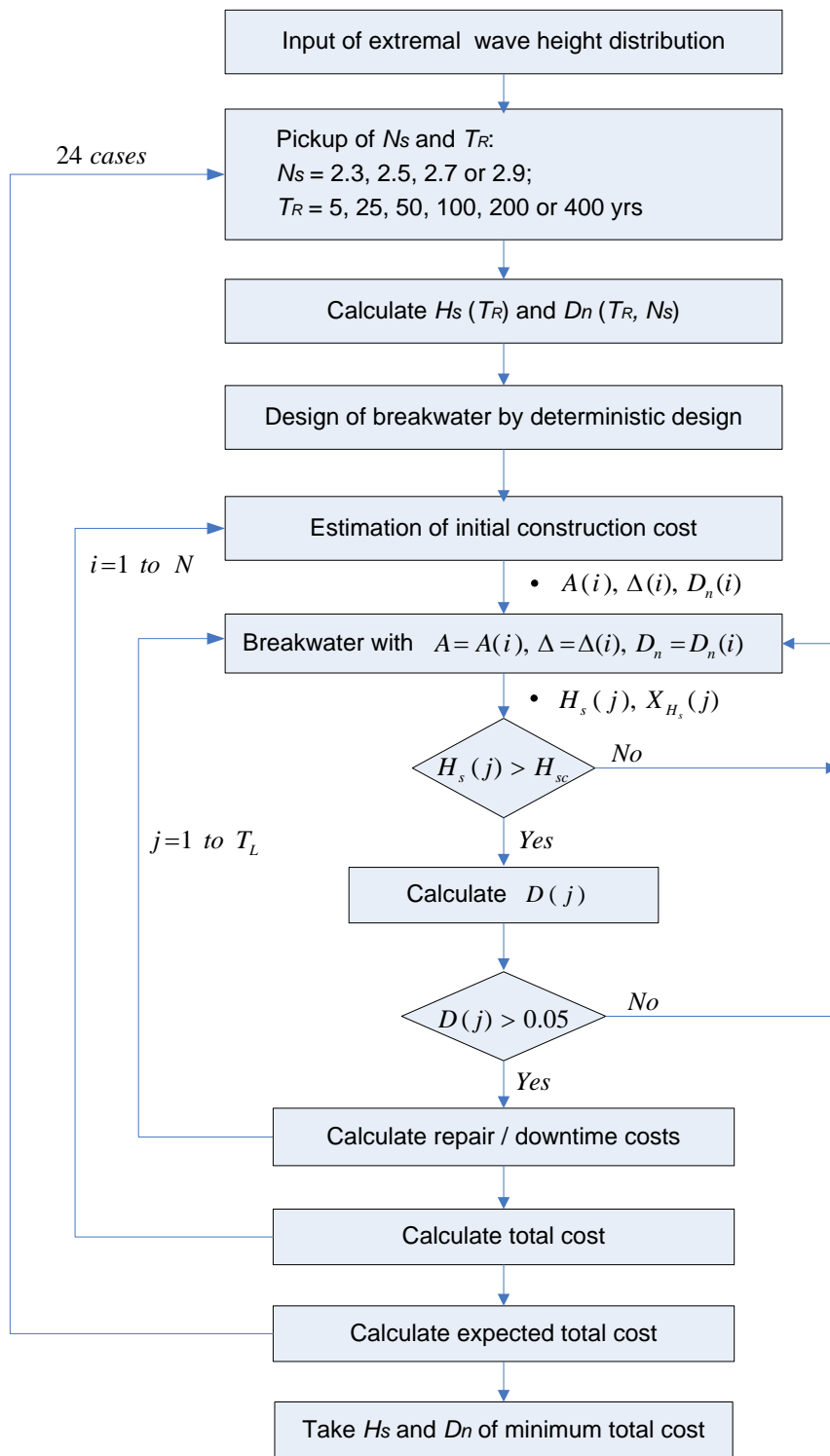


Fig. 3. Flow chart of cost optimization of Accropode armoured breakwater (• denotes random number generation)

## References given in Appendix C1

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**Appendix C2 Raw data sheets for the optimizations analyses of Accropode armoured rubble mound breakwaters**

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	183.	45.	1740.	15617.	0.0092	0.0145	0.0394
5.	4.35	1.296	2.50	11.72	5.22	12417.	559.	114.	6053.	19143.	0.0300	0.0426	0.1481
5.	4.35	1.200	2.70	14.76	4.14	11416.	1311.	255.	15728.	28710.	0.0734	0.1060	0.4135
5.	4.35	1.117	2.90	18.29	3.34	10588.	2783.	502.	36238.	50112.	0.1619	0.2308	1.0184
25.	5.07	1.642	2.30	9.13	10.62	16395.	14.	5.	95.	16508.	0.0006	0.0012	0.0019
25.	5.07	1.510	2.50	11.72	8.27	14817.	62.	17.	528.	15423.	0.0032	0.0050	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	198.	50.	1983.	15770.	0.0103	0.0164	0.0451
25.	5.07	1.302	2.90	18.29	5.30	12485.	508.	111.	5731.	18836.	0.0273	0.0407	0.1388
50.	5.36	1.736	2.30	9.13	12.55	17578.	3.	1.	25.	17608.	0.0002	0.0003	0.0005
50.	5.36	1.597	2.50	11.72	9.77	15849.	26.	7.	165.	16047.	0.0012	0.0019	0.0034
50.	5.36	1.479	2.70	14.76	7.76	14449.	82.	22.	784.	15338.	0.0041	0.0069	0.0170
50.	5.36	1.377	2.90	18.29	6.26	13297.	245.	55.	2467.	16063.	0.0127	0.0185	0.0568
100.	5.64	1.828	2.30	9.13	14.66	18777.	1.	1.	5.	18783.	0.0000	0.0001	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	9.	3.	50.	16956.	0.0004	0.0007	0.0010
100.	5.64	1.557	2.70	14.76	9.06	15371.	40.	10.	301.	15722.	0.0019	0.0029	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	114.	30.	1113.	15375.	0.0059	0.0093	0.0245
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	0.	0.	19998.	0.0000	0.0000	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	2.	1.	18.	17977.	0.0001	0.0003	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	13.	4.	107.	16431.	0.0006	0.0011	0.0021
200.	5.92	1.522	2.90	18.29	8.46	14951.	54.	14.	471.	15491.	0.0027	0.0043	0.0099
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	0.	0.	21239.	0.0000	0.0000	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	0.	3.	19041.	0.0001	0.0001	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	5.	2.	48.	17314.	0.0002	0.0005	0.0009
400.	6.20	1.593	2.90	18.29	9.70	15798.	23.	7.	176.	16003.	0.0011	0.0019	0.0036

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS NO DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	451.	182.	6866.	56567.	0.0110	0.0169	0.0525
5.	8.43	2.514	2.50	11.72	38.12	44559.	1242.	477.	21179.	67456.	0.0334	0.0489	0.1788
5.	8.43	2.328	2.70	14.76	30.26	40899.	2661.	982.	50962.	95504.	0.0776	0.1133	0.4731
5.	8.43	2.167	2.90	18.29	24.42	37878.	5269.	1772.	108055.	152974.	0.1647	0.2275	1.0943
25.	9.93	3.220	2.30	9.13	80.12	59955.	40.	18.	389.	60402.	0.0008	0.0013	0.0025
25.	9.93	2.962	2.50	11.72	62.39	54061.	148.	63.	1959.	56231.	0.0034	0.0052	0.0138
25.	9.93	2.743	2.70	14.76	49.52	49291.	410.	183.	6255.	56139.	0.0100	0.0166	0.0476
25.	9.93	2.554	2.90	18.29	39.97	45366.	1046.	383.	16778.	63573.	0.0277	0.0386	0.1400
50.	10.52	3.411	2.30	9.13	95.26	64539.	14.	7.	102.	64662.	0.0003	0.0005	0.0006
50.	10.52	3.138	2.50	11.72	74.18	58052.	75.	31.	714.	58873.	0.0015	0.0022	0.0046
50.	10.52	2.906	2.70	14.76	58.88	52810.	202.	91.	2732.	55835.	0.0047	0.0074	0.0195
50.	10.52	2.705	2.90	18.29	47.52	48500.	519.	207.	7710.	56935.	0.0129	0.0189	0.0605
100.	11.09	3.595	2.30	9.13	111.54	69121.	8.	3.	52.	69183.	0.0001	0.0001	0.0003
100.	11.09	3.308	2.50	11.72	86.86	62039.	22.	14.	210.	62285.	0.0004	0.0009	0.0013
100.	11.09	3.063	2.70	14.76	68.95	56321.	89.	43.	1167.	57620.	0.0020	0.0033	0.0077
100.	11.09	2.851	2.90	18.29	55.65	51624.	276.	115.	3908.	55923.	0.0064	0.0097	0.0280
200.	11.64	3.774	2.30	9.13	129.01	73721.	2.	1.	4.	73728.	0.0000	0.0001	0.0000
200.	11.64	3.472	2.50	11.72	100.46	66037.	9.	4.	94.	66145.	0.0002	0.0003	0.0005
200.	11.64	3.215	2.70	14.76	79.75	59839.	37.	18.	375.	60269.	0.0008	0.0013	0.0024
200.	11.64	2.993	2.90	18.29	64.36	54751.	127.	57.	1569.	56503.	0.0029	0.0045	0.0108
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	0.	0.	78348.	0.0000	0.0000	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	6.	1.	28.	70091.	0.0001	0.0001	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	16.	7.	175.	63570.	0.0003	0.0005	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	70.	32.	773.	58764.	0.0014	0.0023	0.0051



SERIES 23 BILBAO WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	99.	36.	793.	42011.	0.0029	0.0043	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	420.	160.	4236.	42383.	0.0131	0.0209	0.0469
5.	7.21	1.991	2.70	14.76	18.94	34705.	1332.	477.	16308.	52822.	0.0454	0.0701	0.1954
5.	7.21	1.854	2.90	18.29	15.28	32336.	3765.	1245.	49643.	86989.	0.1359	0.2024	0.6365
25.	8.09	2.623	2.30	9.13	43.31	46785.	8.	4.	59.	46856.	0.0002	0.0004	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	53.	21.	442.	43077.	0.0015	0.0024	0.0043
25.	8.09	2.234	2.70	14.76	26.77	39132.	197.	83.	2103.	41514.	0.0060	0.0105	0.0221
25.	8.09	2.080	2.90	18.29	21.61	36298.	721.	269.	7813.	45102.	0.0236	0.0374	0.0884
50.	8.43	2.733	2.30	9.13	49.02	49092.	2.	1.	16.	49112.	0.0000	0.0001	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	21.	8.	127.	44736.	0.0006	0.0009	0.0012
50.	8.43	2.329	2.70	14.76	30.30	40918.	89.	42.	949.	41997.	0.0027	0.0050	0.0093
50.	8.43	2.168	2.90	18.29	24.45	37895.	350.	142.	3706.	42093.	0.0110	0.0184	0.0404
100.	8.76	2.839	2.30	9.13	54.93	51359.	3.	1.	6.	51369.	0.0001	0.0001	0.0000
100.	8.76	2.612	2.50	11.72	42.78	46561.	7.	5.	64.	46638.	0.0002	0.0005	0.0005
100.	8.76	2.419	2.70	14.76	33.96	42669.	45.	22.	419.	43155.	0.0013	0.0024	0.0041
100.	8.76	2.252	2.90	18.29	27.41	39459.	180.	76.	1781.	41496.	0.0056	0.0092	0.0186
200.	9.08	2.941	2.30	9.13	61.08	53598.	1.	0.	3.	53603.	0.0000	0.0000	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	1.	2.	19.	48538.	0.0000	0.0002	0.0002
200.	9.08	2.506	2.70	14.76	37.76	44397.	25.	11.	155.	44589.	0.0007	0.0011	0.0015
200.	9.08	2.333	2.90	18.29	30.47	41002.	94.	42.	857.	41995.	0.0027	0.0048	0.0084
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	0.	0.	55819.	0.0000	0.0000	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	2.	1.	2.	50459.	0.0001	0.0001	0.0000
400.	9.38	2.590	2.70	14.76	41.70	46108.	9.	6.	82.	46205.	0.0003	0.0005	0.0008
400.	9.38	2.411	2.90	18.29	33.66	42529.	56.	20.	403.	43008.	0.0016	0.0023	0.0038

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02													
TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	190.	110.	1816.	15765.	0.0097	0.0419	0.0409
5.	4.35	1.296	2.50	11.72	5.22	12417.	514.	181.	5966.	19079.	0.0278	0.0747	0.1456
5.	4.35	1.200	2.70	14.76	4.14	11416.	1308.	327.	16024.	29075.	0.0738	0.1447	0.4222
5.	4.35	1.117	2.90	18.29	3.34	10588.	2804.	585.	35889.	49867.	0.1633	0.2805	1.0101
25.	5.07	1.642	2.30	9.13	10.62	16395.	16.	103.	112.	16626.	0.0008	0.0345	0.0021
25.	5.07	1.510	2.50	11.72	8.27	14817.	62.	104.	540.	15523.	0.0030	0.0376	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	198.	108.	2045.	15890.	0.0103	0.0413	0.0466
25.	5.07	1.302	2.90	18.29	5.30	12485.	516.	193.	5521.	18714.	0.0277	0.0788	0.1351
50.	5.36	1.736	2.30	9.13	12.55	17578.	3.	92.	23.	17695.	0.0001	0.0294	0.0004
50.	5.36	1.597	2.50	11.72	9.77	15849.	19.	127.	198.	16193.	0.0009	0.0438	0.0040
50.	5.36	1.479	2.70	14.76	7.76	14449.	83.	126.	821.	15480.	0.0042	0.0454	0.0176
50.	5.36	1.377	2.90	18.29	6.26	13297.	245.	132.	2523.	16197.	0.0127	0.0509	0.0584
100.	5.64	1.828	2.30	9.13	14.66	18777.	1.	98.	7.	18882.	0.0000	0.0280	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	9.	120.	53.	17076.	0.0004	0.0376	0.0011
100.	5.64	1.557	2.70	14.76	9.06	15371.	33.	75.	296.	15776.	0.0016	0.0260	0.0060
100.	5.64	1.450	2.90	18.29	7.31	14118.	124.	87.	1128.	15459.	0.0064	0.0327	0.0248
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	98.	3.	20097.	0.0000	0.0279	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	3.	76.	17.	18052.	0.0001	0.0226	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	12.	109.	120.	16549.	0.0006	0.0366	0.0024
200.	5.92	1.522	2.90	18.29	8.46	14951.	56.	77.	459.	15543.	0.0027	0.0278	0.0098
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	160.	0.	21398.	0.0000	0.0382	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	95.	6.	19137.	0.0000	0.0273	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	4.	107.	33.	17401.	0.0002	0.0307	0.0007
400.	6.20	1.593	2.90	18.29	9.70	15798.	28.	80.	186.	16091.	0.0013	0.0280	0.0037

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	462.	272.	7068.	56871.	0.0113	0.0275	0.0537
5.	8.43	2.514	2.50	11.72	38.12	44559.	1204.	544.	20888.	67194.	0.0326	0.0582	0.1772
5.	8.43	2.328	2.70	14.76	30.26	40899.	2783.	1071.	51355.	96108.	0.0810	0.1273	0.4793
5.	8.43	2.167	2.90	18.29	24.42	37878.	5386.	1911.	108359.	153533.	0.1676	0.2502	1.0972
25.	9.93	3.220	2.30	9.13	80.12	59955.	49.	107.	434.	60546.	0.0010	0.0097	0.0028
25.	9.93	2.962	2.50	11.72	62.39	54061.	156.	158.	1906.	56280.	0.0036	0.0148	0.0135
25.	9.93	2.743	2.70	14.76	49.52	49291.	452.	265.	6644.	56652.	0.0111	0.0257	0.0500
25.	9.93	2.554	2.90	18.29	39.97	45366.	1048.	471.	17219.	64104.	0.0278	0.0503	0.1438
50.	10.52	3.411	2.30	9.13	95.26	64539.	13.	76.	132.	64761.	0.0003	0.0065	0.0007
50.	10.52	3.138	2.50	11.72	74.18	58052.	62.	106.	681.	58901.	0.0013	0.0102	0.0045
50.	10.52	2.906	2.70	14.76	58.88	52810.	218.	181.	2773.	55982.	0.0050	0.0170	0.0197
50.	10.52	2.705	2.90	18.29	47.52	48500.	499.	270.	7955.	57224.	0.0127	0.0267	0.0622
100.	11.09	3.595	2.30	9.13	111.54	69121.	4.	116.	45.	69286.	0.0001	0.0084	0.0002
100.	11.09	3.308	2.50	11.72	86.86	62039.	20.	169.	255.	62484.	0.0004	0.0140	0.0015
100.	11.09	3.063	2.70	14.76	68.95	56321.	88.	146.	1127.	57683.	0.0019	0.0133	0.0075
100.	11.09	2.851	2.90	18.29	55.65	51624.	257.	180.	3534.	55595.	0.0060	0.0175	0.0260
200.	11.64	3.774	2.30	9.13	129.01	73721.	1.	131.	14.	73867.	0.0000	0.0094	0.0001
200.	11.64	3.472	2.50	11.72	100.46	66037.	10.	114.	111.	66273.	0.0002	0.0094	0.0007
200.	11.64	3.215	2.70	14.76	79.75	59839.	40.	89.	480.	60448.	0.0009	0.0078	0.0028
200.	11.64	2.993	2.90	18.29	64.36	54751.	135.	157.	1648.	56692.	0.0030	0.0146	0.0112
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	148.	2.	78498.	0.0000	0.0103	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	2.	156.	33.	70246.	0.0000	0.0116	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	27.	96.	171.	63666.	0.0005	0.0083	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	69.	97.	728.	58783.	0.0015	0.0091	0.0047

SERIES 23 BILBAO WAVES DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	92.	134.	793.	42101.	0.0027	0.0191	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	427.	282.	4374.	42650.	0.0136	0.0420	0.0486
5.	7.21	1.991	2.70	14.76	18.94	34705.	1361.	647.	16494.	53208.	0.0470	0.1014	0.1981
5.	7.21	1.854	2.90	18.29	15.28	32336.	3702.	1400.	48508.	85947.	0.1343	0.2350	0.6264
25.	8.09	2.623	2.30	9.13	43.31	46785.	8.	169.	53.	47015.	0.0002	0.0206	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	43.	137.	387.	43129.	0.0012	0.0199	0.0038
25.	8.09	2.234	2.70	14.76	26.77	39132.	203.	217.	2000.	41552.	0.0063	0.0305	0.0210
25.	8.09	2.080	2.90	18.29	21.61	36298.	726.	361.	7701.	45086.	0.0234	0.0537	0.0879
50.	8.43	2.733	2.30	9.13	49.02	49092.	2.	224.	8.	49326.	0.0000	0.0257	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	24.	120.	110.	44834.	0.0006	0.0153	0.0011
50.	8.43	2.329	2.70	14.76	30.30	40918.	107.	187.	893.	42106.	0.0032	0.0264	0.0089
50.	8.43	2.168	2.90	18.29	24.45	37895.	360.	275.	3770.	42300.	0.0114	0.0415	0.0411
100.	8.76	2.839	2.30	9.13	54.93	51359.	0.	176.	11.	51546.	0.0000	0.0200	0.0001
100.	8.76	2.612	2.50	11.72	42.78	46561.	7.	173.	48.	46790.	0.0002	0.0225	0.0004
100.	8.76	2.419	2.70	14.76	33.96	42669.	41.	136.	397.	43244.	0.0012	0.0173	0.0039
100.	8.76	2.252	2.90	18.29	27.41	39459.	177.	162.	1753.	41552.	0.0052	0.0244	0.0183
200.	9.08	2.941	2.30	9.13	61.08	53598.	1.	242.	3.	53843.	0.0000	0.0265	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	2.	130.	15.	48663.	0.0001	0.0148	0.0001
200.	9.08	2.506	2.70	14.76	37.76	44397.	23.	147.	197.	44764.	0.0006	0.0193	0.0018
200.	9.08	2.333	2.90	18.29	30.47	41002.	98.	189.	859.	42148.	0.0028	0.0268	0.0087
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	122.	0.	55941.	0.0000	0.0129	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	201.	9.	50665.	0.0000	0.0223	0.0001
400.	9.38	2.590	2.70	14.76	41.70	46108.	10.	127.	55.	46301.	0.0003	0.0156	0.0005
400.	9.38	2.411	2.90	18.29	33.66	42529.	48.	144.	395.	43115.	0.0014	0.0192	0.0039

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	109.	27.	1022.	14808.	0.0092	0.0145	0.0394
5.	4.35	1.296	2.50	11.72	5.22	12417.	331.	67.	3563.	16378.	0.0300	0.0426	0.1481
5.	4.35	1.200	2.70	14.76	4.14	11416.	776.	150.	9271.	21614.	0.0734	0.1060	0.4135
5.	4.35	1.117	2.90	18.29	3.34	10588.	1646.	295.	21344.	33874.	0.1619	0.2308	1.0184
25.	5.07	1.642	2.30	9.13	10.62	16395.	9.	3.	55.	16461.	0.0006	0.0012	0.0019
25.	5.07	1.510	2.50	11.72	8.27	14817.	34.	10.	311.	15171.	0.0032	0.0050	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	116.	30.	1176.	14860.	0.0103	0.0164	0.0451
25.	5.07	1.302	2.90	18.29	5.30	12485.	300.	65.	3387.	16237.	0.0273	0.0407	0.1388
50.	5.36	1.736	2.30	9.13	12.55	17578.	2.	1.	15.	17596.	0.0002	0.0003	0.0005
50.	5.36	1.597	2.50	11.72	9.77	15849.	16.	4.	97.	15965.	0.0012	0.0019	0.0034
50.	5.36	1.479	2.70	14.76	7.76	14449.	48.	13.	465.	14975.	0.0041	0.0069	0.0170
50.	5.36	1.377	2.90	18.29	6.26	13297.	145.	32.	1462.	14937.	0.0127	0.0185	0.0568
100.	5.64	1.828	2.30	9.13	14.66	18777.	1.	0.	2.	18780.	0.0000	0.0001	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	5.	2.	29.	16929.	0.0004	0.0007	0.0010
100.	5.64	1.557	2.70	14.76	9.06	15371.	23.	6.	177.	15577.	0.0019	0.0029	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	65.	18.	655.	14857.	0.0059	0.0093	0.0245
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	0.	0.	19997.	0.0000	0.0000	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	1.	1.	10.	17968.	0.0001	0.0003	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	8.	2.	61.	16379.	0.0006	0.0011	0.0021
200.	5.92	1.522	2.90	18.29	8.46	14951.	31.	8.	275.	15266.	0.0027	0.0043	0.0099
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	0.	0.	21239.	0.0000	0.0000	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	0.	2.	19039.	0.0001	0.0001	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	3.	1.	27.	17289.	0.0002	0.0005	0.0009
400.	6.20	1.593	2.90	18.29	9.70	15798.	13.	4.	105.	15920.	0.0011	0.0019	0.0036

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	266.	107.	4040.	53481.	0.0110	0.0169	0.0525
5.	8.43	2.514	2.50	11.72	38.12	44559.	736.	281.	12520.	58095.	0.0334	0.0489	0.1788
5.	8.43	2.328	2.70	14.76	30.26	40899.	1563.	581.	30098.	73141.	0.0776	0.1133	0.4731
5.	8.43	2.167	2.90	18.29	24.42	37878.	3109.	1044.	63768.	105799.	0.1647	0.2275	1.0943
25.	9.93	3.220	2.30	9.13	80.12	59955.	23.	10.	219.	60207.	0.0008	0.0013	0.0025
25.	9.93	2.962	2.50	11.72	62.39	54061.	87.	37.	1159.	55344.	0.0034	0.0052	0.0138
25.	9.93	2.743	2.70	14.76	49.52	49291.	242.	108.	3699.	53341.	0.0100	0.0166	0.0476
25.	9.93	2.554	2.90	18.29	39.97	45366.	616.	224.	9829.	56035.	0.0277	0.0386	0.1400
50.	10.52	3.411	2.30	9.13	95.26	64539.	8.	4.	58.	64609.	0.0003	0.0005	0.0006
50.	10.52	3.138	2.50	11.72	74.18	58052.	47.	18.	422.	58539.	0.0015	0.0022	0.0046
50.	10.52	2.906	2.70	14.76	58.88	52810.	116.	54.	1593.	54573.	0.0047	0.0074	0.0195
50.	10.52	2.705	2.90	18.29	47.52	48500.	307.	122.	4499.	53427.	0.0129	0.0189	0.0605
100.	11.09	3.595	2.30	9.13	111.54	69121.	5.	2.	31.	69158.	0.0001	0.0001	0.0003
100.	11.09	3.308	2.50	11.72	86.86	62039.	13.	8.	118.	62178.	0.0004	0.0009	0.0013
100.	11.09	3.063	2.70	14.76	68.95	56321.	51.	26.	702.	57100.	0.0020	0.0033	0.0077
100.	11.09	2.851	2.90	18.29	55.65	51624.	163.	68.	2331.	54186.	0.0064	0.0097	0.0280
200.	11.64	3.774	2.30	9.13	129.01	73721.	1.	1.	2.	73725.	0.0000	0.0001	0.0000
200.	11.64	3.472	2.50	11.72	100.46	66037.	5.	2.	57.	66102.	0.0002	0.0003	0.0005
200.	11.64	3.215	2.70	14.76	79.75	59839.	22.	11.	214.	60086.	0.0008	0.0013	0.0024
200.	11.64	2.993	2.90	18.29	64.36	54751.	71.	32.	932.	55786.	0.0029	0.0045	0.0108
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	0.	0.	78348.	0.0000	0.0000	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	4.	1.	14.	70074.	0.0001	0.0001	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	10.	4.	98.	63483.	0.0003	0.0005	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	43.	19.	464.	58416.	0.0014	0.0023	0.0051

SERIES 23 BILBAO WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	57.	22.	462.	41623.	0.0029	0.0043	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	250.	94.	2477.	40389.	0.0131	0.0209	0.0469
5.	7.21	1.991	2.70	14.76	18.94	34705.	781.	282.	9592.	45361.	0.0454	0.0701	0.1954
5.	7.21	1.854	2.90	18.29	15.28	32336.	2228.	732.	29394.	64691.	0.1359	0.2024	0.6365
25.	8.09	2.623	2.30	9.13	43.31	46785.	4.	2.	35.	46826.	0.0002	0.0004	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	31.	12.	256.	42861.	0.0015	0.0024	0.0043
25.	8.09	2.234	2.70	14.76	26.77	39132.	116.	49.	1237.	40534.	0.0060	0.0105	0.0221
25.	8.09	2.080	2.90	18.29	21.61	36298.	424.	159.	4614.	41495.	0.0236	0.0374	0.0884
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	1.	11.	49106.	0.0000	0.0001	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	12.	5.	73.	44670.	0.0006	0.0009	0.0012
50.	8.43	2.329	2.70	14.76	30.30	40918.	51.	25.	564.	41559.	0.0027	0.0050	0.0093
50.	8.43	2.168	2.90	18.29	24.45	37895.	206.	84.	2193.	40378.	0.0110	0.0184	0.0404
100.	8.76	2.839	2.30	9.13	54.93	51359.	2.	0.	4.	51365.	0.0001	0.0001	0.0000
100.	8.76	2.612	2.50	11.72	42.78	46561.	5.	3.	40.	46609.	0.0002	0.0005	0.0005
100.	8.76	2.419	2.70	14.76	33.96	42669.	25.	13.	242.	42949.	0.0013	0.0024	0.0041
100.	8.76	2.252	2.90	18.29	27.41	39459.	102.	45.	1049.	40656.	0.0056	0.0092	0.0186
200.	9.08	2.941	2.30	9.13	61.08	53598.	1.	0.	2.	53601.	0.0000	0.0000	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	1.	1.	11.	48529.	0.0000	0.0002	0.0002
200.	9.08	2.506	2.70	14.76	37.76	44397.	15.	7.	90.	44509.	0.0007	0.0011	0.0015
200.	9.08	2.333	2.90	18.29	30.47	41002.	56.	25.	509.	41593.	0.0027	0.0048	0.0084
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	0.	0.	55819.	0.0000	0.0000	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	1.	2.	50458.	0.0001	0.0001	0.0000
400.	9.38	2.590	2.70	14.76	41.70	46108.	5.	3.	46.	46163.	0.0003	0.0005	0.0008
400.	9.38	2.411	2.90	18.29	33.66	42529.	33.	11.	240.	42814.	0.0016	0.0023	0.0038

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS DAMMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	113.	65.	1076.	14903.	0.0097	0.0419	0.0409
5.	4.35	1.296	2.50	11.72	5.22	12417.	302.	107.	3531.	16357.	0.0278	0.0747	0.1456
5.	4.35	1.200	2.70	14.76	4.14	11416.	769.	191.	9433.	21809.	0.0738	0.1447	0.4222
5.	4.35	1.117	2.90	18.29	3.34	10588.	1655.	342.	21135.	33721.	0.1633	0.2805	1.0101
25.	5.07	1.642	2.30	9.13	10.62	16395.	8.	60.	68.	16532.	0.0008	0.0345	0.0021
25.	5.07	1.510	2.50	11.72	8.27	14817.	36.	61.	319.	15234.	0.0030	0.0376	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	116.	64.	1212.	14930.	0.0103	0.0413	0.0466
25.	5.07	1.302	2.90	18.29	5.30	12485.	304.	113.	3237.	16139.	0.0277	0.0788	0.1351
50.	5.36	1.736	2.30	9.13	12.55	17578.	1.	54.	13.	17646.	0.0001	0.0294	0.0004
50.	5.36	1.597	2.50	11.72	9.77	15849.	10.	74.	117.	16050.	0.0009	0.0438	0.0040
50.	5.36	1.479	2.70	14.76	7.76	14449.	48.	74.	488.	15060.	0.0042	0.0454	0.0176
50.	5.36	1.377	2.90	18.29	6.26	13297.	145.	78.	1488.	15007.	0.0127	0.0509	0.0584
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	58.	3.	18838.	0.0000	0.0280	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	5.	71.	29.	16999.	0.0004	0.0376	0.0011
100.	5.64	1.557	2.70	14.76	9.06	15371.	19.	45.	177.	15611.	0.0016	0.0260	0.0060
100.	5.64	1.450	2.90	18.29	7.31	14118.	71.	51.	674.	14915.	0.0064	0.0327	0.0248
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	57.	2.	20056.	0.0000	0.0279	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	2.	45.	9.	18011.	0.0001	0.0226	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	7.	64.	73.	16451.	0.0006	0.0366	0.0024
200.	5.92	1.522	2.90	18.29	8.46	14951.	33.	45.	271.	15300.	0.0027	0.0278	0.0098
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	94.	0.	21332.	0.0000	0.0382	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	56.	3.	19096.	0.0000	0.0273	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	2.	62.	19.	17342.	0.0002	0.0307	0.0007
400.	6.20	1.593	2.90	18.29	9.70	15798.	17.	47.	110.	15972.	0.0013	0.0280	0.0037

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS DAMMAGE ACCUMULATION RATE 0.05



50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	273.	159.	4192.	53692.	0.0113	0.0275	0.0537
5.	8.43	2.514	2.50	11.72	38.12	44559.	710.	320.	12260.	57848.	0.0326	0.0582	0.1772
5.	8.43	2.328	2.70	14.76	30.26	40899.	1638.	625.	30170.	73332.	0.0810	0.1273	0.4793
5.	8.43	2.167	2.90	18.29	24.42	37878.	3194.	1117.	63915.	106103.	0.1676	0.2502	1.0972
25.	9.93	3.220	2.30	9.13	80.12	59955.	29.	61.	252.	60297.	0.0010	0.0097	0.0028
25.	9.93	2.962	2.50	11.72	62.39	54061.	87.	92.	1107.	55347.	0.0036	0.0148	0.0135
25.	9.93	2.743	2.70	14.76	49.52	49291.	261.	156.	3942.	53650.	0.0111	0.0257	0.0500
25.	9.93	2.554	2.90	18.29	39.97	45366.	614.	273.	10103.	56355.	0.0278	0.0503	0.1438
50.	10.52	3.411	2.30	9.13	95.26	64539.	8.	44.	85.	64675.	0.0003	0.0065	0.0007
50.	10.52	3.138	2.50	11.72	74.18	58052.	36.	61.	401.	58551.	0.0013	0.0102	0.0045
50.	10.52	2.906	2.70	14.76	58.88	52810.	127.	107.	1649.	54692.	0.0050	0.0170	0.0197
50.	10.52	2.705	2.90	18.29	47.52	48500.	289.	159.	4656.	53604.	0.0127	0.0267	0.0622
100.	11.09	3.595	2.30	9.13	111.54	69121.	3.	66.	29.	69219.	0.0001	0.0084	0.0002
100.	11.09	3.308	2.50	11.72	86.86	62039.	11.	98.	160.	62309.	0.0004	0.0140	0.0015
100.	11.09	3.063	2.70	14.76	68.95	56321.	50.	87.	665.	57123.	0.0019	0.0133	0.0075
100.	11.09	2.851	2.90	18.29	55.65	51624.	153.	103.	2058.	53937.	0.0060	0.0175	0.0260
200.	11.64	3.774	2.30	9.13	129.01	73721.	1.	76.	7.	73804.	0.0000	0.0094	0.0001
200.	11.64	3.472	2.50	11.72	100.46	66037.	7.	65.	65.	66175.	0.0002	0.0094	0.0007
200.	11.64	3.215	2.70	14.76	79.75	59839.	23.	52.	292.	60206.	0.0009	0.0078	0.0028
200.	11.64	2.993	2.90	18.29	64.36	54751.	80.	92.	982.	55906.	0.0030	0.0146	0.0112
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	86.	1.	78435.	0.0000	0.0103	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	1.	90.	19.	70166.	0.0000	0.0116	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	16.	56.	94.	63538.	0.0005	0.0083	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	38.	56.	430.	58414.	0.0015	0.0091	0.0047

SERIES 23 BILBAO WAVES DOWNTIME COSTS DAMMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	55.	78.	470.	41685.	0.0027	0.0191	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	248.	166.	2559.	40541.	0.0136	0.0420	0.0486
5.	7.21	1.991	2.70	14.76	18.94	34705.	788.	379.	9706.	45579.	0.0470	0.1014	0.1981
5.	7.21	1.854	2.90	18.29	15.28	32336.	2176.	818.	28534.	63865.	0.1343	0.2350	0.6264
25.	8.09	2.623	2.30	9.13	43.31	46785.	5.	101.	31.	46921.	0.0002	0.0206	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	25.	80.	225.	42891.	0.0012	0.0199	0.0038
25.	8.09	2.234	2.70	14.76	26.77	39132.	117.	128.	1194.	40570.	0.0063	0.0305	0.0210
25.	8.09	2.080	2.90	18.29	21.61	36298.	434.	211.	4528.	41472.	0.0234	0.0537	0.0879
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	130.	6.	49230.	0.0000	0.0257	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	16.	70.	63.	44728.	0.0006	0.0153	0.0011
50.	8.43	2.329	2.70	14.76	30.30	40918.	63.	109.	528.	41618.	0.0032	0.0264	0.0089
50.	8.43	2.168	2.90	18.29	24.45	37895.	211.	160.	2238.	40505.	0.0114	0.0415	0.0411
100.	8.76	2.839	2.30	9.13	54.93	51359.	0.	103.	7.	51469.	0.0000	0.0200	0.0001
100.	8.76	2.612	2.50	11.72	42.78	46561.	4.	101.	27.	46692.	0.0002	0.0225	0.0004
100.	8.76	2.419	2.70	14.76	33.96	42669.	24.	81.	231.	43005.	0.0012	0.0173	0.0039
100.	8.76	2.252	2.90	18.29	27.41	39459.	106.	94.	1037.	40697.	0.0052	0.0244	0.0183
200.	9.08	2.941	2.30	9.13	61.08	53598.	0.	144.	3.	53745.	0.0000	0.0265	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	2.	76.	9.	48604.	0.0001	0.0148	0.0001
200.	9.08	2.506	2.70	14.76	37.76	44397.	14.	86.	123.	44620.	0.0006	0.0193	0.0018
200.	9.08	2.333	2.90	18.29	30.47	41002.	60.	112.	502.	41675.	0.0028	0.0268	0.0087
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	72.	0.	55891.	0.0000	0.0129	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	119.	5.	50578.	0.0000	0.0223	0.0001
400.	9.38	2.590	2.70	14.76	41.70	46108.	6.	74.	32.	46220.	0.0003	0.0156	0.0005
400.	9.38	2.411	2.90	18.29	33.66	42529.	28.	84.	232.	42873.	0.0014	0.0192	0.0039

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	75.	19.	689.	14431.	0.0092	0.0145	0.0394
5.	4.35	1.296	2.50	11.72	5.22	12417.	226.	45.	2418.	15107.	0.0300	0.0426	0.1481
5.	4.35	1.200	2.70	14.76	4.14	11416.	529.	102.	6301.	18348.	0.0734	0.1060	0.4135
5.	4.35	1.117	2.90	18.29	3.34	10588.	1122.	201.	14500.	26411.	0.1619	0.2308	1.0184
25.	5.07	1.642	2.30	9.13	10.62	16395.	6.	2.	37.	16439.	0.0006	0.0012	0.0019
25.	5.07	1.510	2.50	11.72	8.27	14817.	22.	6.	211.	15057.	0.0032	0.0050	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	77.	20.	802.	14439.	0.0103	0.0164	0.0451
25.	5.07	1.302	2.90	18.29	5.30	12485.	205.	44.	2304.	15037.	0.0273	0.0407	0.1388
50.	5.36	1.736	2.30	9.13	12.55	17578.	1.	1.	11.	17590.	0.0002	0.0003	0.0005
50.	5.36	1.597	2.50	11.72	9.77	15849.	11.	3.	66.	15928.	0.0012	0.0019	0.0034
50.	5.36	1.479	2.70	14.76	7.76	14449.	33.	8.	317.	14808.	0.0041	0.0069	0.0170
50.	5.36	1.377	2.90	18.29	6.26	13297.	99.	22.	997.	14415.	0.0127	0.0185	0.0568
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	0.	1.	18779.	0.0000	0.0001	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	3.	1.	19.	16917.	0.0004	0.0007	0.0010
100.	5.64	1.557	2.70	14.76	9.06	15371.	16.	4.	120.	15511.	0.0019	0.0029	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	43.	12.	444.	14618.	0.0059	0.0093	0.0245
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	0.	0.	19997.	0.0000	0.0000	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	1.	0.	7.	17964.	0.0001	0.0003	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	6.	2.	41.	16355.	0.0006	0.0011	0.0021
200.	5.92	1.522	2.90	18.29	8.46	14951.	21.	5.	185.	15163.	0.0027	0.0043	0.0099
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	0.	0.	21239.	0.0000	0.0000	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	0.	1.	19038.	0.0001	0.0001	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	2.	1.	17.	17279.	0.0002	0.0005	0.0009
400.	6.20	1.593	2.90	18.29	9.70	15798.	9.	3.	72.	15881.	0.0011	0.0019	0.0036

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	181.	73.	2741.	52062.	0.0110	0.0169	0.0525
5.	8.43	2.514	2.50	11.72	38.12	44559.	503.	191.	8533.	53785.	0.0334	0.0489	0.1788
5.	8.43	2.328	2.70	14.76	30.26	40899.	1058.	396.	20474.	62827.	0.0776	0.1133	0.4731
5.	8.43	2.167	2.90	18.29	24.42	37878.	2117.	709.	43385.	84089.	0.1647	0.2275	1.0943
25.	9.93	3.220	2.30	9.13	80.12	59955.	16.	6.	142.	60119.	0.0008	0.0013	0.0025
25.	9.93	2.962	2.50	11.72	62.39	54061.	59.	25.	792.	54937.	0.0034	0.0052	0.0138
25.	9.93	2.743	2.70	14.76	49.52	49291.	166.	74.	2512.	52043.	0.0100	0.0166	0.0476
25.	9.93	2.554	2.90	18.29	39.97	45366.	418.	152.	6646.	52582.	0.0277	0.0386	0.1400
50.	10.52	3.411	2.30	9.13	95.26	64539.	6.	3.	38.	64585.	0.0003	0.0005	0.0006
50.	10.52	3.138	2.50	11.72	74.18	58052.	33.	12.	289.	58386.	0.0015	0.0022	0.0046
50.	10.52	2.906	2.70	14.76	58.88	52810.	77.	37.	1072.	53996.	0.0047	0.0074	0.0195
50.	10.52	2.705	2.90	18.29	47.52	48500.	210.	83.	3040.	51833.	0.0129	0.0189	0.0605
100.	11.09	3.595	2.30	9.13	111.54	69121.	3.	1.	21.	69147.	0.0001	0.0001	0.0003
100.	11.09	3.308	2.50	11.72	86.86	62039.	9.	5.	78.	62132.	0.0004	0.0009	0.0013
100.	11.09	3.063	2.70	14.76	68.95	56321.	34.	18.	484.	56857.	0.0020	0.0033	0.0077
100.	11.09	2.851	2.90	18.29	55.65	51624.	111.	47.	1598.	53380.	0.0064	0.0097	0.0280
200.	11.64	3.774	2.30	9.13	129.01	73721.	1.	0.	1.	73723.	0.0000	0.0001	0.0000
200.	11.64	3.472	2.50	11.72	100.46	66037.	3.	1.	39.	66081.	0.0002	0.0003	0.0005
200.	11.64	3.215	2.70	14.76	79.75	59839.	15.	7.	139.	60001.	0.0008	0.0013	0.0024
200.	11.64	2.993	2.90	18.29	64.36	54751.	46.	21.	635.	55454.	0.0029	0.0045	0.0108
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	0.	0.	78347.	0.0000	0.0000	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	3.	0.	8.	70067.	0.0001	0.0001	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	7.	2.	64.	63445.	0.0003	0.0005	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	31.	14.	319.	58253.	0.0014	0.0023	0.0051

SERIES 23 BILBAO WAVES DOWNTIME COSTS NO DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	39.	15.	309.	41445.	0.0029	0.0043	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	171.	64.	1673.	39476.	0.0131	0.0209	0.0469
5.	7.21	1.991	2.70	14.76	18.94	34705.	530.	192.	6514.	41941.	0.0454	0.0701	0.1954
5.	7.21	1.854	2.90	18.29	15.28	32336.	1521.	497.	20056.	54411.	0.1359	0.2024	0.6365
25.	8.09	2.623	2.30	9.13	43.31	46785.	3.	2.	23.	46812.	0.0002	0.0004	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	22.	8.	170.	42761.	0.0015	0.0024	0.0043
25.	8.09	2.234	2.70	14.76	26.77	39132.	78.	33.	844.	40088.	0.0060	0.0105	0.0221
25.	8.09	2.080	2.90	18.29	21.61	36298.	287.	108.	3135.	39829.	0.0236	0.0374	0.0884
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	1.	9.	49103.	0.0000	0.0001	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	8.	3.	49.	44640.	0.0006	0.0009	0.0012
50.	8.43	2.329	2.70	14.76	30.30	40918.	35.	17.	385.	41355.	0.0027	0.0050	0.0093
50.	8.43	2.168	2.90	18.29	24.45	37895.	140.	57.	1498.	39590.	0.0110	0.0184	0.0404
100.	8.76	2.839	2.30	9.13	54.93	51359.	2.	0.	3.	51363.	0.0001	0.0001	0.0000
100.	8.76	2.612	2.50	11.72	42.78	46561.	4.	2.	28.	46594.	0.0002	0.0005	0.0005
100.	8.76	2.419	2.70	14.76	33.96	42669.	16.	9.	162.	42856.	0.0013	0.0024	0.0041
100.	8.76	2.252	2.90	18.29	27.41	39459.	68.	30.	711.	40268.	0.0056	0.0092	0.0186
200.	9.08	2.941	2.30	9.13	61.08	53598.	1.	0.	1.	53600.	0.0000	0.0000	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	0.	1.	8.	48525.	0.0000	0.0002	0.0002
200.	9.08	2.506	2.70	14.76	37.76	44397.	10.	5.	60.	44473.	0.0007	0.0011	0.0015
200.	9.08	2.333	2.90	18.29	30.47	41002.	38.	17.	348.	41406.	0.0027	0.0048	0.0084
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	0.	0.	55819.	0.0000	0.0000	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	1.	2.	50457.	0.0001	0.0001	0.0000
400.	9.38	2.590	2.70	14.76	41.70	46108.	3.	2.	31.	46144.	0.0003	0.0005	0.0008
400.	9.38	2.411	2.90	18.29	33.66	42529.	23.	7.	165.	42724.	0.0016	0.0023	0.0038

SERIES 21 FOLLONICA WAVES DOWNTIME COSTS DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	76.	44.	733.	14502.	0.0097	0.0419	0.0409
5.	4.35	1.296	2.50	11.72	5.22	12417.	204.	72.	2407.	15101.	0.0278	0.0747	0.1456
5.	4.35	1.200	2.70	14.76	4.14	11416.	521.	129.	6408.	18474.	0.0738	0.1447	0.4222
5.	4.35	1.117	2.90	18.29	3.34	10588.	1126.	231.	14361.	26306.	0.1633	0.2805	1.0101
25.	5.07	1.642	2.30	9.13	10.62	16395.	5.	41.	48.	16488.	0.0008	0.0345	0.0021
25.	5.07	1.510	2.50	11.72	8.27	14817.	24.	41.	218.	15100.	0.0030	0.0376	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	78.	43.	828.	14488.	0.0103	0.0413	0.0466
25.	5.07	1.302	2.90	18.29	5.30	12485.	207.	77.	2189.	14957.	0.0277	0.0788	0.1351
50.	5.36	1.736	2.30	9.13	12.55	17578.	1.	36.	8.	17623.	0.0001	0.0294	0.0004
50.	5.36	1.597	2.50	11.72	9.77	15849.	7.	50.	79.	15985.	0.0009	0.0438	0.0040
50.	5.36	1.479	2.70	14.76	7.76	14449.	32.	50.	336.	14867.	0.0042	0.0454	0.0176
50.	5.36	1.377	2.90	18.29	6.26	13297.	98.	53.	1010.	14458.	0.0127	0.0509	0.0584
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	39.	2.	18818.	0.0000	0.0280	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	4.	48.	18.	16963.	0.0004	0.0376	0.0011
100.	5.64	1.557	2.70	14.76	9.06	15371.	12.	30.	121.	15535.	0.0016	0.0260	0.0060
100.	5.64	1.450	2.90	18.29	7.31	14118.	47.	35.	463.	14663.	0.0064	0.0327	0.0248
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	39.	1.	20036.	0.0000	0.0279	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	1.	30.	6.	17992.	0.0001	0.0226	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	4.	44.	51.	16406.	0.0006	0.0366	0.0024
200.	5.92	1.522	2.90	18.29	8.46	14951.	22.	30.	184.	15187.	0.0027	0.0278	0.0098
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	63.	0.	21302.	0.0000	0.0382	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	38.	2.	19077.	0.0000	0.0273	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	1.	42.	13.	17314.	0.0002	0.0307	0.0007
400.	6.20	1.593	2.90	18.29	9.70	15798.	12.	32.	76.	15917.	0.0013	0.0280	0.0037

SERIES 22 NORTH SEA WAVES DOWNTIME COSTS DAMMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	187.	107.	2865.	52226.	0.0113	0.0275	0.0537
5.	8.43	2.514	2.50	11.72	38.12	44559.	483.	217.	8298.	53556.	0.0326	0.0582	0.1772
5.	8.43	2.328	2.70	14.76	30.26	40899.	1113.	421.	20435.	62868.	0.0810	0.1273	0.4793
5.	8.43	2.167	2.90	18.29	24.42	37878.	2183.	754.	43464.	84279.	0.1676	0.2502	1.0972
25.	9.93	3.220	2.30	9.13	80.12	59955.	20.	41.	169.	60185.	0.0010	0.0097	0.0028
25.	9.93	2.962	2.50	11.72	62.39	54061.	57.	62.	744.	54923.	0.0036	0.0148	0.0135
25.	9.93	2.743	2.70	14.76	49.52	49291.	173.	106.	2686.	52255.	0.0111	0.0257	0.0500
25.	9.93	2.554	2.90	18.29	39.97	45366.	416.	183.	6831.	52795.	0.0278	0.0503	0.1438
50.	10.52	3.411	2.30	9.13	95.26	64539.	5.	29.	62.	64635.	0.0003	0.0065	0.0007
50.	10.52	3.138	2.50	11.72	74.18	58052.	25.	41.	273.	58391.	0.0013	0.0102	0.0045
50.	10.52	2.906	2.70	14.76	58.88	52810.	85.	72.	1130.	54097.	0.0050	0.0170	0.0197
50.	10.52	2.705	2.90	18.29	47.52	48500.	195.	108.	3145.	51947.	0.0127	0.0267	0.0622
100.	11.09	3.595	2.30	9.13	111.54	69121.	2.	44.	20.	69187.	0.0001	0.0084	0.0002
100.	11.09	3.308	2.50	11.72	86.86	62039.	7.	66.	115.	62227.	0.0004	0.0140	0.0015
100.	11.09	3.063	2.70	14.76	68.95	56321.	33.	59.	453.	56866.	0.0019	0.0133	0.0075
100.	11.09	2.851	2.90	18.29	55.65	51624.	104.	68.	1380.	53176.	0.0060	0.0175	0.0260
200.	11.64	3.774	2.30	9.13	129.01	73721.	0.	51.	4.	73776.	0.0000	0.0094	0.0001
200.	11.64	3.472	2.50	11.72	100.46	66037.	5.	43.	43.	66129.	0.0002	0.0094	0.0007
200.	11.64	3.215	2.70	14.76	79.75	59839.	15.	35.	204.	60093.	0.0009	0.0078	0.0028
200.	11.64	2.993	2.90	18.29	64.36	54751.	55.	62.	676.	55544.	0.0030	0.0146	0.0112
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	57.	1.	78405.	0.0000	0.0103	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	1.	60.	12.	70129.	0.0000	0.0116	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	10.	37.	60.	63479.	0.0005	0.0083	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	24.	38.	294.	58245.	0.0015	0.0091	0.0047

SERIES 23    BILBAO WAVES    DOWNTIME COSTS    DAMMAGE ACCUMULATION    RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	38.	52.	320.	41493.	0.0027	0.0191	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	166.	113.	1733.	39579.	0.0136	0.0420	0.0486
5.	7.21	1.991	2.70	14.76	18.94	34705.	527.	257.	6596.	42085.	0.0470	0.1014	0.1981
5.	7.21	1.854	2.90	18.29	15.28	32336.	1475.	551.	19360.	53723.	0.1343	0.2350	0.6264
25.	8.09	2.623	2.30	9.13	43.31	46785.	3.	69.	21.	46877.	0.0002	0.0206	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	16.	53.	152.	42783.	0.0012	0.0199	0.0038
25.	8.09	2.234	2.70	14.76	26.77	39132.	78.	87.	819.	40115.	0.0063	0.0305	0.0210
25.	8.09	2.080	2.90	18.29	21.61	36298.	299.	142.	3071.	39810.	0.0234	0.0537	0.0879
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	88.	4.	49186.	0.0000	0.0257	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	11.	47.	41.	44680.	0.0006	0.0153	0.0011
50.	8.43	2.329	2.70	14.76	30.30	40918.	43.	73.	357.	41391.	0.0032	0.0264	0.0089
50.	8.43	2.168	2.90	18.29	24.45	37895.	143.	108.	1531.	39677.	0.0114	0.0415	0.0411
100.	8.76	2.839	2.30	9.13	54.93	51359.	0.	69.	5.	51434.	0.0000	0.0200	0.0001
100.	8.76	2.612	2.50	11.72	42.78	46561.	2.	67.	18.	46648.	0.0002	0.0225	0.0004
100.	8.76	2.419	2.70	14.76	33.96	42669.	16.	55.	156.	42896.	0.0012	0.0173	0.0039
100.	8.76	2.252	2.90	18.29	27.41	39459.	73.	63.	707.	40303.	0.0052	0.0244	0.0183
200.	9.08	2.941	2.30	9.13	61.08	53598.	0.	98.	3.	53699.	0.0000	0.0265	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	1.	52.	7.	48576.	0.0001	0.0148	0.0001
200.	9.08	2.506	2.70	14.76	37.76	44397.	9.	58.	86.	44551.	0.0006	0.0193	0.0018
200.	9.08	2.333	2.90	18.29	30.47	41002.	41.	76.	337.	41457.	0.0028	0.0268	0.0087
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	49.	0.	55868.	0.0000	0.0129	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	81.	3.	50539.	0.0000	0.0223	0.0001
400.	9.38	2.590	2.70	14.76	41.70	46108.	3.	49.	21.	46183.	0.0003	0.0156	0.0005
400.	9.38	2.411	2.90	18.29	33.66	42529.	20.	57.	157.	42762.	0.0014	0.0192	0.0039

SERIES 21 FOLLONICA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02



50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	77.	114.	1291.	15131.	0.0093	0.0446	0.0395
5.	4.35	1.296	2.50	11.72	5.22	12417.	217.	188.	4369.	17192.	0.0303	0.0771	0.1484
5.	4.35	1.200	2.70	14.76	4.14	11416.	476.	309.	11025.	23226.	0.0747	0.1340	0.4147
5.	4.35	1.117	2.90	18.29	3.34	10588.	942.	581.	24665.	36776.	0.1645	0.2784	1.0213
25.	5.07	1.642	2.30	9.13	10.62	16395.	7.	111.	74.	16587.	0.0006	0.0365	0.0019
25.	5.07	1.510	2.50	11.72	8.27	14817.	28.	88.	398.	15331.	0.0033	0.0318	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	82.	117.	1469.	15206.	0.0103	0.0439	0.0452
25.	5.07	1.302	2.90	18.29	5.30	12485.	198.	177.	4149.	17009.	0.0276	0.0718	0.1391
50.	5.36	1.736	2.30	9.13	12.55	17578.	2.	75.	20.	17674.	0.0002	0.0227	0.0005
50.	5.36	1.597	2.50	11.72	9.77	15849.	12.	123.	127.	16111.	0.0012	0.0405	0.0034
50.	5.36	1.479	2.70	14.76	7.76	14449.	36.	94.	590.	15169.	0.0042	0.0346	0.0170
50.	5.36	1.377	2.90	18.29	6.26	13297.	101.	115.	1818.	15331.	0.0128	0.0449	0.0569
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	97.	4.	18879.	0.0000	0.0265	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	4.	79.	39.	17017.	0.0004	0.0264	0.0010
100.	5.64	1.557	2.70	14.76	9.06	15371.	18.	72.	229.	15690.	0.0019	0.0256	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	49.	96.	833.	15097.	0.0060	0.0374	0.0245
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	137.	0.	20134.	0.0000	0.0336	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	1.	141.	14.	18112.	0.0001	0.0411	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	6.	88.	84.	16484.	0.0006	0.0296	0.0021
200.	5.92	1.522	2.90	18.29	8.46	14951.	24.	64.	359.	15398.	0.0027	0.0234	0.0100
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	95.	0.	21334.	0.0000	0.0237	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	1.	95.	2.	19134.	0.0001	0.0273	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	3.	129.	38.	17428.	0.0002	0.0395	0.0009
400.	6.20	1.593	2.90	18.29	9.70	15798.	11.	88.	135.	16031.	0.0011	0.0303	0.0036

SERIES 22 NORTH SEA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	325.	266.	6276.	55935.	0.0111	0.0263	0.0527
5.	8.43	2.514	2.50	11.72	38.12	44559.	870.	532.	19163.	65123.	0.0339	0.0568	0.1792
5.	8.43	2.328	2.70	14.76	30.26	40899.	1802.	1067.	45620.	89388.	0.0790	0.1263	0.4742
5.	8.43	2.167	2.90	18.29	24.42	37878.	3425.	1888.	95712.	138904.	0.1668	0.2467	1.0970
25.	9.93	3.220	2.30	9.13	80.12	59955.	31.	124.	362.	60473.	0.0008	0.0113	0.0025
25.	9.93	2.962	2.50	11.72	62.39	54061.	110.	123.	1804.	56098.	0.0034	0.0118	0.0138
25.	9.93	2.743	2.70	14.76	49.52	49291.	297.	262.	5714.	55565.	0.0100	0.0261	0.0477
25.	9.93	2.554	2.90	18.29	39.97	45366.	739.	453.	15206.	61764.	0.0280	0.0479	0.1403
50.	10.52	3.411	2.30	9.13	95.26	64539.	11.	79.	96.	64724.	0.0003	0.0071	0.0006
50.	10.52	3.138	2.50	11.72	74.18	58052.	57.	124.	663.	58897.	0.0015	0.0112	0.0046
50.	10.52	2.906	2.70	14.76	58.88	52810.	149.	171.	2515.	55645.	0.0047	0.0166	0.0196
50.	10.52	2.705	2.90	18.29	47.52	48500.	374.	275.	7034.	56183.	0.0130	0.0273	0.0606
100.	11.09	3.595	2.30	9.13	111.54	69121.	6.	112.	48.	69288.	0.0001	0.0086	0.0003
100.	11.09	3.308	2.50	11.72	86.86	62039.	16.	111.	197.	62364.	0.0004	0.0096	0.0013
100.	11.09	3.063	2.70	14.76	68.95	56321.	69.	126.	1078.	57595.	0.0020	0.0120	0.0077
100.	11.09	2.851	2.90	18.29	55.65	51624.	204.	211.	3588.	55627.	0.0065	0.0194	0.0281
200.	11.64	3.774	2.30	9.13	129.01	73721.	2.	140.	4.	73867.	0.0000	0.0096	0.0000
200.	11.64	3.472	2.50	11.72	100.46	66037.	7.	94.	88.	66227.	0.0002	0.0075	0.0005
200.	11.64	3.215	2.70	14.76	79.75	59839.	28.	103.	348.	60318.	0.0008	0.0094	0.0024
200.	11.64	2.993	2.90	18.29	64.36	54751.	96.	180.	1446.	56474.	0.0029	0.0166	0.0108
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	128.	0.	78476.	0.0000	0.0084	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	5.	178.	27.	70265.	0.0001	0.0124	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	13.	98.	163.	63646.	0.0003	0.0082	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	54.	139.	714.	58797.	0.0014	0.0124	0.0051

SERIES 23 BILBAO WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.02

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	67.	162.	705.	42016.	0.0029	0.0231	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	272.	302.	3715.	41856.	0.0132	0.0453	0.0471
5.	7.21	1.991	2.70	14.76	18.94	34705.	829.	611.	14129.	50275.	0.0462	0.0965	0.1963
5.	7.21	1.854	2.90	18.29	15.28	32336.	2261.	1408.	42497.	78502.	0.1395	0.2370	0.6396
25.	8.09	2.623	2.30	9.13	43.31	46785.	6.	206.	53.	47050.	0.0002	0.0255	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	36.	147.	395.	43139.	0.0015	0.0195	0.0043
25.	8.09	2.234	2.70	14.76	26.77	39132.	130.	270.	1858.	41391.	0.0062	0.0394	0.0222
25.	8.09	2.080	2.90	18.29	21.61	36298.	459.	377.	6825.	43959.	0.0239	0.0573	0.0888
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	165.	14.	49274.	0.0001	0.0202	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	15.	177.	114.	44886.	0.0006	0.0235	0.0012
50.	8.43	2.329	2.70	14.76	30.30	40918.	60.	247.	845.	42070.	0.0027	0.0341	0.0093
50.	8.43	2.168	2.90	18.29	24.45	37895.	230.	281.	3256.	41661.	0.0112	0.0428	0.0406
100.	8.76	2.839	2.30	9.13	54.93	51359.	2.	195.	6.	51563.	0.0001	0.0201	0.0000
100.	8.76	2.612	2.50	11.72	42.78	46561.	6.	130.	58.	46754.	0.0002	0.0168	0.0005
100.	8.76	2.419	2.70	14.76	33.96	42669.	31.	205.	374.	43280.	0.0014	0.0287	0.0041
100.	8.76	2.252	2.90	18.29	27.41	39459.	121.	224.	1573.	41377.	0.0057	0.0313	0.0187
200.	9.08	2.941	2.30	9.13	61.08	53598.	1.	170.	3.	53772.	0.0000	0.0180	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	1.	198.	17.	48732.	0.0000	0.0226	0.0002
200.	9.08	2.506	2.70	14.76	37.76	44397.	18.	141.	139.	44695.	0.0007	0.0184	0.0015
200.	9.08	2.333	2.90	18.29	30.47	41002.	63.	166.	764.	41994.	0.0027	0.0241	0.0084
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	167.	0.	55986.	0.0000	0.0167	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	88.	2.	50545.	0.0001	0.0106	0.0000
400.	9.38	2.590	2.70	14.76	41.70	46108.	6.	148.	73.	46335.	0.0003	0.0192	0.0008
400.	9.38	2.411	2.90	18.29	33.66	42529.	38.	108.	360.	43035.	0.0016	0.0149	0.0038

SERIES 21 FOLLONICA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	46.	68.	759.	14521.	0.0093	0.0446	0.0395
5.	4.35	1.296	2.50	11.72	5.22	12417.	129.	110.	2570.	15226.	0.0303	0.0771	0.1484
5.	4.35	1.200	2.70	14.76	4.14	11416.	281.	181.	6498.	18376.	0.0747	0.1340	0.4147
5.	4.35	1.117	2.90	18.29	3.34	10588.	555.	340.	14526.	26009.	0.1645	0.2784	1.0213
25.	5.07	1.642	2.30	9.13	10.62	16395.	4.	65.	43.	16507.	0.0006	0.0365	0.0019
25.	5.07	1.510	2.50	11.72	8.27	14817.	15.	51.	234.	15118.	0.0033	0.0318	0.0114
25.	5.07	1.398	2.70	14.76	6.56	13539.	48.	69.	871.	14526.	0.0103	0.0439	0.0452
25.	5.07	1.302	2.90	18.29	5.30	12485.	117.	104.	2452.	15157.	0.0276	0.0718	0.1391
50.	5.36	1.736	2.30	9.13	12.55	17578.	1.	44.	12.	17634.	0.0002	0.0227	0.0005
50.	5.36	1.597	2.50	11.72	9.77	15849.	7.	72.	74.	16003.	0.0012	0.0405	0.0034
50.	5.36	1.479	2.70	14.76	7.76	14449.	21.	54.	350.	14874.	0.0042	0.0346	0.0170
50.	5.36	1.377	2.90	18.29	6.26	13297.	60.	67.	1078.	14502.	0.0128	0.0449	0.0569
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	58.	2.	18837.	0.0000	0.0265	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	2.	46.	23.	16966.	0.0004	0.0264	0.0010
100.	5.64	1.557	2.70	14.76	9.06	15371.	10.	42.	134.	15558.	0.0019	0.0256	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	28.	57.	491.	14694.	0.0060	0.0374	0.0245
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	80.	0.	20077.	0.0000	0.0336	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	1.	82.	8.	18047.	0.0001	0.0411	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	4.	51.	48.	16410.	0.0006	0.0296	0.0021
200.	5.92	1.522	2.90	18.29	8.46	14951.	14.	37.	209.	15212.	0.0027	0.0234	0.0100
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	55.	0.	21294.	0.0000	0.0237	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	0.	55.	1.	19093.	0.0001	0.0273	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	2.	76.	21.	17356.	0.0002	0.0395	0.0009
400.	6.20	1.593	2.90	18.29	9.70	15798.	6.	51.	81.	15936.	0.0011	0.0303	0.0036

SERIES 21 FOLLONICA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	4.35	1.408	2.30	9.13	6.70	13649.	31.	48.	534.	14262.	0.0091	0.0467	0.0416
5.	4.35	1.296	2.50	11.72	5.22	12417.	85.	76.	1710.	14289.	0.0293	0.0768	0.1443
5.	4.35	1.200	2.70	14.76	4.14	11416.	189.	115.	4329.	16049.	0.0744	0.1281	0.4069
5.	4.35	1.117	2.90	18.29	3.34	10588.	377.	225.	9768.	20958.	0.1646	0.2757	1.0115
25.	5.07	1.642	2.30	9.13	10.62	16395.	2.	39.	30.	16465.	0.0007	0.0312	0.0020
25.	5.07	1.510	2.50	11.72	8.27	14817.	12.	43.	168.	15040.	0.0031	0.0403	0.0124
25.	5.07	1.398	2.70	14.76	6.56	13539.	33.	36.	581.	14188.	0.0103	0.0358	0.0448
25.	5.07	1.302	2.90	18.29	5.30	12485.	78.	77.	1633.	14273.	0.0268	0.0810	0.1353
50.	5.36	1.736	2.30	9.13	12.55	17578.	0.	29.	9.	17615.	0.0001	0.0226	0.0004
50.	5.36	1.597	2.50	11.72	9.77	15849.	4.	46.	59.	15958.	0.0012	0.0394	0.0037
50.	5.36	1.479	2.70	14.76	7.76	14449.	15.	44.	241.	14750.	0.0043	0.0422	0.0176
50.	5.36	1.377	2.90	18.29	6.26	13297.	40.	52.	753.	14143.	0.0130	0.0516	0.0598
100.	5.64	1.828	2.30	9.13	14.66	18777.	0.	40.	1.	18819.	0.0001	0.0284	0.0001
100.	5.64	1.682	2.50	11.72	11.42	16894.	2.	20.	16.	16932.	0.0004	0.0168	0.0009
100.	5.64	1.557	2.70	14.76	9.06	15371.	7.	38.	96.	15512.	0.0018	0.0342	0.0063
100.	5.64	1.450	2.90	18.29	7.31	14118.	22.	49.	340.	14529.	0.0059	0.0467	0.0239
200.	5.92	1.919	2.30	9.13	16.95	19997.	0.	38.	0.	20035.	0.0000	0.0245	0.0000
200.	5.92	1.765	2.50	11.72	13.20	17956.	0.	28.	4.	17989.	0.0001	0.0239	0.0003
200.	5.92	1.634	2.70	14.76	10.48	16307.	3.	35.	41.	16385.	0.0007	0.0299	0.0023
200.	5.92	1.522	2.90	18.29	8.46	14951.	10.	29.	150.	15140.	0.0027	0.0277	0.0100
400.	6.20	2.008	2.30	9.13	19.44	21239.	0.	44.	0.	21282.	0.0000	0.0269	0.0000
400.	6.20	1.848	2.50	11.72	15.14	19036.	0.	36.	2.	19074.	0.0000	0.0261	0.0001
400.	6.20	1.711	2.70	14.76	12.02	17258.	2.	37.	12.	17308.	0.0003	0.0286	0.0008
400.	6.20	1.593	2.90	18.29	9.70	15798.	4.	37.	60.	15899.	0.0012	0.0321	0.0040

SERIES 22 NORTH SEA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	184.	151.	3748.	53151.	0.0109	0.0263	0.0532
5.	8.43	2.514	2.50	11.72	38.12	44559.	498.	319.	11012.	56388.	0.0326	0.0586	0.1746
5.	8.43	2.328	2.70	14.76	30.26	40899.	1068.	615.	27248.	69830.	0.0801	0.1253	0.4812
5.	8.43	2.167	2.90	18.29	24.42	37878.	2010.	1110.	56861.	97858.	0.1658	0.2484	1.1056
25.	9.93	3.220	2.30	9.13	80.12	59955.	17.	84.	247.	60304.	0.0008	0.0121	0.0028
25.	9.93	2.962	2.50	11.72	62.39	54061.	65.	90.	1040.	55256.	0.0034	0.0138	0.0132
25.	9.93	2.743	2.70	14.76	49.52	49291.	181.	141.	3474.	53088.	0.0102	0.0232	0.0502
25.	9.93	2.554	2.90	18.29	39.97	45366.	426.	297.	9038.	55127.	0.0279	0.0529	0.1404
50.	10.52	3.411	2.30	9.13	95.26	64539.	4.	63.	75.	64681.	0.0002	0.0090	0.0009
50.	10.52	3.138	2.50	11.72	74.18	58052.	25.	69.	389.	58536.	0.0012	0.0105	0.0045
50.	10.52	2.906	2.70	14.76	58.88	52810.	94.	104.	1504.	54512.	0.0048	0.0167	0.0197
50.	10.52	2.705	2.90	18.29	47.52	48500.	217.	136.	4320.	53172.	0.0125	0.0232	0.0622
100.	11.09	3.595	2.30	9.13	111.54	69121.	1.	64.	22.	69208.	0.0001	0.0089	0.0002
100.	11.09	3.308	2.50	11.72	86.86	62039.	9.	57.	123.	62228.	0.0004	0.0084	0.0013
100.	11.09	3.063	2.70	14.76	68.95	56321.	40.	61.	601.	57023.	0.0018	0.0096	0.0077
100.	11.09	2.851	2.90	18.29	55.65	51624.	112.	102.	1940.	53777.	0.0061	0.0163	0.0262
200.	11.64	3.774	2.30	9.13	129.01	73721.	0.	79.	9.	73809.	0.0000	0.0091	0.0001
200.	11.64	3.472	2.50	11.72	100.46	66037.	3.	36.	47.	66123.	0.0001	0.0050	0.0004
200.	11.64	3.215	2.70	14.76	79.75	59839.	19.	69.	250.	60177.	0.0008	0.0104	0.0030
200.	11.64	2.993	2.90	18.29	64.36	54751.	54.	87.	904.	55797.	0.0028	0.0143	0.0117
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	129.	2.	78478.	0.0000	0.0135	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	2.	82.	11.	70151.	0.0001	0.0106	0.0001
400.	12.18	3.363	2.70	14.76	91.29	63372.	9.	44.	76.	63501.	0.0003	0.0064	0.0010
400.	12.18	3.131	2.90	18.29	73.68	57890.	27.	66.	494.	58478.	0.0013	0.0100	0.0057

SERIES 22 NORTH SEA WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.08

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	8.43	2.732	2.30	9.13	48.96	49068.	137.	94.	2578.	51877.	0.0120	0.0240	0.0538
5.	8.43	2.514	2.50	11.72	38.12	44559.	358.	210.	7756.	52882.	0.0347	0.0572	0.1789
5.	8.43	2.328	2.70	14.76	30.26	40899.	737.	434.	18270.	60340.	0.0805	0.1288	0.4754
5.	8.43	2.167	2.90	18.29	24.42	37878.	1360.	773.	39035.	79046.	0.1662	0.2519	1.1128
25.	9.93	3.220	2.30	9.13	80.12	59955.	12.	54.	146.	60168.	0.0009	0.0112	0.0027
25.	9.93	2.962	2.50	11.72	62.39	54061.	44.	66.	650.	54820.	0.0034	0.0158	0.0130
25.	9.93	2.743	2.70	14.76	49.52	49291.	131.	97.	2353.	51873.	0.0106	0.0243	0.0495
25.	9.93	2.554	2.90	18.29	39.97	45366.	288.	182.	6159.	51995.	0.0276	0.0476	0.1429
50.	10.52	3.411	2.30	9.13	95.26	64539.	3.	65.	39.	64646.	0.0003	0.0132	0.0008
50.	10.52	3.138	2.50	11.72	74.18	58052.	23.	45.	256.	58376.	0.0014	0.0104	0.0050
50.	10.52	2.906	2.70	14.76	58.88	52810.	59.	71.	1031.	53970.	0.0047	0.0168	0.0196
50.	10.52	2.705	2.90	18.29	47.52	48500.	152.	115.	2955.	51721.	0.0135	0.0278	0.0634
100.	11.09	3.595	2.30	9.13	111.54	69121.	1.	31.	9.	69163.	0.0001	0.0062	0.0002
100.	11.09	3.308	2.50	11.72	86.86	62039.	8.	39.	101.	62187.	0.0005	0.0079	0.0016
100.	11.09	3.063	2.70	14.76	68.95	56321.	28.	56.	415.	56820.	0.0021	0.0125	0.0078
100.	11.09	2.851	2.90	18.29	55.65	51624.	74.	73.	1320.	53091.	0.0060	0.0177	0.0263
200.	11.64	3.774	2.30	9.13	129.01	73721.	1.	55.	6.	73781.	0.0000	0.0097	0.0001
200.	11.64	3.472	2.50	11.72	100.46	66037.	4.	56.	32.	66129.	0.0001	0.0111	0.0005
200.	11.64	3.215	2.70	14.76	79.75	59839.	15.	40.	184.	60078.	0.0010	0.0093	0.0030
200.	11.64	2.993	2.90	18.29	64.36	54751.	42.	50.	580.	55424.	0.0029	0.0127	0.0111
400.	12.18	3.948	2.30	9.13	147.69	78347.	0.	52.	2.	78401.	0.0000	0.0091	0.0000
400.	12.18	3.632	2.50	11.72	115.00	70056.	1.	66.	11.	70134.	0.0000	0.0128	0.0002
400.	12.18	3.363	2.70	14.76	91.29	63372.	5.	46.	55.	63478.	0.0003	0.0097	0.0011
400.	12.18	3.131	2.90	18.29	73.68	57890.	18.	51.	256.	58214.	0.0015	0.0120	0.0048

SERIES 23 BILBAO WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.05

50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	34.	77.	439.	41632.	0.0027	0.0185	0.0082
5.	7.21	2.150	2.50	11.72	23.86	37567.	156.	166.	2279.	40168.	0.0132	0.0415	0.0488
5.	7.21	1.991	2.70	14.76	18.94	34705.	504.	369.	8538.	44116.	0.0475	0.0977	0.1985
5.	7.21	1.854	2.90	18.29	15.28	32336.	1311.	835.	24606.	59088.	0.1375	0.2401	0.6312
25.	8.09	2.623	2.30	9.13	43.31	46785.	5.	86.	31.	46907.	0.0002	0.0195	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	20.	122.	221.	42925.	0.0013	0.0281	0.0039
25.	8.09	2.234	2.70	14.76	26.77	39132.	77.	136.	1072.	40417.	0.0063	0.0352	0.0220
25.	8.09	2.080	2.90	18.29	21.61	36298.	261.	209.	4128.	40897.	0.0236	0.0526	0.0913
50.	8.43	2.733	2.30	9.13	49.02	49092.	0.	106.	9.	49208.	0.0000	0.0215	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	5.	72.	80.	44737.	0.0004	0.0171	0.0014
50.	8.43	2.329	2.70	14.76	30.30	40918.	31.	89.	399.	41437.	0.0025	0.0210	0.0079
50.	8.43	2.168	2.90	18.29	24.45	37895.	143.	161.	2021.	40219.	0.0119	0.0401	0.0422
100.	8.76	2.839	2.30	9.13	54.93	51359.	0.	134.	2.	51495.	0.0000	0.0237	0.0000
100.	8.76	2.612	2.50	11.72	42.78	46561.	4.	58.	33.	46655.	0.0003	0.0137	0.0005
100.	8.76	2.419	2.70	14.76	33.96	42669.	20.	108.	231.	43028.	0.0012	0.0259	0.0039
100.	8.76	2.252	2.90	18.29	27.41	39459.	76.	121.	951.	40608.	0.0056	0.0309	0.0187
200.	9.08	2.941	2.30	9.13	61.08	53598.	0.	110.	0.	53709.	0.0000	0.0189	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	3.	94.	22.	48635.	0.0002	0.0190	0.0003
200.	9.08	2.506	2.70	14.76	37.76	44397.	9.	98.	90.	44594.	0.0006	0.0226	0.0016
200.	9.08	2.333	2.90	18.29	30.47	41002.	32.	135.	453.	41623.	0.0025	0.0308	0.0086
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	120.	0.	55938.	0.0000	0.0213	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	1.	89.	10.	50554.	0.0001	0.0174	0.0001
400.	9.38	2.590	2.70	14.76	41.70	46108.	4.	82.	47.	46241.	0.0003	0.0183	0.0006
400.	9.38	2.411	2.90	18.29	33.66	42529.	16.	105.	219.	42869.	0.0012	0.0241	0.0038

SERIES 23 BILBAO WAVES NO DOWNTIME COSTS DAMAGE ACCUMULATION RATE 0.08



50 years lifetime

TDES	HS	DN	NS	KD	MASS	C-IN	C-RLS	C-SLS	C-ULS	C-TOT	P-RLS	P-SLS	P-ULS
5.	7.21	2.337	2.30	9.13	30.64	41082.	25.	52.	283.	41443.	0.0027	0.0190	0.0080
5.	7.21	2.150	2.50	11.72	23.86	37567.	106.	113.	1512.	39298.	0.0136	0.0420	0.0485
5.	7.21	1.991	2.70	14.76	18.94	34705.	322.	257.	5694.	40979.	0.0470	0.1014	0.1981
5.	7.21	1.854	2.90	18.29	15.28	32336.	865.	551.	16511.	50264.	0.1344	0.2351	0.6266
25.	8.09	2.623	2.30	9.13	43.31	46785.	2.	69.	18.	46874.	0.0002	0.0206	0.0005
25.	8.09	2.413	2.50	11.72	33.73	42562.	11.	53.	135.	42761.	0.0012	0.0199	0.0038
25.	8.09	2.234	2.70	14.76	26.77	39132.	50.	87.	721.	39990.	0.0063	0.0305	0.0210
25.	8.09	2.080	2.90	18.29	21.61	36298.	187.	142.	2669.	39297.	0.0234	0.0538	0.0879
50.	8.43	2.733	2.30	9.13	49.02	49092.	1.	88.	4.	49185.	0.0000	0.0257	0.0001
50.	8.43	2.515	2.50	11.72	38.17	44580.	8.	47.	37.	44672.	0.0006	0.0153	0.0011
50.	8.43	2.329	2.70	14.76	30.30	40918.	29.	73.	315.	41335.	0.0032	0.0264	0.0089
50.	8.43	2.168	2.90	18.29	24.45	37895.	92.	108.	1339.	39434.	0.0114	0.0416	0.0411
100.	8.76	2.839	2.30	9.13	54.93	51359.	0.	69.	5.	51433.	0.0000	0.0200	0.0001
100.	8.76	2.612	2.50	11.72	42.78	46561.	1.	67.	16.	46645.	0.0002	0.0225	0.0004
100.	8.76	2.419	2.70	14.76	33.96	42669.	11.	55.	139.	42874.	0.0012	0.0173	0.0039
100.	8.76	2.252	2.90	18.29	27.41	39459.	48.	63.	622.	40193.	0.0052	0.0244	0.0183
200.	9.08	2.941	2.30	9.13	61.08	53598.	0.	98.	2.	53699.	0.0000	0.0265	0.0000
200.	9.08	2.706	2.50	11.72	47.56	48516.	1.	52.	6.	48575.	0.0001	0.0148	0.0001
200.	9.08	2.506	2.70	14.76	37.76	44397.	7.	58.	77.	44540.	0.0006	0.0193	0.0018
200.	9.08	2.333	2.90	18.29	30.47	41002.	28.	76.	297.	41402.	0.0028	0.0268	0.0087
400.	9.38	3.041	2.30	9.13	67.47	55819.	0.	49.	0.	55868.	0.0000	0.0129	0.0000
400.	9.38	2.797	2.50	11.72	52.53	50454.	0.	81.	3.	50538.	0.0000	0.0223	0.0001
400.	9.38	2.590	2.70	14.76	41.70	46108.	2.	49.	19.	46180.	0.0003	0.0156	0.0005
400.	9.38	2.411	2.90	18.29	33.66	42529.	13.	57.	139.	42738.	0.0014	0.0192	0.0039

## **Appendix D1 Background note containing assumptions and formulae applied in optimizations analyses of caisson breakwaters**

### **1. Objective**

The present note explains the basis for the optimization calculations performed with the objective of identifying the most economical safety levels for conventional caisson breakwaters, evaluated over the service lifetime of the structures. Caissons on bedding layer and high rock foundation are analyzed.

### **2. Procedure in numerical simulations**

Reference is given to Appendix A1.

### **3. General assumptions**

#### *Cross sections*

Fig. 1 shows the cross sections dealt with in the simulations. In accordance with Japanese recommendations given by OCDI (2002) for outer breakwaters is chosen a freeboard of

$h_c = 0.6 \cdot H_s^{T_L}$ , where  $T_L$  is the design life time of the structure.

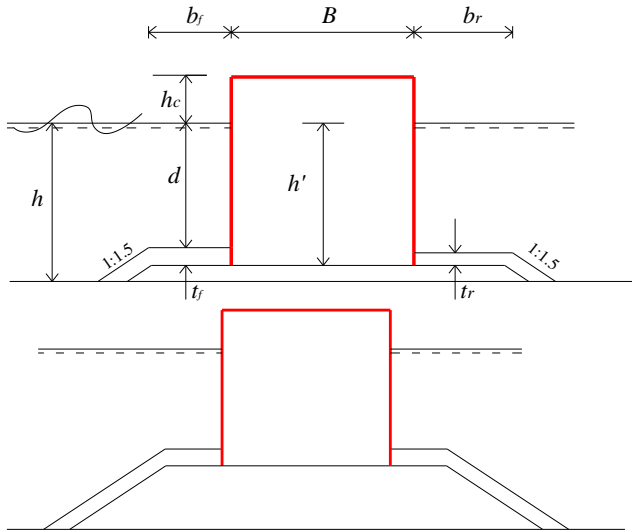


Fig. 1. Cross sections of outer caisson breakwaters on bedding layer (top) and on high mound foundation (bottom).

The ratio between the caisson draft  $h'$  and the water depth  $h$  has been varied in all the simulations in order to identify the most economical ratios.

#### Volumes

$U$  is bulk unit price,  $V$  is volume

Caisson :  $U_c$ ,  $V_c = (h' + h_c)B$

Armour layer front :  $U_{af}$ ,  $V_{af} = (h' - d)(b_f + 1.80(h - 0.5d - 0.5h'))$

Armour layer rear :  $U_{ar}$ ,  $V_{ar} = t_r(b_r + 1.80(h - h' + 0.5t_r))$

Foundation core :  $U_{co}$ ,  $V_{co} = (h - h')(B + b_f + b_r + 1.5(h - h'))$

Conditions both with sea bed materials strong enough to resist slip failures (hard bottom) and sandy sea beds have been analysed. The studied failure modes are shown in Fig. 2. For the slip failure the angle  $\theta$  giving the lowest resistance has been identified.

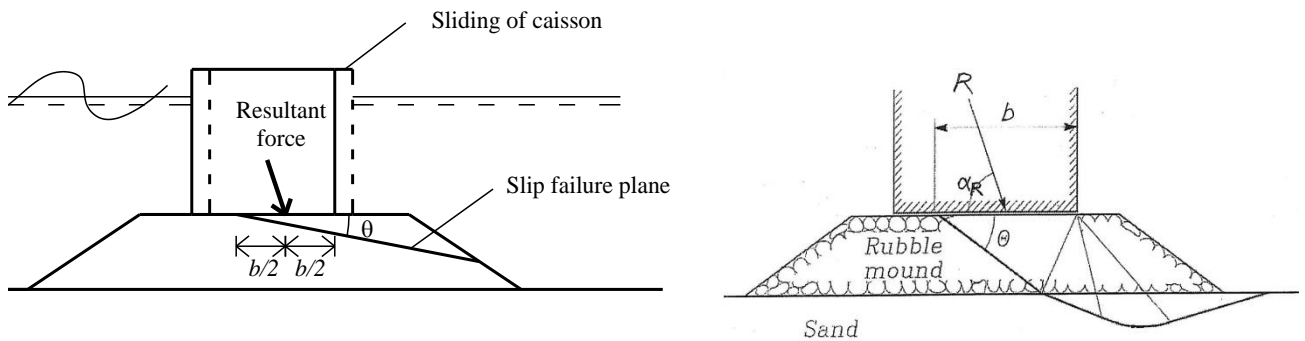


Fig. 2. Failure modes included in the optimization

Toe berm stability has not been included because the extra cost of making the berm armour very safe is too small to have significant influence on the cost optimization.

*Repair strategy, limit state performances, costs of construction and repairs*

Two methods of repair/stabilization as shown in Fig.3 are considered; armour blocks in front and/or a rubble mound behind the caisson.

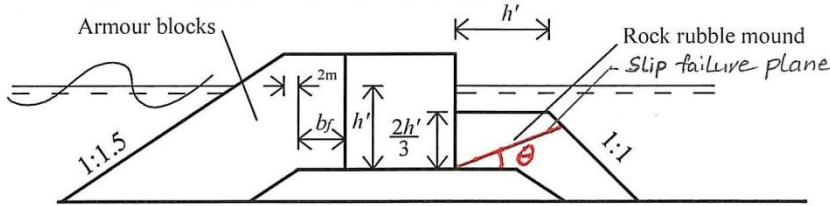


Fig.3. Armour blocks in front of caisson and rubble mound behind caisson as means of repair.

Volume of armour blocks in front for repair (dissipation blocks)

$$V_{diss} = 0.75 (h + h_c)^2 + (b_f + 2)(h + h_c) - 0.75 (h - d)^2 - b_f (h - d)$$

Volume of mound behind for repair

$$V_m = (h - h'/3)h' + 0.5 (h - h'/3)^2 - V_{ar} - (h - h')b_r - 0.75 (h - h')^2$$

The used limit state performances and related methods of repair are given in Table 1.

Table 1. Limit state performances and repair.

Limit states	Failures	Repair
SLS	Sliding distance 0.2 m	No
RLS	Sliding distance 0.5 m	Armour blocks in front or mound behind
ULS	Sliding distance 2.0 m	Both
	Slip failure	Both , double unit costs

The chosen sliding distances are assumed reasonable values for outer breakwaters with no berths arranged on the harbour side of the caissons.

Table 2 provides the average built-in bulk unit prices collected by the PIANC MarCom Working Group 47 members. The Japanese prices are used in the present analyses. For the identification of

the optimum safety level only the ratio between the costs of the various parts of the structure including repairs are of importance.

The unit price for the caissons is kept constant although the price will increase if the height of the caissons demands special production plants. The consequence of this simplification is that the optimization calculations will show that it is more economical even in very deep water to have the caissons placed on a thin bedding layer rather than on a high rubble foundation. In order to avoid such bias the maximum draught of the caissons is set to 24 m in the simulations.

Table 2. Average built-in bulk unit prices in Euro/m<sup>3</sup> (app. 2007).

Structure part	Europe	Japan
Caisson, $U_c$	90	150
Armour layers, $U_{af}$ and $U_{ar}$	150	235
Foundation core, $U_{co}$	25	37
Armour blocks in front for repair, $U_{diss}$	150	200
Mound behind for repair, $U_m$	30	50

The ratio of unit prices in Japan and Europe is approximately 1.6.

Construction costs

$$C = U_c \cdot V_c + U_{af} \cdot V_{af} + U_{ar} \cdot V_{ar} + U_c \cdot V_c$$

*Downtime costs*

No downtime costs are included as increase in wave transmission in case of failures will be very limited because the reduction in caisson crest level will be small.

#### 4. Wave induced loads

The formula of Goda (1974) with inclusions of Tanimoto et al. (1976) is used. It is assumed that large impulsive forces are avoided by imposing the conditions that the sea bed is more gentle than 1:50 and  $d/h \geq 0.6$ .

Fig. 4. Definition sketch related to the Goda wave loads on caisson

Waves perpendicular to caisson front.

$$\eta^* = 1.50 \cdot H_{\max} \quad (1)$$

$$p_1 = (\alpha_1 \lambda_1 + \alpha_2 \lambda_2) \rho_w \cdot g \cdot H_{\max}$$

$$p_2 = \frac{\eta^* - h_c}{\eta^*} \cdot p_1, \quad p_2 \equiv 0 \text{ for } h_c \geq \eta^*$$

$$p_3 = \alpha_3 \cdot p_1$$

$$p_u = \lambda_3 \alpha_1 \cdot \alpha_3 \rho_w \cdot g \cdot H_{\max}$$

where

$$\alpha_1 = 0.6 + 0.5 \left[ \frac{4\pi \cdot h / L}{\sin h(4\pi h / L)} \right]^2$$

$$\alpha_2 = \min \left[ \frac{h-d}{3h} \left( \frac{H_{\max}}{d} \right)^2, \frac{2 \cdot d}{H_{\max}} \right]$$

$$\alpha_3 = 1 - \frac{h'}{h} \left[ 1 - \frac{1}{\cos h(2\pi h/L)} \right]$$

$\lambda_1 = \lambda_2 = \lambda_3 = 1$  for impermeable wall without blocks in front

In accordance with OCDI (2002), the following factors in the Goda formula for the reduction of the wave loads in case of repair with armour blocks in front of the caisson is used:

$$\lambda_1 = \lambda_3 = \begin{cases} 1.0 & \text{for } H_{\max} / h < 0.3 \\ 1.2 - 0.67 H_{\max} / h & \text{for } 0.3 \leq H_{\max} / h < 0.6 \\ 0.8 & \text{for } H_{\max} / h \geq 0.6 \end{cases} \quad \lambda_2 = 0$$

$L$  = wave length corresponding to the significant wave height  $H_s$  at water depth at distance five times  $H_s$  from the front of the caisson.

$$H_{\max} = 1.8 \cdot H_{so}^{T_L} \text{ (non - depth limited conditions)}$$

$$\text{Deep water wave steepness } s_o = \frac{H_{so}^{T_L}}{L_{so}^{T_L}}$$

$$L_{so}^{T_L} = \frac{H_{so}^{T_L}}{s_o} = \frac{g}{2\pi} T_s^2$$

$$L = L_{so}^{T_L} \tan h\left(\frac{2\pi}{L} h\right) = \frac{H_{so}^{T_L}}{s_o} \tan h\left(\frac{2\pi}{L} h\right)$$

*Resultant wave induced forces*

(No crown wall. Japanese case for outer breakwater)

Fig. 5. Definition sketch for resultant wave induced forces on caisson

*Horizontal force*

$$F_H = 0.5(p_1 + p_2) \cdot h_c + 0.5(p_1 + p_3)h' \quad (2)$$

$$a_{F_H} = \frac{1}{F_H} \left[ \frac{1}{2} p_2 h_c h' + \frac{1}{3} p_2 h_c^2 + \frac{1}{6} p_1 h_c^2 + \frac{1}{3} p_1 h'^2 + \frac{1}{2} p_1 \cdot h_c h' + \frac{1}{6} p_3 h'^2 \right]$$

(control : for  $p_1 = p_2 = p_3 \Rightarrow F_H = p_1(h_c + h')$  and  $a_{F_H} = \frac{1}{2}(h_c + h')$ )

*Vertical forces*

$$G_c = [\rho_c \cdot B(h' + h_c) - \rho_w \cdot B \cdot h']g \quad (3)$$

$$a_{G_c} = \frac{1}{2}B$$

$$F_u = \frac{1}{2} \cdot p_u \cdot B$$

$$a_{F_u} = \frac{2}{3}B$$

*Resultant vertical force*

$$R_v = G_c - F_u = B[(\rho_c - \rho_w)h + \rho_c h_c]g - \frac{1}{2}p_u B$$

(4)

Fig. 6. Definition sketch for resultant caisson force on foundation

$$R = F_u \frac{\cos \alpha_1}{\sin \alpha_2} \tag{5}$$

where

$$\alpha_1 = \tan^{-1}\left(\frac{G_c}{F_H}\right)$$

$$\alpha_2 = \tan^{-1}\left(\frac{F_u \cos \alpha_1}{(G_c^2 + F_H^2)^{0.5} - F_u \sin \alpha_1}\right)$$

$$\alpha_R = \alpha_1 - \alpha_2$$

$$a_R = \frac{1}{R} (G_c \cdot a_{G_c} - F_H \cdot a_{F_H} - F_u \cdot a_{F_u}), \text{ must be positive in order to keep the intersection}$$

between  $R$  and the base plate inside the caisson.

$$b = \frac{2 a_R}{\sin \alpha_R}$$

## 5. Stability calculations



Wave loads on caissons are determined by the formula by Goda (2000). It is assumed that large impulsive forces are avoided by imposing the conditions that the sea bed slope is milder than 1:50, and  $d/h \geq 0.6$ , see Fig.1.

### *Deterministic design*

The caisson width  $B$  in the deterministic design is determined by applying the design wave height  $H_{design} = 1.8 \cdot H_{s0}^{T_L}$  for non-depth limited conditions.  $H_{s0}^{T_L}$  is the deep water significant wave height corresponding to return period  $T_L$ , i.e. the service life time of the structure. Wave lengths corresponding to local water depths  $h$  given a deep water wave steepness of  $s_o=0.04$  are applied. For depth limited conditions is used a maximum  $H_{design}=0.8 h$ .

The design equation for  $B$  reads

$$B = \frac{S \cdot F_H}{f \left[ (\rho_c - \rho_w) h' g + \rho_c h_c \cdot g - \frac{1}{2} \rho_u \right]} \quad (6)$$

where  $F_H$  is the horizontal wave load corresponding to  $H_{design}$ , calculated by the Goda formula for wave loads on caissons, see Goda (2000).

$S = 1.2$  is a safety factor

$f = 0.6$  is the friction coefficient of the base plate

$\rho_c = 2150 \text{ kg/m}^3$ , bulk mass density of caisson

$\rho_w = 1025 \text{ kg/m}^3$ , mass density of water

$\rho_u$  = wave induced uplift pressure at base plate front edge calculated by the Goda formula.

Tilting of the caisson around the heel applying a safety factor of  $S = 2.5$  is included in the deterministic determination of  $B$ , but was never critical.

The average normal stress  $\sigma$  over the effective foundation width  $b$  shown in Fig. 2 is calculated in order to get a simple measure for the foundation loading.

### *Reliability calculations*

In the probabilistic calculation of the performances of the deterministic designs are used the actual time series of Rayleigh distributed wave heights obtained from sample simulations in accordance with predefined long-term statistics, see PIANC (1992), including uncertainties on the distribution parameters. In order to avoid unrealistic wave height double truncated Weibull distributions are used (Tae-Min Kim, 2004). The number of waves in each storm is set to 1,000.

A limit for the maximum wave height of 0.8 times the local water depth  $h$  is used.

Wave loads were determined from the Goda formula without safety factor, corrected for bias and including uncertainty by introducing double truncated Normal-distributed factors  $X_{FH}$  and  $X_{FU}$  on

$F_H$  and  $F_U$  as follows:

Horizontal force factor,  $0.5 < X_{FH} < 1.4$ ,  $\mu_{X_{FH}} = 0.90$ ,

$$\frac{\sigma_{X_{FH}}}{\mu_{X_{FH}}} = 0.20$$

Uplift force factor,  $0.5 < X_{FU} < 1.4$ ,  $\mu_{X_{FU}} = 0.80$ ,

$$\frac{\sigma_{X_{FU}}}{\mu_{X_{FU}}} = 0.30$$

$F_U$  is the wave induced uplift force on the caisson bottom slab.

For limits related to the double truncated normal distributions see Tae-Min Kim (2004) p. 55-62, Table 3.11.

The Goda formula is a conservative design formula for which reason a positive bias is inherent in the formula. The bias was not included in the calculations by Tae- Min Kim (2004).

The friction factor  $f$  is modelled by a double truncated normal distribution with mean value  $\mu_f = 0.6$ ,  $\sigma_f / \mu_f = 0.1$ , and cut-off limits  $0.7 < f < 1.4$ .

#### *Resistance to sliding from mound behind caisson*

The resistance to sliding  $R_m$  provided by the mound behind the caisson is calculated in accordance with OCDI (2002), see Figs. 3 and 7 for dimensions of the mound.

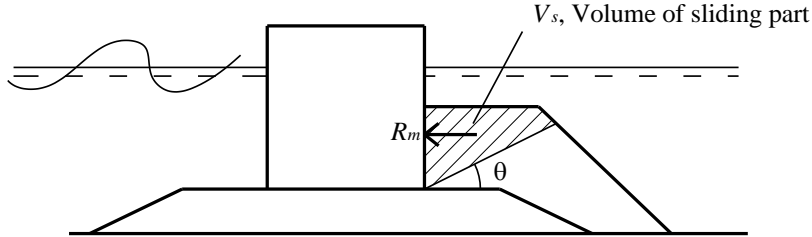


Fig. 7. Illustration of resistance of mound to sliding.

$$R_m = V_s \cdot \gamma' \tan(\theta + \varphi)$$

where  $V_s$  is the volume of the sliding part of the mound

$$\gamma' = 9810 \text{ N/m}^3 \text{ submerged unit weight of mound}$$

$$\varphi = 38^\circ, \text{ friction angle of mound material}$$

$\theta$  is the slip plane angle with horizontal to be identified related to min.  $R_m$ .

$$V_s = 2/9 h^2 \tan(90^\circ - \theta) \quad \text{for } \theta \geq 33.7^\circ$$

$$V_s = (0.333 + 0.708 \sin(33.7^\circ - \theta) / \sin(45^\circ + \theta)) h^2 \quad \text{for } \theta < 33.7^\circ$$

### Geotechnical slip failure resistance

The equations related to slip failures are given in Sorensen and Burcharth (2000).

For the strength of the quarry rock rubble foundation are used friction angles of  $37^\circ$ ,  $40^\circ$  and  $45^\circ$  are used. For the sand seabed are used the friction angles  $30^\circ$  and  $35^\circ$ .

These friction angles are the effective friction angles, i.e. they include the effect of the dilation angles of the materials. The uncertainty on the friction angles is modelled as a Normal distribution with a coefficient of variation of 10%.

### Determination of caisson sliding distance

The sliding distance SD of the caisson should preferably be determined from the dynamic equation of motion assuming a model for the time history of the loading by each wave. In order to save computation time the diagrams shown in Fig. 8 are used. The ordinate is the ratio of the actual horizontal wave force  $F_H$  of a single wave to the wave force  $F_{H,limit}$  which is the force just causing the caisson to slide, calculated from eq. (6) with  $S = 1$ .

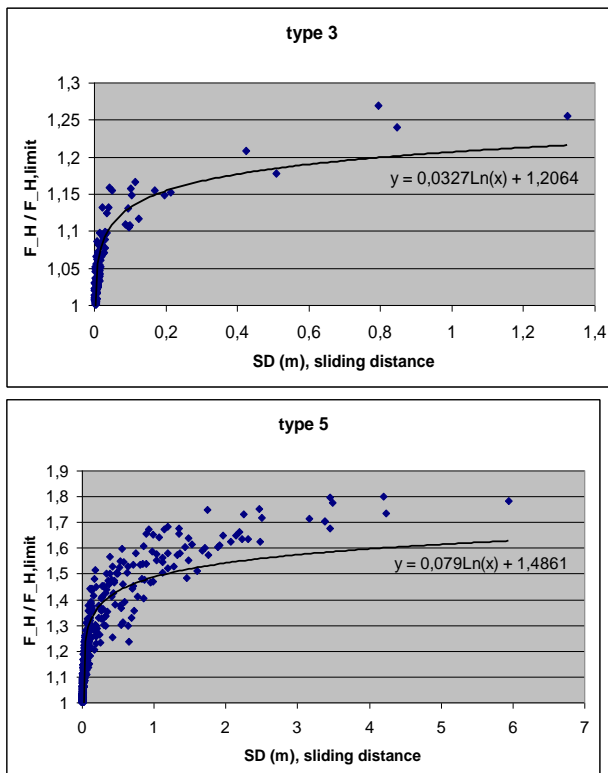


Fig. 8. Diagrams for the estimation of caisson sliding distance.

The data points in Fig. 8 was provided by Tae-Min Kim (2005), based on his earlier calculations for a caisson (type 3) in water depth  $h = 16$  m, of dimensions

$h' \times h_c \times B \times d = 13 \times 5 \times 25.3 \times 11.5\text{m}$ , and a caisson (type 5) in water depth  $h = 24\text{ m}$ , of dimensions  $h' \times h_c \times B \times d = 14 \times 5 \times 26.8 \times 12.5\text{m}$

The graphs fitted to the data points are deliberately chosen to be on the safe side for larger values of  $F_H/F_{H,\text{limit}}$  because the dimensions of the caissons and the wave conditions applied in the simulations deviate somewhat from those studied by Tae-Min Kim. A sensitivity analysis has shown that if a graph following more closely the larger data points for Type 5 caisson is used in the simulations then the probability of occurrence of the limit state sliding distances will be approximately halved. However, the slip failure probabilities and the minimum lifetime costs are not significantly changed.

## 6. Formulation of total cost functions

See Appendix A1.

## 7. Characteristics of design variables in stochastic model

As to wave modelling see Appendix A1. Data for other variables are given in Chapter 5.

## 8. Case studies

The performance of caisson structures deterministically designed for significant wave height return periods of 25, 50, 100, 200, 400, 1000, 1600 and 3200 years are analysed by probabilistic Monte Carlo simulations. The related lifetime costs are determined and the safety levels and the structure dimensions corresponding to the minimum lifetime costs are identified.

### *Caissons on rubble foundation on hard bottom seabed*

A deep water wave steepness of 0.04 and an interest rate of 5% p.a. are used in all cases. No downtime costs are included. Service lifetime is 100 years. Rubble friction angles of  $\phi = 37^\circ$ ,  $40^\circ$  and  $45^\circ$  are applied.

Table 3 gives an overview of the studied cases.

Table 3. Case studies. Caissons on hard bottom. Structure lifetime  $T_L = 100$  years

Case	Water depth, $h$ (m)	Wave climate		Rubble friction angle $\phi$ (degrees)	Dimensions of berms and armour (Fig.1), (m)				Sliding eq. No. cf. Fig. 14.4	RLS repair
		Location	$H_s^{100\text{y}}$		$b_f$	$t_f$	$b_r$	$t_r$		
F1-a-37	15	Follonica	5.64	37	8.00	1.50	10.00	1.50	3	Armour blocks front
F1-b-37	-	-	-	-	-	-	-	-	-	Mound behind
F1-b-40	-	-	-	40	-	-	-	-	-	-

F1-b-45	-	-	-	45	-	-	-	-	-	-
B1-a-37	25	Bilbao	8.76	37	10.00	2.00	12.00	1.5	5	Armour blocks front
B1-b-37	-	-	-	-	-	-	-	-	-	Mound behind
B2-b-37	-	.	-	-	-	-	24.00	-	-	-
B1-b-40	-	-	-	40	-	-	12.00	-	-	-
B1-b-45	-	-	-	45	-	-	-	-	-	-
S1-b-37	40	Sines	13.2	37	12.00	3.00	14.00	2.00	5	-
S2-b-37	-	-	-	-	-	-	28.00	-	-	-
S1-b-40	-	-	-	40	-	-	14.00	-	-	-
S2-b-40	-	-	-	-	-	-	28.00	-	-	-
S1-b-45	-	-	-	45	-	-	14.00	-	-	-
S2-b-45	-	-	-	-	-	-	28.00	-	-	-
FD-b-40	-	Follonica	5.64	40	8.00	1.50	14.00	1.50	5	-

*Caissons on rubble foundation on sand seabed*

The simulations are performed with sand friction angles  $\varphi = 30^\circ$  and  $35^\circ$ . The friction angles of the rubble foundation are  $\varphi = 37^\circ$ ,  $40^\circ$  and  $45^\circ$ . A deep water wave steepness of 0.04 and an interest rate of 5% p.a. are used in all cases. No downtime costs are included. Service lifetime is 100 years.

Table 4 gives an overview of the studied cases.

Table 4. Case studies. Caissons on sand sea beds. Structure lifetime  $T_L = 100$  years

Case	Water depth, h (m)	Wave climate		Friction angle $\varphi$ (degrees)		Dimensions of berms and armour (Fig.1), (m)				Sliding eq. No. cf. Fig. 14.4	RLS repair
		Location	$H_s^{100y}$	Rubble	Sand	$b_r$	$t_r$	$b_r$	$t_r$		
F1-s30-r37	15	Follonica	5.64	37	30	8.00	1.50	10.00	1.50	3	Mound behind
F1-s35-r37	-	-	-	-	35	-	-	-	-	-	-

F1-s35-r40	-	-	-	40	-	-	-	-	-	-	-
F1-s35-r45	-	-	-	45	-	-	-	-	-	-	-
F2-s35-r45				-	-	-	-	20.00	-	3	-
B1-s30-r37	25	Bilbao	8.76	37	30	10.00	2.00	12.00	1.5	5	-
B1-s35-r37	-	-	-	-	35	-	-	-	-	-	-
B2-s35-r37	-	.	-	-	-	-	-	24.00	-	-	-
B1-s35-r40	-	-	-	40	-	-	-	12.00	-	-	-
B1-s35-r45	-	-	-	45	-	-	-	-	-	-	-
B2-s35-r45	-	-	-	-	-	-	-	24	-	-	-
S1-s35-r45	40	Sines	13.2	45	35	12.00	3.00	14.00	2.00	5	-
S2-s35-r45	-	-	-	-	-	-	-	28.00	-	-	-

### References given in Appendix D1

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## **Appendix D2 Raw data sheets for the optimizations analyses of caisson breakwaters.**

In the data sheets the following notation is used:

D = toe level below SWL (m)

TDES = return period of design waves (years)

B = width of caisson (m)

bz = effective width of caisson in terms of width over which the foundation load is distributed (m)

sigma = average foundation normal stress in  $\text{kN/m}^2$

EH1 = ratio of maximum wave height to  $H_s$  in a storm

EH2 = mean value of  $H_s$  in simulations

PFS = probability of SLS within structure service lifetime

PRS = probability of RLS within structure service lifetime

PFU = probability of ULS within structure service lifetime

PPF = probability of foundation slip failure within structure lifetime

CIN = construction costs (EURO/m)

ERR = costs of RLS repair (EURO/m)

EUU = costs of ULS repair (EURO/m)

EFF = costs of foundation failure repair (EURO/m)

CTOT = total lifetime costs (EURO/m)

PFrubble = probability of slip failure in rubble foundation within structure lifetime

PFsand = probability of slip failure in sand seabed within structure lifetime

## D2.1. Caissons on rubble foundation on hard seabed

October 31, 2013

Hard Bottom			F1-a-37										ICASE F,1	
D =	TDES	HSD	B	bz	sigma	EH1	EH2	PFS	PFR	PFU	PFF	CIN	ERR	EUU
EFF	CTOT	PFrubble	PFsand											
D = 9,00	25,00	5,07	15,27	9, 284,	1,92	3,23	0,197	0,170	0,122	0,432	51473,	3464,		
2854,	24949,	82740,	0,432	0,000										
50,00	5,36	16,16	9, 281,	1,92	3,24	0,163	0,141	0,097	0,338	53480,	2677,			
2244,	18923,	77323,	0,338	0,000										
100,00	5,64	17,06	10, 279,	1,92	3,25	0,097	0,082	0,047	0,295	55496,	1591,			
1188,	14655,	72930,	0,295	0,000										
200,00	5,92	17,96	10, 276,	1,92	3,23	0,082	0,071	0,042	0,238	57531,	1201,			
895,	12224,	71852,	0,238	0,000										
400,00	6,20	18,88	10, 274,	1,92	3,24	0,046	0,039	0,024	0,158	59596,	545,			
392,	8681,	69214,	0,158	0,000										
1000,00	6,56	20,91	12, 258,	1,92	3,25	0,027	0,023	0,009	0,080	64157,	502,			
225,	3737,	68620,	0,080	0,000										
1600,00	6,74	22,18	13, 249,	1,92	3,25	0,013	0,010	0,004	0,058	67004,	171,			
88,	2891,	70154,	0,058	0,000										
3200,00	7,01	24,13	15, 237,	1,92	3,24	0,006	0,003	0,003	0,027	71401,	50,			
55,	1097,	72602,	0,027	0,000										
D = 10,00	25,00	5,07	15,33	9, 303,	1,92	3,25	0,131	0,115	0,072	0,272	50965,	2434,		
1957,	15096,	70452,	0,272	0,000										
50,00	5,36	16,18	9, 300,	1,92	3,23	0,101	0,090	0,061	0,203	52967,	2019,			
1504,	10327,	66817,	0,203	0,000										
100,00	5,64	17,03	10, 298,	1,92	3,22	0,064	0,056	0,035	0,151	54965,	1095,			
738,	7874,	64672,	0,151	0,000										
200,00	5,92	17,87	10, 296,	1,92	3,23	0,042	0,031	0,016	0,119	56971,	781,			
505,	5679,	63937,	0,119	0,000										
400,00	6,20	18,73	10, 293,	1,92	3,24	0,038	0,030	0,021	0,077	58993,	308,			
221,	3556,	63078,	0,077	0,000										
1000,00	6,56	19,88	11, 290,	1,92	3,24	0,014	0,011	0,003	0,050	61701,	207,			
79,	2594,	64581,	0,050	0,000										
1600,00	6,74	20,47	11, 288,	1,92	3,25	0,016	0,012	0,006	0,036	63109,	189,			
129,	1583,	65011,	0,036	0,000										
3200,00	7,01	21,86	12, 278,	1,92	3,24	0,009	0,005	0,002	0,015	66393,	63,			
65,	720,	67240,	0,015	0,000										
D = 11,00	25,00	5,07	15,46	9, 322,	1,92	3,24	0,090	0,080	0,057	0,141	50759,	2080,		
1770,	7657,	62266,	0,141	0,000										
50,00	5,36	16,28	9, 320,	1,92	3,25	0,059	0,048	0,023	0,094	52781,	1148,			
565,	5337,	59830,	0,094	0,000										
100,00	5,64	17,09	10, 317,	1,92	3,24	0,035	0,025	0,006	0,057	54787,	503,			
197,	2991,	58479,	0,057	0,000										
200,00	5,92	17,90	10, 315,	1,92	3,25	0,028	0,022	0,014	0,037	56791,	408,			
327,	1880,	59406,	0,037	0,000										
400,00	6,20	18,71	10, 312,	1,92	3,25	0,022	0,014	0,006	0,032	58799,	275,			
110,	1897,	61081,	0,032	0,000										
1000,00	6,56	19,79	11, 309,	1,92	3,23	0,013	0,009	0,003	0,017	61471,	150,			
75,	1326,	63023,	0,017	0,000										
1600,00	6,74	20,35	11, 308,	1,92	3,26	0,007	0,006	0,003	0,012	62854,	136,			
61,	567,	63617,	0,012	0,000										
3200,00	7,01	21,18	12, 305,	1,92	3,24	0,008	0,007	0,004	0,006	64910,	90,			
84,	295,	65380,	0,006	0,000										



D = 12,00  
 25,00 5,07 15,64 9, 341, 1,92 3,26 0,059 0,049 0,027 0,040 50815, 1235,  
 759, 2711, 55519, 0,040 0,000  
 50,00 5,36 16,44 9, 339, 1,92 3,23 0,039 0,031 0,020 0,025 52876, 607,  
 484, 1377, 55344, 0,025 0,000  
 100,00 5,64 17,23 10, 336, 1,92 3,25 0,023 0,019 0,009 0,018 54911, 381,  
 213, 1010, 56515, 0,018 0,000  
 200,00 5,92 18,01 10, 334, 1,92 3,23 0,012 0,008 0,005 0,011 56932, 263,  
 224, 397, 57816, 0,011 0,000  
 400,00 6,20 18,79 11, 331, 1,92 3,24 0,015 0,009 0,002 0,010 58949, 143,  
 34, 369, 59494, 0,010 0,000  
 1000,00 6,56 19,82 11, 328, 1,92 3,25 0,005 0,004 0,001 0,002 61617, 25,  
 11, 287, 61940, 0,002 0,000  
 1600,00 6,74 20,35 11, 327, 1,92 3,25 0,005 0,003 0,001 0,001 62991, 26,  
 17, 33, 63068, 0,001 0,000  
 3200,00 7,01 21,14 12, 324, 1,92 3,22 0,002 0,001 0,001 0,000 65026, 3,  
 3, 0, 65033, 0,000 0,000

D = 13,00  
 25,00 5,07 15,85 9, 360, 1,92 3,24 0,041 0,030 0,020 0,010 51104, 464,  
 252, 492, 52311, 0,010 0,000  
 50,00 5,36 16,64 10, 358, 1,92 3,25 0,018 0,016 0,010 0,002 53218, 448,  
 305, 173, 54144, 0,002 0,000  
 100,00 5,64 17,41 10, 356, 1,92 3,26 0,017 0,016 0,005 0,001 55297, 253,  
 51, 113, 55713, 0,001 0,000  
 200,00 5,92 18,17 10, 353, 1,92 3,23 0,009 0,006 0,002 0,002 57354, 120,  
 79, 19, 57572, 0,002 0,000  
 400,00 6,20 18,92 11, 351, 1,92 3,26 0,004 0,003 0,001 0,000 59396, 24,  
 3, 0, 59423, 0,000 0,000  
 1000,00 6,56 19,92 11, 348, 1,92 3,23 0,003 0,001 0,001 0,000 62086, 4,  
 4, 0, 62095, 0,000 0,000  
 1600,00 6,74 20,43 11, 346, 1,92 3,24 0,000 0,000 0,000 0,000 63464, 0,  
 0, 0, 63464, 0,000 0,000  
 3200,00 7,01 21,18 12, 344, 1,92 3,24 0,001 0,001 0,001 0,000 65499, 5,  
 6, 0, 65510, 0,000 0,000

F1-b-37

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D = 9,00  
 25,00 5,07 15,27 9, 284, 1,92 3,23 0,197 0,170 0,142 0,421 51473, 285,  
 3124, 24127, 79009, 0,421 0,000  
 50,00 5,36 16,16 9, 281, 1,92 3,24 0,163 0,141 0,117 0,330 53480, 220,  
 2404, 18439, 74543, 0,330 0,000  
 100,00 5,64 17,06 10, 279, 1,92 3,25 0,097 0,082 0,062 0,287 55496, 131,  
 1358, 14460, 71444, 0,287 0,000  
 200,00 5,92 17,96 10, 276, 1,92 3,23 0,082 0,071 0,053 0,229 57531, 99,  
 999, 11886, 70516, 0,229 0,000  
 400,00 6,20 18,88 10, 274, 1,92 3,24 0,046 0,039 0,029 0,151 59596, 45,  
 405, 8440, 68486, 0,151 0,000  
 1000,00 6,56 20,91 12, 258, 1,92 3,25 0,027 0,023 0,013 0,077 64157, 41,  
 295, 3529, 68022, 0,077 0,000  
 1600,00 6,74 22,18 13, 249, 1,92 3,25 0,013 0,010 0,005 0,057 67004, 14,  
 89, 2888, 69995, 0,057 0,000  
 3200,00 7,01 24,13 15, 237, 1,92 3,24 0,006 0,003 0,003 0,027 71401, 4,  
 55, 1097, 72556, 0,027 0,000

D = 10,00  
 25,00 5,07 15,33 9, 303, 1,92 3,25 0,131 0,115 0,085 0,263 50965, 230,  
 2093, 14607, 67896, 0,263 0,000  
 50,00 5,36 16,18 9, 300, 1,92 3,23 0,101 0,090 0,075 0,192 52967, 191,  
 1612, 9561, 64331, 0,192 0,000  
 100,00 5,64 17,03 10, 298, 1,92 3,22 0,064 0,056 0,048 0,142 54965, 104,  
 843, 7212, 63123, 0,142 0,000  
 200,00 5,92 17,87 10, 296, 1,92 3,23 0,042 0,031 0,026 0,114 56971, 74,  
 601, 5451, 63096, 0,114 0,000  
 400,00 6,20 18,73 10, 293, 1,92 3,24 0,038 0,030 0,022 0,076 58993, 29,  
 223, 3452, 62697, 0,076 0,000

1000,00	6,56	19,88	11, 290,	1,92	3,24	0,014	0,011	0,007	0,050	61701,	20,
122,	2594,	64436,	0,050	0,000							
1600,00	6,74	20,47	11, 288,	1,92	3,25	0,016	0,012	0,006	0,034	63109,	18,
129,	1480,	64737,	0,034	0,000							
3200,00	7,01	21,86	12, 278,	1,92	3,24	0,009	0,005	0,002	0,015	66393,	6,
65,	720,	67183,	0,015	0,000							
D = 11,00											
25,00	5,07	15,46	9, 322,	1,92	3,24	0,090	0,080	0,065	0,137	50759,	217,
1865,	7419,	60260,	0,137	0,000							
50,00	5,36	16,28	9, 320,	1,92	3,25	0,059	0,048	0,039	0,087	52781,	120,
787,	5123,	58811,	0,087	0,000							
100,00	5,64	17,09	10, 317,	1,92	3,24	0,035	0,025	0,015	0,052	54787,	52,
268,	2770,	57878,	0,052	0,000							
200,00	5,92	17,90	10, 315,	1,92	3,25	0,028	0,022	0,018	0,035	56791,	43,
344,	1807,	58984,	0,035	0,000							
400,00	6,20	18,71	10, 312,	1,92	3,25	0,022	0,014	0,010	0,030	58799,	29,
150,	1765,	60742,	0,030	0,000							
1000,00	6,56	19,79	11, 309,	1,92	3,23	0,013	0,009	0,005	0,016	61471,	16,
99,	1287,	62872,	0,016	0,000							
1600,00	6,74	20,35	11, 308,	1,92	3,26	0,007	0,006	0,005	0,012	62854,	14,
66,	567,	63500,	0,012	0,000							
3200,00	7,01	21,18	12, 305,	1,92	3,24	0,008	0,007	0,004	0,006	64910,	9,
84,	295,	65299,	0,006	0,000							
D = 12,00											
25,00	5,07	15,64	9, 341,	1,92	3,26	0,059	0,049	0,036	0,037	50815,	138,
918,	2517,	54388,	0,037	0,000							
50,00	5,36	16,44	9, 339,	1,92	3,23	0,039	0,031	0,024	0,022	52876,	68,
522,	1219,	54685,	0,022	0,000							
100,00	5,64	17,23	10, 336,	1,92	3,25	0,023	0,019	0,015	0,016	54911,	43,
236,	975,	56164,	0,016	0,000							
200,00	5,92	18,01	10, 334,	1,92	3,23	0,012	0,008	0,007	0,011	56932,	29,
273,	397,	57631,	0,011	0,000							
400,00	6,20	18,79	11, 331,	1,92	3,24	0,015	0,009	0,004	0,008	58949,	16,
53,	351,	59369,	0,008	0,000							
1000,00	6,56	19,82	11, 328,	1,92	3,25	0,005	0,004	0,001	0,002	61617,	3,
11,	287,	61918,	0,002	0,000							
1600,00	6,74	20,35	11, 327,	1,92	3,25	0,005	0,003	0,002	0,001	62991,	3,
19,	33,	63047,	0,001	0,000							
3200,00	7,01	21,14	12, 324,	1,92	3,22	0,002	0,001	0,001	0,000	65026,	0,
3,	0,	65030,	0,000	0,000							
D = 13,00											
25,00	5,07	15,85	9, 360,	1,92	3,24	0,041	0,030	0,022	0,010	51104,	55,
276,	492,	51926,	0,010	0,000							
50,00	5,36	16,64	10, 358,	1,92	3,25	0,018	0,016	0,012	0,002	53218,	53,
314,	173,	53757,	0,002	0,000							
100,00	5,64	17,41	10, 356,	1,92	3,26	0,017	0,016	0,009	0,001	55297,	30,
82,	113,	55522,	0,001	0,000							
200,00	5,92	18,17	10, 353,	1,92	3,23	0,009	0,006	0,003	0,002	57354,	14,
101,	19,	57488,	0,002	0,000							
400,00	6,20	18,92	11, 351,	1,92	3,26	0,004	0,003	0,001	0,000	59396,	3,
3,	0,	59403,	0,000	0,000							
1000,00	6,56	19,92	11, 348,	1,92	3,23	0,003	0,001	0,001	0,000	62086,	0,
4,	0,	62091,	0,000	0,000							
1600,00	6,74	20,43	11, 346,	1,92	3,24	0,000	0,000	0,000	0,000	63464,	0,
0,	0,	63464,	0,000	0,000							
3200,00	7,01	21,18	12, 344,	1,92	3,24	0,001	0,001	0,001	0,000	65499,	1,
6,	0,	65505,	0,000	0,000							

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D = 9,00

25,00	5,07	15,27	9, 284,	1,92	3,25	0,206	0,175	0,151	0,275	51473,	298,
3336,	14336,	69443,	0,275	0,000							
50,00	5,36	16,16	9, 281,	1,92	3,24	0,168	0,142	0,108	0,212	53480,	188,
1848,	10547,	66064,	0,212	0,000							
100,00	5,64	17,06	10, 279,	1,92	3,25	0,131	0,114	0,089	0,149	55496,	168,
1736,	7245,	64645,	0,149	0,000							
200,00	5,92	17,96	10, 276,	1,92	3,25	0,085	0,074	0,059	0,136	57531,	112,
1176,	6913,	65732,	0,136	0,000							
400,00	6,20	18,88	10, 274,	1,92	3,24	0,059	0,043	0,028	0,078	59596,	60,
538,	3406,	63601,	0,078	0,000							
1000,00	6,56	20,91	12, 258,	1,92	3,24	0,031	0,024	0,017	0,034	64157,	22,
221,	1616,	66016,	0,034	0,000							
1600,00	6,74	22,18	13, 249,	1,92	3,25	0,025	0,021	0,014	0,016	67004,	32,
288,	443,	67768,	0,016	0,000							
3200,00	7,01	24,13	15, 237,	1,92	3,24	0,006	0,005	0,003	0,007	71401,	5,
19,	507,	71932,	0,007	0,000							

D = 10,00

25,00	5,07	15,33	9, 303,	1,92	3,23	0,114	0,099	0,080	0,133	50965,	192,
1799,	6219,	59175,	0,133	0,000							
50,00	5,36	16,18	9, 300,	1,92	3,24	0,085	0,070	0,053	0,104	52967,	139,
1114,	4593,	58813,	0,104	0,000							
100,00	5,64	17,03	10, 298,	1,92	3,25	0,067	0,055	0,044	0,079	54965,	100,
1051,	3475,	59591,	0,079	0,000							
200,00	5,92	17,87	10, 296,	1,92	3,27	0,051	0,040	0,027	0,050	56971,	72,
577,	2438,	60058,	0,050	0,000							
400,00	6,20	18,73	10, 293,	1,92	3,24	0,030	0,020	0,016	0,026	58993,	48,
388,	999,	60428,	0,026	0,000							
1000,00	6,56	19,88	11, 290,	1,92	3,26	0,029	0,024	0,018	0,016	61701,	33,
200,	825,	62759,	0,016	0,000							
1600,00	6,74	20,47	11, 288,	1,92	3,24	0,022	0,016	0,011	0,011	63109,	23,
196,	231,	63560,	0,011	0,000							
3200,00	7,01	21,86	12, 278,	1,92	3,25	0,006	0,004	0,003	0,006	66393,	5,
50,	159,	66606,	0,006	0,000							

D = 11,00

25,00	5,07	15,46	9, 322,	1,92	3,24	0,086	0,075	0,060	0,059	50759,	164,
1368,	2903,	55194,	0,059	0,000							
50,00	5,36	16,28	9, 320,	1,92	3,23	0,069	0,056	0,037	0,043	52781,	110,
771,	2813,	56474,	0,043	0,000							
100,00	5,64	17,09	10, 317,	1,92	3,24	0,040	0,032	0,021	0,026	54787,	64,
342,	1411,	56604,	0,026	0,000							
200,00	5,92	17,90	10, 315,	1,92	3,25	0,035	0,029	0,019	0,014	56791,	60,
405,	693,	57948,	0,014	0,000							
400,00	6,20	18,71	10, 312,	1,92	3,25	0,023	0,020	0,012	0,007	58799,	37,
214,	217,	59266,	0,007	0,000							
1000,00	6,56	19,79	11, 309,	1,92	3,25	0,011	0,008	0,005	0,005	61471,	17,
62,	176,	61727,	0,005	0,000							
1600,00	6,74	20,35	11, 308,	1,92	3,25	0,005	0,005	0,003	0,011	62854,	9,
78,	472,	63413,	0,011	0,000							
3200,00	7,01	21,18	12, 305,	1,92	3,27	0,003	0,001	0,001	0,002	64910,	1,
6,	77,	64994,	0,002	0,000							

D = 12,00

25,00	5,07	15,64	9, 341,	1,92	3,26	0,044	0,037	0,024	0,014	50815,	78,
599,	384,	51875,	0,014	0,000							
50,00	5,36	16,44	9, 339,	1,92	3,24	0,033	0,027	0,017	0,008	52876,	74,
511,	469,	53929,	0,008	0,000							
100,00	5,64	17,23	10, 336,	1,92	3,23	0,032	0,027	0,016	0,005	54911,	45,
273,	182,	55410,	0,005	0,000							
200,00	5,92	18,01	10, 334,	1,92	3,21	0,009	0,007	0,007	0,002	56932,	27,
159,	61,	57180,	0,002	0,000							
400,00	6,20	18,79	11, 331,	1,92	3,23	0,011	0,010	0,006	0,002	58949,	16,
146,	63,	59174,	0,002	0,000							
1000,00	6,56	19,82	11, 328,	1,92	3,24	0,006	0,006	0,005	0,002	61617,	18,
113,	90,	61838,	0,002	0,000							

1600,00	6,74	20,35	11, 327,	1,92	3,23	0,007	0,005	0,003	0,000	62991,	13,
125,	0,	63129,	0,000	0,000							
3200,00	7,01	21,14	12, 324,	1,92	3,24	0,004	0,002	0,002	0,001	65026,	5,
35,	35,	65101,	0,001	0,000							
D = 13,00											
25,00	5,07	15,85	9, 360,	1,92	3,25	0,030	0,025	0,019	0,003	51104,	82,
577,	12,	51774,	0,003	0,000							
50,00	5,36	16,64	10, 358,	1,92	3,24	0,028	0,021	0,014	0,000	53218,	67,
431,	0,	53716,	0,000	0,000							
100,00	5,64	17,41	10, 356,	1,92	3,24	0,008	0,005	0,003	0,000	55297,	10,
85,	0,	55392,	0,000	0,000							
200,00	5,92	18,17	10, 353,	1,92	3,25	0,012	0,009	0,006	0,000	57354,	22,
128,	0,	57504,	0,000	0,000							
400,00	6,20	18,92	11, 351,	1,92	3,24	0,003	0,002	0,001	0,001	59396,	7,
1,	88,	59493,	0,001	0,000							
1000,00	6,56	19,92	11, 348,	1,92	3,25	0,001	0,001	0,001	0,000	62086,	1,
4,	0,	62091,	0,000	0,000							
1600,00	6,74	20,43	11, 346,	1,92	3,24	0,002	0,001	0,001	0,000	63464,	2,
1,	0,	63467,	0,000	0,000							
3200,00	7,01	21,18	12, 344,	1,92	3,25	0,000	0,000	0,000	0,000	65499,	0,
0,	0,	65499,	0,000	0,000							

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D = 9,00											
25,00	5,07	15,27	9, 284,	1,92	3,24	0,214	0,186	0,146	0,099	51473,	326,
3653,	4751,	60203,	0,099	0,000							
50,00	5,36	16,16	9, 281,	1,92	3,25	0,157	0,138	0,114	0,057	53480,	247,
2323,	2907,	58958,	0,057	0,000							
100,00	5,64	17,06	10, 279,	1,92	3,24	0,109	0,096	0,068	0,060	55496,	143,
1371,	3178,	60187,	0,060	0,000							
200,00	5,92	17,96	10, 276,	1,92	3,26	0,082	0,068	0,052	0,031	57531,	109,
1109,	1168,	59918,	0,031	0,000							
400,00	6,20	18,88	10, 274,	1,92	3,25	0,056	0,048	0,038	0,020	59596,	65,
661,	729,	61051,	0,020	0,000							
1000,00	6,56	20,91	12, 258,	1,92	3,25	0,028	0,024	0,014	0,008	64157,	22,
158,	363,	64700,	0,008	0,000							
1600,00	6,74	22,18	13, 249,	1,92	3,25	0,017	0,012	0,009	0,003	67004,	21,
204,	88,	67317,	0,003	0,000							
3200,00	7,01	24,13	15, 237,	1,92	3,24	0,009	0,007	0,006	0,000	71401,	12,
137,	0,	71550,	0,000	0,000							
D = 10,00											
25,00	5,07	15,33	9, 303,	1,92	3,24	0,123	0,109	0,087	0,059	50965,	245,
2378,	3195,	56783,	0,059	0,000							
50,00	5,36	16,18	9, 300,	1,92	3,24	0,094	0,088	0,062	0,029	52967,	146,
1296,	1055,	55464,	0,029	0,000							
100,00	5,64	17,03	10, 298,	1,92	3,24	0,062	0,049	0,036	0,017	54965,	98,
895,	526,	56483,	0,017	0,000							
200,00	5,92	17,87	10, 296,	1,92	3,25	0,058	0,046	0,034	0,013	56971,	81,
735,	628,	58415,	0,013	0,000							
400,00	6,20	18,73	10, 293,	1,92	3,25	0,031	0,020	0,017	0,004	58993,	31,
343,	125,	59492,	0,004	0,000							
1000,00	6,56	19,88	11, 290,	1,92	3,23	0,028	0,019	0,009	0,002	61701,	26,
115,	124,	61965,	0,002	0,000							
1600,00	6,74	20,47	11, 288,	1,92	3,25	0,013	0,006	0,004	0,003	63109,	9,
101,	84,	63303,	0,003	0,000							
3200,00	7,01	21,86	12, 278,	1,92	3,24	0,008	0,007	0,003	0,000	66393,	8,
73,	0,	66474,	0,000	0,000							
D = 11,00											
25,00	5,07	15,46	9, 322,	1,92	3,24	0,094	0,076	0,066	0,010	50759,	203,
1676,	500,	53137,	0,010	0,000							
50,00	5,36	16,28	9, 320,	1,92	3,24	0,068	0,056	0,043	0,007	52781,	102,
827,	193,	53903,	0,007	0,000							
100,00	5,64	17,09	10, 317,	1,92	3,27	0,037	0,028	0,021	0,003	54787,	61,
356,	73,	55276,	0,003	0,000							

200,00	5,92	17,90	10,315,	1,92	3,26	0,039	0,029	0,022	0,001	56791,	37,
256,	44,	57128,	0,001	0,000							
400,00	6,20	18,71	10,312,	1,92	3,23	0,015	0,013	0,007	0,001	58799,	18,
130,	68,	59015,	0,001	0,000							
1000,00	6,56	19,79	11,309,	1,92	3,23	0,009	0,006	0,002	0,001	61471,	17,
36,	3,	61527,	0,001	0,000							
1600,00	6,74	20,35	11,308,	1,92	3,24	0,009	0,007	0,005	0,000	62854,	22,
223,	0,	63098,	0,000	0,000							
3200,00	7,01	21,18	12,305,	1,92	3,26	0,002	0,002	0,001	0,001	64910,	3,
6,	53,	64972,	0,001	0,000							
D = 12,00											
25,00	5,07	15,64	9,341,	1,92	3,25	0,058	0,050	0,030	0,001	50815,	81,
426,	3,	51325,	0,001	0,000							
50,00	5,36	16,44	9,339,	1,92	3,20	0,036	0,022	0,018	0,000	52876,	57,
480,	0,	53412,	0,000	0,000							
100,00	5,64	17,23	10,336,	1,92	3,26	0,030	0,025	0,018	0,000	54911,	49,
329,	0,	55289,	0,000	0,000							
200,00	5,92	18,01	10,334,	1,92	3,25	0,012	0,011	0,006	0,000	56932,	33,
195,	0,	57160,	0,000	0,000							
400,00	6,20	18,79	11,331,	1,92	3,24	0,009	0,006	0,003	0,000	58949,	6,
29,	0,	58984,	0,000	0,000							
1000,00	6,56	19,82	11,328,	1,92	3,24	0,004	0,003	0,003	0,000	61617,	3,
34,	0,	61654,	0,000	0,000							
1600,00	6,74	20,35	11,327,	1,92	3,24	0,001	0,001	0,001	0,000	62991,	8,
75,	0,	63074,	0,000	0,000							
3200,00	7,01	21,14	12,324,	1,92	3,26	0,008	0,005	0,002	0,000	65026,	11,
63,	0,	65099,	0,000	0,000							
D = 13,00											
25,00	5,07	15,85	9,360,	1,92	3,24	0,048	0,033	0,024	0,000	51104,	83,
511,	0,	51698,	0,000	0,000							
50,00	5,36	16,64	10,358,	1,92	3,23	0,020	0,018	0,014	0,000	53218,	63,
506,	0,	53788,	0,000	0,000							
100,00	5,64	17,41	10,356,	1,92	3,25	0,017	0,013	0,008	0,001	55297,	41,
230,	113,	55681,	0,001	0,000							
200,00	5,92	18,17	10,353,	1,92	3,24	0,008	0,007	0,004	0,000	57354,	16,
104,	0,	57473,	0,000	0,000							
400,00	6,20	18,92	11,351,	1,92	3,24	0,006	0,004	0,003	0,000	59396,	3,
23,	0,	59422,	0,000	0,000							
1000,00	6,56	19,92	11,348,	1,92	3,23	0,001	0,001	0,000	0,000	62086,	6,
0,	0,	62092,	0,000	0,000							
1600,00	6,74	20,43	11,346,	1,92	3,24	0,004	0,002	0,001	0,000	63464,	3,
11,	0,	63478,	0,000	0,000							
3200,00	7,01	21,18	12,344,	1,92	3,23	0,001	0,001	0,001	0,000	65499,	0,
1,	0,	65500,	0,000	0,000							

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D = 15,00											
25,00	8,09	24,22	14,453,	1,92	5,88	0,087	0,064	0,025	0,528	123666,	2712,
1303,	92905,	220586,	0,528	0,000							
50,00	8,43	25,25	14,450,	1,92	5,86	0,080	0,061	0,012	0,471	127388,	2294,
946,	73594,	204222,	0,471	0,000							
100,00	8,76	26,25	15,447,	1,92	5,86	0,057	0,038	0,013	0,404	131019,	1937,
1374,	64109,	198439,	0,404	0,000							
200,00	9,08	27,23	15,444,	1,92	5,86	0,053	0,034	0,012	0,342	134588,	1588,
807,	52953,	189935,	0,342	0,000							
400,00	9,38	28,20	16,442,	1,92	5,85	0,026	0,016	0,003	0,298	138112,	553,
159,	42029,	180854,	0,298	0,000							
1000,00	9,77	29,47	16,438,	1,92	5,86	0,026	0,017	0,003	0,264	142726,	754,
139,	34719,	178337,	0,264	0,000							
1600,00	9,97	30,11	17,437,	1,92	5,87	0,027	0,016	0,003	0,227	145079,	609,
215,	30407,	176309,	0,227	0,000							
3200,00	10,25	31,19	17,432,	1,92	5,86	0,015	0,010	0,002	0,162	149001,	535,
277,	20232,	170045,	0,162	0,000							
D = 16,00											

25,00	8,09	24,30	14, 472,	1,92	5,87	0,077	0,056	0,010	0,448	123364,	2998,
672,	80194,	207228,	0,448	0,000							
50,00	8,43	25,30	14, 469,	1,92	5,88	0,046	0,035	0,009	0,368	127089,	1484,
654,	61759,	190986,	0,368	0,000							
100,00	8,76	26,26	15, 466,	1,92	5,90	0,037	0,020	0,006	0,303	130713,	782,
190,	49128,	180813,	0,303	0,000							
200,00	9,08	27,21	15, 464,	1,92	5,87	0,032	0,019	0,004	0,287	134265,	644,
170,	43330,	178409,	0,287	0,000							
400,00	9,38	28,14	16, 461,	1,92	5,89	0,018	0,011	0,005	0,214	137765,	425,
229,	31140,	169559,	0,214	0,000							
1000,00	9,77	29,36	16, 458,	1,92	5,88	0,015	0,011	0,000	0,168	142331,	198,
0,	23479,	166008,	0,168	0,000							
1600,00	9,97	29,98	17, 456,	1,92	5,87	0,007	0,004	0,001	0,165	144655,	76,
18,	19114,	163863,	0,165	0,000							
3200,00	10,25	30,89	17, 453,	1,92	5,85	0,010	0,010	0,000	0,111	148065,	162,
0,	13853,	162080,	0,111	0,000							
D = 18,00											
25,00	8,09	24,58	14, 510,	1,92	5,84	0,040	0,027	0,003	0,223	123629,	984,
369,	33985,	158966,	0,223	0,000							
50,00	8,43	25,53	15, 507,	1,92	5,85	0,023	0,011	0,001	0,185	127410,	471,
30,	26967,	154879,	0,185	0,000							
100,00	8,76	26,46	15, 505,	1,92	5,86	0,022	0,008	0,001	0,145	131070,	389,
73,	23750,	155281,	0,145	0,000							
200,00	9,08	27,35	16, 502,	1,92	5,88	0,005	0,004	0,001	0,105	134639,	152,
130,	13483,	148405,	0,105	0,000							
400,00	9,38	28,23	16, 499,	1,92	5,86	0,008	0,006	0,000	0,074	138140,	125,
0,	8852,	147117,	0,074	0,000							
1000,00	9,77	29,38	17, 496,	1,92	5,86	0,008	0,004	0,000	0,074	142684,	185,
0,	7949,	150818,	0,074	0,000							
1600,00	9,97	29,96	17, 494,	1,92	5,86	0,006	0,004	0,001	0,053	144986,	90,
76,	6537,	151689,	0,053	0,000							
3200,00	10,25	30,80	17, 492,	1,92	5,88	0,005	0,004	0,000	0,037	148351,	198,
0,	4857,	153406,	0,037	0,000							
D = 20,00											
25,00	8,09	24,97	14, 549,	1,92	5,86	0,019	0,015	0,000	0,079	124902,	636,
0,	12582,	138121,	0,079	0,000							
50,00	8,43	25,89	15, 546,	1,92	5,83	0,014	0,009	0,000	0,059	128790,	331,
0,	9021,	138141,	0,059	0,000							
100,00	8,76	26,79	15, 543,	1,92	5,85	0,010	0,004	0,000	0,044	132537,	232,
0,	6211,	138979,	0,044	0,000							
200,00	9,08	27,65	16, 540,	1,92	5,89	0,009	0,002	0,000	0,028	136177,	60,
0,	2602,	138839,	0,028	0,000							
400,00	9,38	28,50	16, 538,	1,92	5,86	0,004	0,002	0,000	0,021	139732,	3,
0,	2650,	142385,	0,021	0,000							
1000,00	9,77	29,59	17, 534,	1,92	5,85	0,001	0,000	0,000	0,014	144325,	0,
0,	1966,	146291,	0,014	0,000							
1600,00	9,97	30,15	17, 533,	1,92	5,85	0,002	0,000	0,000	0,013	146643,	0,
0,	1385,	148028,	0,013	0,000							
3200,00	10,25	30,95	17, 530,	1,92	5,87	0,000	0,000	0,000	0,004	150021,	0,
0,	447,	150468,	0,004	0,000							
D = 22,00											
25,00	8,09	25,41	15, 587,	1,92	5,89	0,003	0,001	0,000	0,004	127059,	10,
0,	533,	127602,	0,004	0,000							
50,00	8,43	26,32	15, 584,	1,92	5,88	0,005	0,003	0,000	0,005	131092,	13,
0,	1111,	132216,	0,005	0,000							
100,00	8,76	27,20	16, 581,	1,92	5,87	0,003	0,000	0,000	0,004	134965,	0,
0,	1042,	136008,	0,004	0,000							
200,00	9,08	28,05	16, 579,	1,92	5,87	0,001	0,001	0,000	0,006	138715,	2,
0,	599,	139316,	0,006	0,000							
400,00	9,38	28,87	17, 576,	1,92	5,86	0,002	0,001	0,000	0,003	142365,	3,
0,	580,	142948,	0,003	0,000							
1000,00	9,77	29,93	17, 573,	1,92	5,84	0,000	0,000	0,000	0,000	147063,	0,
0,	0,	147063,	0,000	0,000							
1600,00	9,97	30,47	17, 571,	1,92	5,89	0,000	0,000	0,000	0,000	149425,	0,
0,	0,	149425,	0,000	0,000							

3200,00 10,25 31,24 18, 568, 1,92 5,87 0,000 0,000 0,000 0,001 152859, 0,  
 0, 35, 152894, 0,001 0,000

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----- ICASE B,1

D = 15,00  
 25,00 8,09 24,22 14, 453, 1,92 5,88 0,087 0,064 0,042 0,521 123666, 296,  
 1843, 92008, 217813, 0,521 0,000  
 50,00 8,43 25,25 14, 450, 1,92 5,86 0,080 0,061 0,026 0,467 127388, 250,  
 1197, 72908, 201742, 0,467 0,000  
 100,00 8,76 26,25 15, 447, 1,92 5,86 0,057 0,038 0,022 0,396 131019, 211,  
 1476, 63662, 196368, 0,396 0,000  
 200,00 9,08 27,23 15, 444, 1,92 5,86 0,053 0,034 0,018 0,340 134588, 173,  
 970, 52357, 188088, 0,340 0,000  
 400,00 9,38 28,20 16, 442, 1,92 5,85 0,026 0,016 0,007 0,295 138112, 60,  
 299, 41867, 180338, 0,295 0,000  
 1000,00 9,77 29,47 16, 438, 1,92 5,86 0,026 0,017 0,008 0,257 142726, 82,  
 192, 33551, 176550, 0,257 0,000  
 1600,00 9,97 30,11 17, 437, 1,92 5,87 0,027 0,016 0,006 0,226 145079, 66,  
 345, 30102, 175591, 0,226 0,000  
 3200,00 10,25 31,19 17, 432, 1,92 5,86 0,015 0,010 0,005 0,159 149001, 58,  
 388, 19916, 169363, 0,159 0,000  
 D = 16,00  
 25,00 8,09 24,30 14, 472, 1,92 5,87 0,077 0,056 0,024 0,438 123364, 347,  
 1133, 78278, 203121, 0,438 0,000  
 50,00 8,43 25,30 14, 469, 1,92 5,88 0,046 0,035 0,018 0,365 127089, 172,  
 934, 61128, 189324, 0,365 0,000  
 100,00 8,76 26,26 15, 466, 1,92 5,90 0,037 0,020 0,012 0,301 130713, 90,  
 284, 48903, 179991, 0,301 0,000  
 200,00 9,08 27,21 15, 464, 1,92 5,87 0,032 0,019 0,007 0,282 134265, 74,  
 243, 42608, 177191, 0,282 0,000  
 400,00 9,38 28,14 16, 461, 1,92 5,89 0,018 0,011 0,007 0,213 137765, 49,  
 331, 30993, 169138, 0,213 0,000  
 1000,00 9,77 29,36 16, 458, 1,92 5,88 0,015 0,011 0,002 0,167 142331, 23,  
 4, 23282, 165640, 0,167 0,000  
 1600,00 9,97 29,98 17, 456, 1,92 5,87 0,007 0,004 0,001 0,163 144655, 9,  
 18, 19095, 163776, 0,163 0,000  
 3200,00 10,25 30,89 17, 453, 1,92 5,85 0,010 0,010 0,001 0,109 148065, 19,  
 9, 13758, 161851, 0,109 0,000  
 D = 18,00  
 25,00 8,09 24,58 14, 510, 1,92 5,84 0,040 0,027 0,010 0,219 123629, 124,  
 456, 33434, 157643, 0,219 0,000  
 50,00 8,43 25,53 15, 507, 1,92 5,85 0,023 0,011 0,004 0,181 127410, 59,  
 98, 26285, 153852, 0,181 0,000  
 100,00 8,76 26,46 15, 505, 1,92 5,86 0,022 0,008 0,004 0,145 131070, 49,  
 151, 23750, 155019, 0,145 0,000  
 200,00 9,08 27,35 16, 502, 1,92 5,88 0,005 0,004 0,002 0,105 134639, 19,  
 136, 13483, 148277, 0,105 0,000  
 400,00 9,38 28,23 16, 499, 1,92 5,86 0,008 0,006 0,002 0,070 138140, 16,  
 49, 8619, 146823, 0,070 0,000  
 1000,00 9,77 29,38 17, 496, 1,92 5,86 0,008 0,004 0,000 0,073 142684, 23,  
 0, 7772, 150480, 0,073 0,000  
 1600,00 9,97 29,96 17, 494, 1,92 5,86 0,006 0,004 0,001 0,051 144986, 11,  
 76, 6510, 151583, 0,051 0,000  
 3200,00 10,25 30,80 17, 492, 1,92 5,88 0,005 0,004 0,002 0,036 148351, 25,  
 90, 4508, 152973, 0,036 0,000  
 D = 20,00  
 25,00 8,09 24,97 14, 549, 1,92 5,86 0,019 0,015 0,004 0,075 124902, 85,  
 141, 12047, 137175, 0,075 0,000  
 50,00 8,43 25,89 15, 546, 1,92 5,83 0,014 0,009 0,004 0,056 128790, 44,  
 103, 8556, 137493, 0,056 0,000  
 100,00 8,76 26,79 15, 543, 1,92 5,85 0,010 0,004 0,001 0,043 132537, 31,  
 39, 5931, 138538, 0,043 0,000  
 200,00 9,08 27,65 16, 540, 1,92 5,89 0,009 0,002 0,000 0,026 136177, 8,  
 0, 2459, 138643, 0,026 0,000

400,00	9,38	28,50	16,	538,	1,92	5,86	0,004	0,002	0,000	0,021	139732,	0,
0,	2650,	142382,	0,021	0,000								
1000,00	9,77	29,59	17,	534,	1,92	5,85	0,001	0,000	0,000	0,014	144325,	0,
0,	1966,	146291,	0,014	0,000								
1600,00	9,97	30,15	17,	533,	1,92	5,85	0,002	0,000	0,000	0,013	146643,	0,
0,	1385,	148028,	0,013	0,000								
3200,00	10,25	30,95	17,	530,	1,92	5,87	0,000	0,000	0,000	0,004	150021,	0,
0,	447,	150468,	0,004	0,000								
D = 22,00												
25,00	8,09	25,41	15,	587,	1,92	5,89	0,003	0,001	0,000	0,004	127059,	1,
0,	533,	127594,	0,004	0,000								
50,00	8,43	26,32	15,	584,	1,92	5,88	0,005	0,003	0,000	0,005	131092,	2,
0,	1111,	132205,	0,005	0,000								
100,00	8,76	27,20	16,	581,	1,92	5,87	0,003	0,000	0,000	0,004	134965,	0,
0,	1042,	136008,	0,004	0,000								
200,00	9,08	28,05	16,	579,	1,92	5,87	0,001	0,001	0,000	0,005	138715,	0,
0,	594,	139309,	0,005	0,000								
400,00	9,38	28,87	17,	576,	1,92	5,86	0,002	0,001	0,000	0,003	142365,	0,
0,	580,	142945,	0,003	0,000								
1000,00	9,77	29,93	17,	573,	1,92	5,84	0,000	0,000	0,000	0,000	147063,	0,
0,	0,	147063,	0,000	0,000								
1600,00	9,97	30,47	17,	571,	1,92	5,89	0,000	0,000	0,000	0,000	149425,	0,
0,	0,	149425,	0,000	0,000								
3200,00	10,25	31,24	18,	568,	1,92	5,87	0,000	0,000	0,000	0,001	152859,	0,
0,	35,	152894,	0,001	0,000								

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ERUBLE 37,00000000000000

RLS repair: blocks behind

----- ICASE B

D = 15,00												
25,00	8,09	24,22	14,	453,	1,92	5,87	0,084	0,055	0,024	0,349	132858,	142,
1012,	50394,	184406,	0,349	0,000								
50,00	8,43	25,25	14,	450,	1,92	5,89	0,059	0,040	0,026	0,331	136580,	148,
1311,	44159,	182198,	0,331	0,000								
100,00	8,76	26,25	15,	447,	1,92	5,86	0,044	0,030	0,010	0,240	140211,	104,
663,	31142,	172120,	0,240	0,000								
200,00	9,08	27,23	15,	444,	1,92	5,87	0,051	0,030	0,014	0,237	143780,	90,
518,	30846,	175234,	0,237	0,000								
400,00	9,38	28,20	16,	442,	1,92	5,86	0,043	0,029	0,014	0,191	147304,	91,
785,	23870,	172050,	0,191	0,000								
1000,00	9,77	29,47	16,	438,	1,92	5,82	0,019	0,011	0,004	0,151	151918,	24,
328,	18493,	170762,	0,151	0,000								
1600,00	9,97	30,11	17,	437,	1,92	5,86	0,018	0,009	0,003	0,116	154271,	21,
138,	15212,	169642,	0,116	0,000								
3200,00	10,25	31,19	17,	432,	1,92	5,85	0,022	0,012	0,004	0,101	158193,	38,
224,	12736,	171192,	0,101	0,000								
D = 16,00												
25,00	8,09	24,30	14,	472,	1,92	5,89	0,067	0,038	0,020	0,283	132112,	156,
1358,	41078,	174704,	0,283	0,000								
50,00	8,43	25,30	14,	469,	1,92	5,91	0,060	0,041	0,017	0,247	135837,	144,
577,	35425,	171983,	0,247	0,000								
100,00	8,76	26,26	15,	466,	1,92	5,83	0,030	0,023	0,011	0,181	139461,	67,
235,	25008,	164771,	0,181	0,000								
200,00	9,08	27,21	15,	464,	1,92	5,86	0,027	0,021	0,012	0,143	143013,	74,
572,	19405,	163065,	0,143	0,000								
400,00	9,38	28,14	16,	461,	1,92	5,91	0,025	0,016	0,007	0,129	146513,	48,
340,	15033,	161934,	0,129	0,000								
1000,00	9,77	29,36	16,	458,	1,92	5,88	0,012	0,010	0,002	0,096	151079,	30,
123,	11812,	163045,	0,096	0,000								
1600,00	9,97	29,98	17,	456,	1,92	5,81	0,021	0,011	0,004	0,085	153403,	19,
54,	9436,	162911,	0,085	0,000								
3200,00	10,25	30,89	17,	453,	1,92	5,84	0,015	0,010	0,002	0,060	156813,	18,
41,	7770,	164642,	0,060	0,000								
D = 18,00												



25,00	8,09	24,58	14, 510,	1,92	5,85	0,029	0,018	0,008	0,125	131489,	75,
383,	17918,	149865,	0,125	0,000							
50,00	8,43	25,53	15, 507,	1,92	5,90	0,030	0,013	0,005	0,092	135270,	70,
386,	14003,	149729,	0,092	0,000							
100,00	8,76	26,46	15, 505,	1,92	5,86	0,020	0,014	0,004	0,078	138930,	62,
378,	9977,	149347,	0,078	0,000							
200,00	9,08	27,35	16, 502,	1,92	5,88	0,013	0,009	0,002	0,066	142499,	40,
144,	8101,	150784,	0,066	0,000							
400,00	9,38	28,23	16, 499,	1,92	5,91	0,012	0,007	0,001	0,037	146000,	22,
86,	4745,	150852,	0,037	0,000							
1000,00	9,77	29,38	17, 496,	1,92	5,89	0,006	0,003	0,002	0,038	150544,	18,
83,	5089,	155734,	0,038	0,000							
1600,00	9,97	29,96	17, 494,	1,92	5,87	0,004	0,002	0,000	0,025	152846,	3,
0,	3687,	156536,	0,025	0,000							
3200,00	10,25	30,80	17, 492,	1,92	5,88	0,005	0,002	0,000	0,022	156211,	10,
0,	3260,	159481,	0,022	0,000							
D = 20,00											
25,00	8,09	24,97	14, 549,	1,92	5,89	0,018	0,008	0,002	0,044	131874,	25,
31,	7522,	139452,	0,044	0,000							
50,00	8,43	25,89	15, 546,	1,92	5,90	0,011	0,006	0,002	0,028	135762,	18,
23,	2682,	138485,	0,028	0,000							
100,00	8,76	26,79	15, 543,	1,92	5,87	0,010	0,003	0,001	0,026	139509,	6,
24,	3668,	143207,	0,026	0,000							
200,00	9,08	27,65	16, 540,	1,92	5,86	0,003	0,003	0,001	0,022	143149,	12,
3,	3395,	146560,	0,022	0,000							
400,00	9,38	28,50	16, 538,	1,92	5,85	0,005	0,002	0,001	0,007	146704,	7,
52,	1715,	148478,	0,007	0,000							
1000,00	9,77	29,59	17, 534,	1,92	5,88	0,003	0,000	0,000	0,011	151297,	0,
0,	1281,	152579,	0,011	0,000							
1600,00	9,97	30,15	17, 533,	1,92	5,85	0,001	0,001	0,000	0,003	153615,	0,
0,	186,	153802,	0,003	0,000							
3200,00	10,25	30,95	17, 530,	1,92	5,88	0,003	0,002	0,001	0,002	156993,	12,
4,	149,	157158,	0,002	0,000							
D = 22,00											
25,00	8,09	25,41	15, 587,	1,92	5,84	0,010	0,008	0,004	0,004	133143,	46,
97,	406,	133693,	0,004	0,000							
50,00	8,43	26,32	15, 584,	1,92	5,87	0,002	0,002	0,000	0,002	137176,	4,
0,	84,	137264,	0,002	0,000							
100,00	8,76	27,20	16, 581,	1,92	5,86	0,003	0,000	0,000	0,002	141049,	0,
0,	245,	141295,	0,002	0,000							
200,00	9,08	28,05	16, 579,	1,92	5,87	0,004	0,001	0,000	0,003	144799,	1,
0,	560,	145360,	0,003	0,000							
400,00	9,38	28,87	17, 576,	1,92	5,84	0,002	0,000	0,000	0,001	148449,	0,
0,	394,	148843,	0,001	0,000							
1000,00	9,77	29,93	17, 573,	1,92	5,89	0,001	0,001	0,001	0,000	153147,	1,
6,	0,	153154,	0,000	0,000							
1600,00	9,97	30,47	17, 571,	1,92	5,86	0,001	0,000	0,000	0,000	155509,	0,
0,	0,	155509,	0,000	0,000							
3200,00	10,25	31,24	18, 568,	1,92	5,84	0,000	0,000	0,000	0,000	158943,	0,
0,	0,	158943,	0,000	0,000							

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ICASE B,1

D = 15,00

25,00	8,09	24,22	14, 453,	1,92	5,87	0,073	0,055	0,034	0,369	123666,	240,
1169,	56310,	181385,	0,369	0,000							
50,00	8,43	25,25	14, 450,	1,92	5,86	0,068	0,048	0,022	0,336	127388,	219,
1177,	45253,	174037,	0,336	0,000							
100,00	8,76	26,25	15, 447,	1,92	5,87	0,061	0,041	0,024	0,273	131019,	153,
673,	38593,	170438,	0,273	0,000							
200,00	9,08	27,23	15, 444,	1,92	5,83	0,030	0,019	0,012	0,212	134588,	86,
509,	29544,	164727,	0,212	0,000							
400,00	9,38	28,20	16, 442,	1,92	5,88	0,028	0,017	0,008	0,187	138112,	79,
390,	23944,	162525,	0,187	0,000							

1000,00	9,77	29,47	16,438,	1,92	5,83	0,027	0,019	0,006	0,143	142726,	53,
221,	17804,	160804,	0,143	0,000							
1600,00	9,97	30,11	17,437,	1,92	5,90	0,023	0,017	0,003	0,124	145079,	45,
156,	14014,	159294,	0,124	0,000							
3200,00	10,25	31,19	17,432,	1,92	5,88	0,012	0,005	0,001	0,104	149001,	16,
9,	14910,	163936,	0,104	0,000							
D = 16,00											
25,00	8,09	24,30	14,472,	1,92	5,86	0,059	0,035	0,022	0,290	123364,	192,
788,	42862,	167206,	0,290	0,000							
50,00	8,43	25,30	14,469,	1,92	5,87	0,044	0,025	0,012	0,216	127089,	105,
440,	27945,	155579,	0,216	0,000							
100,00	8,76	26,26	15,466,	1,92	5,85	0,047	0,034	0,021	0,194	130713,	172,
740,	27412,	159037,	0,194	0,000							
200,00	9,08	27,21	15,464,	1,92	5,88	0,025	0,012	0,005	0,156	134265,	69,
324,	20030,	154688,	0,156	0,000							
400,00	9,38	28,14	16,461,	1,92	5,86	0,028	0,018	0,008	0,123	137765,	104,
360,	13398,	151626,	0,123	0,000							
1000,00	9,77	29,36	16,458,	1,92	5,92	0,021	0,015	0,007	0,112	142331,	99,
426,	15798,	158655,	0,112	0,000							
1600,00	9,97	29,98	17,456,	1,92	5,85	0,010	0,007	0,003	0,069	144655,	29,
41,	7835,	152561,	0,069	0,000							
3200,00	10,25	30,89	17,453,	1,92	5,88	0,011	0,008	0,003	0,056	148065,	34,
188,	6575,	154862,	0,056	0,000							
D = 18,00											
25,00	8,09	24,58	14,510,	1,92	5,88	0,028	0,019	0,009	0,141	123629,	106,
429,	18068,	142231,	0,141	0,000							
50,00	8,43	25,53	15,507,	1,92	5,87	0,020	0,014	0,005	0,081	127410,	53,
263,	10288,	138014,	0,081	0,000							
100,00	8,76	26,46	15,505,	1,92	5,87	0,018	0,014	0,005	0,066	131070,	57,
203,	9129,	140459,	0,066	0,000							
200,00	9,08	27,35	16,502,	1,92	5,89	0,020	0,013	0,004	0,061	134639,	65,
69,	9474,	144248,	0,061	0,000							
400,00	9,38	28,23	16,499,	1,92	5,88	0,008	0,004	0,001	0,037	138140,	11,
26,	3451,	141628,	0,037	0,000							
1000,00	9,77	29,38	17,496,	1,92	5,86	0,008	0,005	0,000	0,024	142684,	23,
0,	2429,	145136,	0,024	0,000							
1600,00	9,97	29,96	17,494,	1,92	5,88	0,005	0,002	0,001	0,019	144986,	19,
23,	2693,	147720,	0,019	0,000							
3200,00	10,25	30,80	17,492,	1,92	5,86	0,002	0,001	0,001	0,017	148351,	4,
3,	1860,	150218,	0,017	0,000							
D = 20,00											
25,00	8,09	24,97	14,549,	1,92	5,85	0,017	0,010	0,002	0,036	124902,	36,
85,	6893,	131916,	0,036	0,000							
50,00	8,43	25,89	15,546,	1,92	5,87	0,012	0,007	0,004	0,022	128790,	53,
25,	3361,	132228,	0,022	0,000							
100,00	8,76	26,79	15,543,	1,92	5,88	0,009	0,004	0,000	0,013	132537,	16,
0,	1834,	134387,	0,013	0,000							
200,00	9,08	27,65	16,540,	1,92	5,89	0,007	0,004	0,002	0,007	136177,	27,
154,	761,	137119,	0,007	0,000							
400,00	9,38	28,50	16,538,	1,92	5,88	0,003	0,002	0,000	0,011	139732,	1,
0,	1526,	141258,	0,011	0,000							
1000,00	9,77	29,59	17,534,	1,92	5,88	0,003	0,000	0,000	0,003	144325,	0,
0,	438,	144763,	0,003	0,000							
1600,00	9,97	30,15	17,533,	1,92	5,89	0,002	0,001	0,001	0,002	146643,	2,
5,	397,	147047,	0,002	0,000							
3200,00	10,25	30,95	17,530,	1,92	5,90	0,004	0,001	0,000	0,001	150021,	0,
0,	324,	150346,	0,001	0,000							
D = 22,00											
25,00	8,09	25,41	15,587,	1,92	5,93	0,007	0,002	0,001	0,005	127059,	6,
9,	593,	127667,	0,005	0,000							
50,00	8,43	26,32	15,584,	1,92	5,91	0,005	0,003	0,000	0,001	131092,	11,
0,	65,	131169,	0,001	0,000							
100,00	8,76	27,20	16,581,	1,92	5,88	0,004	0,003	0,000	0,002	134965,	3,
0,	510,	135479,	0,002	0,000							
200,00	9,08	28,05	16,579,	1,92	5,87	0,002	0,001	0,001	0,001	138715,	21,
172,	69,	138976,	0,001	0,000							

400,00	9,38	28,87	17,	576,	1,92	5,85	0,001	0,000	0,000	0,000	142365,	0,
0,	0,	142365,	0,000	0,000								
1000,00	9,77	29,93	17,	573,	1,92	5,86	0,003	0,001	0,000	0,000	147063,	3,
0,	0,	147066,	0,000	0,000								
1600,00	9,97	30,47	17,	571,	1,92	5,85	0,000	0,000	0,000	0,000	149425,	0,
0,	0,	149425,	0,000	0,000								
3200,00	10,25	31,24	18,	568,	1,92	5,91	0,000	0,000	0,000	0,000	152859,	0,
0,	0,	152859,	0,000	0,000								

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ICASE B,1

D = 15,00

25,00	8,09	24,22	14,	453,	1,92	5,83	0,085	0,060	0,036	0,178	123666,	350,
2209,	23179,	149404,	0,178	0,000								
50,00	8,43	25,25	14,	450,	1,92	5,89	0,089	0,061	0,036	0,167	127388,	281,
1395,	21055,	150119,	0,167	0,000								
100,00	8,76	26,25	15,	447,	1,92	5,86	0,054	0,036	0,020	0,106	131019,	181,
1497,	12703,	145400,	0,106	0,000								
200,00	9,08	27,23	15,	444,	1,92	5,86	0,040	0,028	0,016	0,078	134588,	119,
411,	8935,	144053,	0,078	0,000								
400,00	9,38	28,20	16,	442,	1,92	5,87	0,027	0,017	0,012	0,061	138112,	87,
551,	6049,	144799,	0,061	0,000								
1000,00	9,77	29,47	16,	438,	1,92	5,87	0,029	0,018	0,003	0,055	142726,	93,
240,	6090,	149149,	0,055	0,000								
1600,00	9,97	30,11	17,	437,	1,92	5,86	0,016	0,006	0,002	0,039	145079,	15,
52,	4021,	149167,	0,039	0,000								
3200,00	10,25	31,19	17,	432,	1,92	5,88	0,015	0,009	0,004	0,027	149001,	51,
317,	2953,	152322,	0,027	0,000								

D = 16,00

25,00	8,09	24,30	14,	472,	1,92	5,87	0,059	0,039	0,026	0,138	123364,	181,
1083,	18775,	143402,	0,138	0,000								
50,00	8,43	25,30	14,	469,	1,92	5,88	0,053	0,037	0,018	0,085	127089,	168,
840,	11875,	139973,	0,085	0,000								
100,00	8,76	26,26	15,	466,	1,92	5,90	0,044	0,028	0,014	0,073	130713,	128,
634,	8601,	140077,	0,073	0,000								
200,00	9,08	27,21	15,	464,	1,92	5,87	0,032	0,020	0,008	0,049	134265,	83,
372,	5525,	140245,	0,049	0,000								
400,00	9,38	28,14	16,	461,	1,92	5,89	0,021	0,010	0,006	0,040	137765,	75,
192,	4340,	142372,	0,040	0,000								
1000,00	9,77	29,36	16,	458,	1,92	5,84	0,010	0,007	0,003	0,027	142331,	35,
19,	2481,	144866,	0,027	0,000								
1600,00	9,97	29,98	17,	456,	1,92	5,89	0,016	0,009	0,005	0,016	144655,	39,
176,	2037,	146907,	0,016	0,000								
3200,00	10,25	30,89	17,	453,	1,92	5,86	0,017	0,007	0,002	0,009	148065,	51,
162,	508,	148786,	0,009	0,000								

D = 18,00

25,00	8,09	24,58	14,	510,	1,92	5,86	0,033	0,022	0,006	0,038	123629,	118,
258,	4443,	128447,	0,038	0,000								
50,00	8,43	25,53	15,	507,	1,92	5,87	0,016	0,011	0,006	0,029	127410,	51,
237,	3811,	131508,	0,029	0,000								
100,00	8,76	26,46	15,	505,	1,92	5,87	0,017	0,012	0,004	0,018	131070,	47,
151,	1565,	132833,	0,018	0,000								
200,00	9,08	27,35	16,	502,	1,92	5,87	0,012	0,004	0,002	0,009	134639,	33,
95,	919,	135687,	0,009	0,000								
400,00	9,38	28,23	16,	499,	1,92	5,85	0,009	0,005	0,002	0,010	138140,	7,
25,	632,	138804,	0,010	0,000								
1000,00	9,77	29,38	17,	496,	1,92	5,88	0,007	0,003	0,001	0,008	142684,	8,
63,	1449,	144204,	0,008	0,000								
1600,00	9,97	29,96	17,	494,	1,92	5,88	0,005	0,002	0,002	0,004	144986,	8,
21,	557,	145572,	0,004	0,000								
3200,00	10,25	30,80	17,	492,	1,92	5,86	0,005	0,001	0,000	0,001	148351,	0,
0,	28,	148379,	0,001	0,000								

D = 20,00

25,00	8,09	24,97	14,	549,	1,92	5,88	0,014	0,009	0,003	0,008	124902,	43,
108,	1253,	126306,	0,008	0,000								

50,00	8,43	25,89	15, 546,	1,92	5,84	0,009	0,004	0,002	0,006	128790,	39,
211,	439,	129478,	0,006	0,000							
100,00	8,76	26,79	15, 543,	1,92	5,85	0,006	0,004	0,003	0,005	132537,	19,
91,	368,	133014,	0,005	0,000							
200,00	9,08	27,65	16, 540,	1,92	5,89	0,005	0,004	0,002	0,001	136177,	10,
35,	172,	136394,	0,001	0,000							
400,00	9,38	28,50	16, 538,	1,92	5,91	0,002	0,002	0,001	0,000	139732,	11,
90,	0,	139833,	0,000	0,000							
1000,00	9,77	29,59	17, 534,	1,92	5,87	0,000	0,000	0,000	0,000	144325,	0,
0,	0,	144325,	0,000	0,000							
1600,00	9,97	30,15	17, 533,	1,92	5,84	0,003	0,001	0,001	0,000	146643,	2,
5,	0,	146650,	0,000	0,000							
3200,00	10,25	30,95	17, 530,	1,92	5,83	0,000	0,000	0,000	0,000	150021,	0,
0,	0,	150021,	0,000	0,000							
D = 22,00											
25,00	8,09	25,41	15, 587,	1,92	5,91	0,009	0,004	0,002	0,000	127059,	35,
15,	0,	127109,	0,000	0,000							
50,00	8,43	26,32	15, 584,	1,92	5,86	0,004	0,001	0,001	0,000	131092,	21,
62,	0,	131174,	0,000	0,000							
100,00	8,76	27,20	16, 581,	1,92	5,83	0,004	0,003	0,000	0,000	134965,	6,
0,	0,	134972,	0,000	0,000							
200,00	9,08	28,05	16, 579,	1,92	5,87	0,005	0,000	0,000	0,000	138715,	0,
0,	0,	138715,	0,000	0,000							
400,00	9,38	28,87	17, 576,	1,92	5,87	0,002	0,000	0,000	0,001	142365,	0,
0,	62,	142427,	0,001	0,000							
1000,00	9,77	29,93	17, 573,	1,92	5,89	0,000	0,000	0,000	0,000	147063,	0,
0,	0,	147063,	0,000	0,000							
1600,00	9,97	30,47	17, 571,	1,92	5,90	0,001	0,001	0,001	0,000	149425,	5,
5,	0,	149436,	0,000	0,000							
3200,00	10,25	31,24	18, 568,	1,92	5,88	0,000	0,000	0,000	0,000	152859,	0,
0,	0,	152859,	0,000	0,000							

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----- ICASE S,1											
D = 15,00											
25,00	12,16	40,70	25, 494,	1,92	9,37	0,361	0,306	0,246	0,860	317466,	1988,
21281,	315384,	656119,	0,860	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,37	0,263	0,224	0,175	0,820	338829,	1312,
14235,	268582,	622958,	0,820	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,31	0,199	0,155	0,111	0,718	360276,	881,
7454,	208684,	577295,	0,718	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,31	0,144	0,125	0,087	0,572	381926,	616,
6071,	154488,	543101,	0,572	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,38	0,097	0,077	0,051	0,506	403859,	409,
4334,	113358,	521960,	0,506	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,35	0,055	0,039	0,022	0,382	433385,	128,
1254,	85620,	520386,	0,382	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,33	0,036	0,026	0,018	0,335	448794,	113,
995,	64093,	513994,	0,335	0,000							
3200,00	15,40	73,52	52, 384,	1,92	9,39	0,025	0,020	0,011	0,252	471875,	69,
579,	50583,	523107,	0,252	0,000							
D = 17,00											
25,00	12,16	36,90	21, 577,	1,92	9,40	0,305	0,256	0,206	0,844	296279,	2509,
19740,	345555,	664084,	0,844	0,000							
50,00	12,71	39,80	23, 555,	1,92	9,32	0,241	0,195	0,143	0,820	310585,	1537,
12445,	300302,	624869,	0,820	0,000							
100,00	13,23	43,55	26, 525,	1,92	9,36	0,185	0,141	0,091	0,735	329037,	956,
7682,	258161,	595836,	0,735	0,000							
200,00	13,71	47,30	29, 501,	1,92	9,36	0,115	0,093	0,060	0,653	347539,	599,
4361,	199588,	552086,	0,653	0,000							
400,00	14,16	51,08	32, 482,	1,92	9,36	0,080	0,064	0,038	0,541	366168,	399,
2541,	148037,	517145,	0,541	0,000							
1000,00	14,73	56,13	37, 461,	1,92	9,36	0,070	0,050	0,028	0,445	391078,	335,
1866,	119456,	512735,	0,445	0,000							
1600,00	15,01	58,75	39, 452,	1,92	9,37	0,044	0,030	0,011	0,362	404009,	129,
1022,	77493,	482652,	0,362	0,000							

3200,00	15,40	62,66	42, 440,	1,92	9,37	0,036	0,025	0,014	0,280	423295,	120,
892,	62531,	486838,	0,280	0,000							
D = 19,00											
25,00	12,16	36,44	21, 615,	1,92	9,36	0,222	0,190	0,139	0,801	291024,	2026,
12839,	340666,	646554,	0,801	0,000							
50,00	12,71	38,28	21, 610,	1,92	9,34	0,195	0,155	0,109	0,742	300519,	1468,
8643,	291142,	601771,	0,742	0,000							
100,00	13,23	40,04	22, 606,	1,92	9,34	0,129	0,106	0,070	0,694	309567,	1059,
6114,	259264,	576005,	0,694	0,000							
200,00	13,71	42,42	24, 589,	1,92	9,33	0,128	0,103	0,058	0,641	321845,	870,
4863,	222659,	550237,	0,641	0,000							
400,00	14,16	45,60	27, 562,	1,92	9,36	0,081	0,052	0,030	0,568	338244,	373,
1535,	168753,	508905,	0,568	0,000							
1000,00	14,73	49,82	30, 534,	1,92	9,34	0,051	0,035	0,019	0,424	360035,	301,
1268,	117691,	479295,	0,424	0,000							
1600,00	15,01	52,01	32, 522,	1,92	9,35	0,022	0,015	0,008	0,363	371290,	155,
523,	98363,	470331,	0,363	0,000							
3200,00	15,40	55,25	35, 506,	1,92	9,35	0,034	0,022	0,011	0,285	388009,	169,
701,	74346,	463226,	0,285	0,000							
D = 21,00											
25,00	12,16	36,28	21, 653,	1,92	9,35	0,138	0,111	0,071	0,741	287627,	1055,
5867,	297518,	592067,	0,741	0,000							
50,00	12,71	38,02	21, 648,	1,92	9,34	0,094	0,072	0,051	0,690	296958,	668,
3934,	264077,	565637,	0,690	0,000							
100,00	13,23	39,66	22, 644,	1,92	9,39	0,092	0,074	0,044	0,624	305812,	668,
3483,	227913,	537875,	0,624	0,000							
200,00	13,71	41,24	23, 640,	1,92	9,33	0,072	0,050	0,027	0,550	314303,	473,
2202,	187685,	504663,	0,550	0,000							
400,00	14,16	42,76	24, 636,	1,92	9,34	0,060	0,045	0,028	0,494	322511,	404,
2414,	171278,	496607,	0,494	0,000							
1000,00	14,73	45,32	25, 621,	1,92	9,35	0,044	0,033	0,022	0,443	336301,	423,
2640,	133045,	472409,	0,443	0,000							
1600,00	15,01	47,20	27, 604,	1,92	9,33	0,025	0,017	0,007	0,368	346387,	131,
748,	113644,	460910,	0,368	0,000							
3200,00	15,40	49,97	29, 583,	1,92	9,39	0,039	0,030	0,011	0,313	361314,	292,
913,	87812,	450331,	0,313	0,000							
D = 23,00											
25,00	12,16	36,33	21, 691,	1,92	9,37	0,102	0,071	0,050	0,616	285757,	830,
4590,	254883,	546060,	0,616	0,000							
50,00	12,71	37,98	22, 687,	1,92	9,37	0,082	0,059	0,033	0,561	295032,	817,
4331,	213491,	513671,	0,561	0,000							
100,00	13,23	39,54	22, 682,	1,92	9,37	0,062	0,050	0,022	0,512	303798,	554,
2281,	187737,	494371,	0,512	0,000							
200,00	13,71	41,04	23, 678,	1,92	9,36	0,035	0,024	0,013	0,427	312174,	327,
972,	141137,	454609,	0,427	0,000							
400,00	14,16	42,48	24, 675,	1,92	9,33	0,030	0,024	0,009	0,396	320242,	296,
690,	130198,	451426,	0,396	0,000							
1000,00	14,73	44,31	25, 670,	1,92	9,36	0,025	0,015	0,008	0,350	330532,	122,
785,	112798,	444237,	0,350	0,000							
1600,00	15,01	45,23	25, 667,	1,92	9,33	0,017	0,010	0,004	0,302	335674,	105,
473,	100982,	437234,	0,302	0,000							
3200,00	15,40	46,56	26, 664,	1,92	9,39	0,018	0,012	0,005	0,276	343115,	89,
225,	85410,	428840,	0,276	0,000							

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ERUBLE 37,000000000000

RLS repair: blocks behind

----- ICASE S,1

D = 15,00

25,00	12,16	40,70	25, 494,	1,92	9,33	0,347	0,303	0,241	0,786	338732,	1,
19970,	244068,	602771,	0,786	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,38	0,284	0,240	0,177	0,705	360095,	0,
12519,	192461,	565075,	0,705	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,39	0,197	0,161	0,112	0,616	381542,	0,
8138,	161373,	551053,	0,616	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,33	0,126	0,113	0,079	0,492	403192,	0,
5522,	111001,	519715,	0,492	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,29	0,076	0,055	0,030	0,416	425125,	0,
1934,	88049,	515108,	0,416	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,35	0,056	0,038	0,022	0,313	454651,	0,
685,	62337,	517673,	0,313	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,29	0,046	0,034	0,025	0,260	470060,	0,
1258,	41928,	513246,	0,260	0,000							
3200,00	15,40	73,52	52, 384,	1,92	9,34	0,038	0,023	0,014	0,188	493141,	0,
1109,	32463,	526712,	0,188	0,000							

D = 17,00

25,00	12,16	36,90	21, 577,	1,92	9,36	0,312	0,260	0,190	0,801	316509,	693,
15585,	268574,	601361,	0,801	0,000							
50,00	12,71	39,80	23, 555,	1,92	9,33	0,249	0,201	0,133	0,713	330815,	523,
10308,	230023,	571669,	0,713	0,000							
100,00	13,23	43,55	26, 525,	1,92	9,38	0,184	0,153	0,107	0,605	349267,	395,
8732,	173985,	532379,	0,605	0,000							
200,00	13,71	47,30	29, 501,	1,92	9,36	0,163	0,134	0,083	0,519	367769,	309,
6616,	141625,	516320,	0,519	0,000							
400,00	14,16	51,08	32, 482,	1,92	9,36	0,093	0,078	0,047	0,433	386398,	162,
2866,	103852,	493277,	0,433	0,000							
1000,00	14,73	56,13	37, 461,	1,92	9,34	0,046	0,033	0,017	0,305	411308,	59,
750,	72040,	484157,	0,305	0,000							
1600,00	15,01	58,75	39, 452,	1,92	9,40	0,041	0,033	0,023	0,275	424239,	82,
2012,	63478,	489810,	0,275	0,000							
3200,00	15,40	62,66	42, 440,	1,92	9,38	0,022	0,014	0,005	0,193	443525,	23,
416,	33924,	477888,	0,193	0,000							

D = 19,00

25,00	12,16	36,44	21, 615,	1,92	9,37	0,199	0,162	0,117	0,710	310218,	819,
10177,	249818,	571032,	0,710	0,000							
50,00	12,71	38,28	21, 610,	1,92	9,39	0,186	0,152	0,103	0,651	319713,	727,
6997,	218114,	545550,	0,651	0,000							
100,00	13,23	40,04	22, 606,	1,92	9,35	0,157	0,127	0,085	0,581	328761,	685,
8156,	183229,	520831,	0,581	0,000							
200,00	13,71	42,42	24, 589,	1,92	9,34	0,118	0,094	0,062	0,528	341039,	451,
4457,	151252,	497200,	0,528	0,000							
400,00	14,16	45,60	27, 562,	1,92	9,33	0,086	0,065	0,042	0,445	357438,	253,
3340,	130242,	491273,	0,445	0,000							
1000,00	14,73	49,82	30, 534,	1,92	9,32	0,048	0,034	0,014	0,319	379229,	160,
1262,	77034,	457686,	0,319	0,000							
1600,00	15,01	52,01	32, 522,	1,92	9,38	0,030	0,017	0,009	0,260	390484,	45,
267,	63399,	454195,	0,260	0,000							
3200,00	15,40	55,25	35, 506,	1,92	9,35	0,025	0,015	0,008	0,202	407203,	64,
745,	45015,	453028,	0,202	0,000							

D = 21,00

25,00	12,16	36,28	21, 653,	1,92	9,36	0,117	0,085	0,055	0,612	305785,	535,
4781,	219088,	530189,	0,612	0,000							
50,00	12,71	38,02	21, 648,	1,92	9,38	0,124	0,086	0,055	0,527	315116,	557,
5084,	171759,	492517,	0,527	0,000							
100,00	13,23	39,66	22, 644,	1,92	9,34	0,105	0,081	0,052	0,455	323970,	541,
4561,	144490,	473562,	0,455	0,000							
200,00	13,71	41,24	23, 640,	1,92	9,37	0,082	0,059	0,041	0,424	332461,	324,
2795,	131234,	466815,	0,424	0,000							
400,00	14,16	42,76	24, 636,	1,92	9,35	0,062	0,048	0,030	0,343	340669,	293,
2672,	100929,	444564,	0,343	0,000							

1000,00	14,73	45,32	25, 621,	1,92	9,41	0,054	0,035	0,017	0,326	354459,	223,
1481,	92368,	448531,	0,326	0,000							
1600,00	15,01	47,20	27, 604,	1,92	9,35	0,029	0,021	0,008	0,263	364545,	90,
339,	69247,	434221,	0,263	0,000							
3200,00	15,40	49,97	29, 583,	1,92	9,32	0,022	0,014	0,006	0,181	379472,	81,
214,	40925,	420691,	0,181	0,000							
D = 23,00											
25,00	12,16	36,33	21, 691,	1,92	9,35	0,103	0,063	0,029	0,483	302879,	447,
3169,	162780,	469275,	0,483	0,000							
50,00	12,71	37,98	22, 687,	1,92	9,37	0,080	0,057	0,030	0,413	312154,	463,
2764,	136535,	451916,	0,413	0,000							
100,00	13,23	39,54	22, 682,	1,92	9,39	0,051	0,040	0,023	0,357	320920,	292,
1369,	112631,	435211,	0,357	0,000							
200,00	13,71	41,04	23, 678,	1,92	9,33	0,039	0,025	0,013	0,306	329296,	199,
1250,	82072,	412817,	0,306	0,000							
400,00	14,16	42,48	24, 675,	1,92	9,37	0,039	0,020	0,006	0,277	337364,	119,
167,	76737,	414388,	0,277	0,000							
1000,00	14,73	44,31	25, 670,	1,92	9,34	0,031	0,019	0,012	0,247	347654,	141,
1259,	63786,	412840,	0,247	0,000							
1600,00	15,01	45,23	25, 667,	1,92	9,32	0,022	0,014	0,008	0,191	352796,	101,
807,	47799,	401503,	0,191	0,000							
3200,00	15,40	46,56	26, 664,	1,92	9,36	0,024	0,017	0,008	0,187	360237,	73,
214,	51257,	411782,	0,187	0,000							

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----- ICASE S,1

D = 15,00											
25,00	12,16	40,70	25, 494,	1,92	9,36	0,351	0,296	0,240	0,784	317466,	1812,
19065,	260517,	598860,	0,784	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,34	0,239	0,202	0,152	0,666	338829,	1223,
13495,	193224,	546771,	0,666	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,30	0,183	0,153	0,108	0,579	360276,	903,
8640,	153346,	523165,	0,579	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,31	0,137	0,097	0,066	0,487	381926,	462,
4034,	113636,	500058,	0,487	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,36	0,117	0,085	0,053	0,392	403859,	403,
3854,	88533,	496649,	0,392	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,34	0,050	0,035	0,016	0,241	433385,	113,
842,	50078,	484417,	0,241	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,28	0,040	0,026	0,016	0,208	448794,	125,
1264,	38415,	488598,	0,208	0,000							
3200,00	15,40	73,52	52, 384,	1,92	9,35	0,034	0,023	0,014	0,161	471875,	138,
717,	30535,	503263,	0,161	0,000							
D = 17,00											
25,00	12,16	36,90	21, 577,	1,92	9,35	0,315	0,263	0,200	0,768	296279,	2487,
21040,	284308,	604113,	0,768	0,000							
50,00	12,71	39,80	23, 555,	1,92	9,32	0,212	0,173	0,129	0,727	310585,	1516,
12816,	245458,	570376,	0,727	0,000							
100,00	13,23	43,55	26, 525,	1,92	9,39	0,178	0,144	0,107	0,600	329037,	1214,
9481,	186840,	526571,	0,600	0,000							
200,00	13,71	47,30	29, 501,	1,92	9,37	0,136	0,107	0,079	0,516	347539,	859,
6452,	140830,	495680,	0,516	0,000							
400,00	14,16	51,08	32, 482,	1,92	9,36	0,097	0,071	0,036	0,396	366168,	394,
2726,	103715,	473003,	0,396	0,000							
1000,00	14,73	56,13	37, 461,	1,92	9,38	0,061	0,050	0,029	0,294	391078,	384,
2156,	64497,	458115,	0,294	0,000							
1600,00	15,01	58,75	39, 452,	1,92	9,35	0,035	0,023	0,015	0,199	404009,	131,
799,	42267,	447205,	0,199	0,000							
3200,00	15,40	62,66	42, 440,	1,92	9,35	0,025	0,017	0,009	0,157	423295,	106,
491,	32873,	456765,	0,157	0,000							
D = 19,00											
25,00	12,16	36,44	21, 615,	1,92	9,37	0,227	0,186	0,133	0,711	291024,	1814,
12872,	263116,	568827,	0,711	0,000							
50,00	12,71	38,28	21, 610,	1,92	9,32	0,168	0,142	0,103	0,634	300519,	1492,
10226,	230564,	542801,	0,634	0,000							

100,00	13,23	40,04	22, 606,	1,92	9,30	0,141	0,112	0,070	0,599	309567,	1030,
5849,	189229,	505676,	0,599	0,000							
200,00	13,71	42,42	24, 589,	1,92	9,36	0,115	0,088	0,053	0,483	321845,	917,
5202,	156201,	484166,	0,483	0,000							
400,00	14,16	45,60	27, 562,	1,92	9,32	0,089	0,068	0,041	0,390	338244,	525,
3305,	113887,	455961,	0,390	0,000							
1000,00	14,73	49,82	30, 534,	1,92	9,32	0,050	0,036	0,018	0,284	360035,	320,
1874,	69073,	431302,	0,284	0,000							
1600,00	15,01	52,01	32, 522,	1,92	9,35	0,040	0,027	0,016	0,225	371290,	210,
983,	51620,	424103,	0,225	0,000							
3200,00	15,40	55,25	35, 506,	1,92	9,36	0,021	0,013	0,007	0,162	388009,	103,
821,	35905,	424838,	0,162	0,000							
D = 21,00											
25,00	12,16	36,28	21, 653,	1,92	9,34	0,140	0,107	0,067	0,608	287627,	1188,
6824,	225771,	521410,	0,608	0,000							
50,00	12,71	38,02	21, 648,	1,92	9,39	0,104	0,077	0,055	0,543	296958,	796,
4796,	192026,	494575,	0,543	0,000							
100,00	13,23	39,66	22, 644,	1,92	9,34	0,094	0,067	0,037	0,493	305812,	625,
3705,	167334,	477476,	0,493	0,000							
200,00	13,71	41,24	23, 640,	1,92	9,33	0,068	0,055	0,029	0,400	314303,	554,
2804,	118762,	436423,	0,400	0,000							
400,00	14,16	42,76	24, 636,	1,92	9,37	0,070	0,054	0,035	0,353	322511,	547,
2199,	112009,	437266,	0,353	0,000							
1000,00	14,73	45,32	25, 621,	1,92	9,32	0,041	0,027	0,018	0,308	336301,	305,
1437,	87495,	425539,	0,308	0,000							
1600,00	15,01	47,20	27, 604,	1,92	9,32	0,025	0,016	0,003	0,219	346387,	102,
72,	57281,	403843,	0,219	0,000							
3200,00	15,40	49,97	29, 583,	1,92	9,32	0,029	0,020	0,009	0,193	361314,	156,
523,	50838,	412832,	0,193	0,000							
D = 23,00											
25,00	12,16	36,33	21, 691,	1,92	9,32	0,112	0,089	0,042	0,443	285757,	1012,
3999,	152063,	442831,	0,443	0,000							
50,00	12,71	37,98	22, 687,	1,92	9,34	0,074	0,050	0,023	0,417	295032,	521,
1958,	140402,	437912,	0,417	0,000							
100,00	13,23	39,54	22, 682,	1,92	9,38	0,048	0,030	0,020	0,348	303798,	331,
1679,	115013,	420821,	0,348	0,000							
200,00	13,71	41,04	23, 678,	1,92	9,41	0,054	0,036	0,018	0,326	312174,	397,
1651,	104696,	418919,	0,326	0,000							
400,00	14,16	42,48	24, 675,	1,92	9,33	0,048	0,033	0,017	0,260	320242,	384,
1467,	76484,	398578,	0,260	0,000							
1000,00	14,73	44,31	25, 670,	1,92	9,38	0,033	0,021	0,014	0,224	330532,	296,
2067,	68156,	401051,	0,224	0,000							
1600,00	15,01	45,23	25, 667,	1,92	9,33	0,023	0,016	0,009	0,183	335674,	167,
841,	52015,	388696,	0,183	0,000							
3200,00	15,40	46,56	26, 664,	1,92	9,42	0,016	0,010	0,004	0,161	343115,	80,
203,	40782,	384181,	0,161	0,000							

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ERUBLE 40,000000000000

RLS repair: blocks behind

----- ICASE S

D = 15,00											
25,00	12,16	40,70	25, 494,	1,92	9,35	0,365	0,307	0,258	0,655	338732,	1,
22521,	185775,	547028,	0,655	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,41	0,279	0,241	0,168	0,570	360095,	0,
13258,	140216,	513570,	0,570	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,38	0,199	0,169	0,109	0,486	381542,	0,
7342,	114542,	503427,	0,486	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,34	0,152	0,120	0,082	0,355	403192,	0,
6238,	77173,	486603,	0,355	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,35	0,083	0,069	0,048	0,286	425125,	0,
2266,	49902,	477292,	0,286	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,38	0,064	0,050	0,032	0,176	454651,	0,
1755,	29787,	486193,	0,176	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,36	0,041	0,028	0,020	0,159	470060,	0,
1222,	28195,	499477,	0,159	0,000							



3200,00	15,40	73,52	52,384,	1,92	9,37	0,027	0,022	0,010	0,125	493141,	0,
165,	18826,	512132,	0,125	0,000							
D = 17,00											
25,00	12,16	36,90	21,577,	1,92	9,36	0,311	0,265	0,208	0,666	316509,	716,
16821,	203751,	537797,	0,666	0,000							
50,00	12,71	39,80	23,555,	1,92	9,36	0,243	0,203	0,148	0,586	330815,	526,
11909,	162519,	505769,	0,586	0,000							
100,00	13,23	43,55	26,525,	1,92	9,32	0,179	0,153	0,121	0,450	349267,	442,
9631,	113141,	472481,	0,450	0,000							
200,00	13,71	47,30	29,501,	1,92	9,34	0,138	0,102	0,067	0,373	367769,	245,
5263,	87049,	460326,	0,373	0,000							
400,00	14,16	51,08	32,482,	1,92	9,38	0,086	0,062	0,042	0,325	386398,	118,
2737,	77152,	466404,	0,325	0,000							
1000,00	14,73	56,13	37,461,	1,92	9,34	0,044	0,038	0,026	0,197	411308,	59,
920,	39698,	451985,	0,197	0,000							
1600,00	15,01	58,75	39,452,	1,92	9,34	0,041	0,028	0,020	0,162	424239,	51,
1002,	30777,	456070,	0,162	0,000							
3200,00	15,40	62,66	42,440,	1,92	9,37	0,032	0,013	0,008	0,125	443525,	31,
585,	25046,	469186,	0,125	0,000							
D = 19,00											
25,00	12,16	36,44	21,615,	1,92	9,34	0,222	0,179	0,131	0,539	310218,	1001,
12706,	166287,	490212,	0,539	0,000							
50,00	12,71	38,28	21,610,	1,92	9,39	0,167	0,129	0,088	0,521	319713,	624,
7238,	154598,	482172,	0,521	0,000							
100,00	13,23	40,04	22,606,	1,92	9,37	0,160	0,136	0,090	0,472	328761,	602,
6355,	138636,	474354,	0,472	0,000							
200,00	13,71	42,42	24,589,	1,92	9,36	0,113	0,091	0,066	0,370	341039,	432,
5092,	95991,	442554,	0,370	0,000							
400,00	14,16	45,60	27,562,	1,92	9,39	0,080	0,063	0,039	0,307	357438,	278,
3658,	81032,	442405,	0,307	0,000							
1000,00	14,73	49,82	30,534,	1,92	9,37	0,053	0,041	0,026	0,207	379229,	184,
1208,	47637,	428258,	0,207	0,000							
1600,00	15,01	52,01	32,522,	1,92	9,30	0,022	0,016	0,009	0,156	390484,	75,
562,	29444,	420564,	0,156	0,000							
3200,00	15,40	55,25	35,506,	1,92	9,36	0,017	0,011	0,010	0,135	407203,	42,
451,	24612,	432308,	0,135	0,000							
D = 21,00											
25,00	12,16	36,28	21,653,	1,92	9,34	0,148	0,112	0,068	0,451	305785,	725,
5405,	146815,	458730,	0,451	0,000							
50,00	12,71	38,02	21,648,	1,92	9,35	0,120	0,089	0,054	0,393	315116,	587,
5097,	118813,	439612,	0,393	0,000							
100,00	13,23	39,66	22,644,	1,92	9,38	0,093	0,068	0,038	0,338	323970,	450,
2678,	92718,	419815,	0,338	0,000							
200,00	13,71	41,24	23,640,	1,92	9,35	0,075	0,056	0,035	0,303	332461,	365,
3523,	82542,	418891,	0,303	0,000							
400,00	14,16	42,76	24,636,	1,92	9,34	0,061	0,048	0,030	0,240	340669,	316,
2048,	67027,	410060,	0,240	0,000							
1000,00	14,73	45,32	25,621,	1,92	9,35	0,047	0,031	0,022	0,192	354459,	127,
1360,	42846,	398792,	0,192	0,000							
1600,00	15,01	47,20	27,604,	1,92	9,38	0,038	0,023	0,011	0,156	364545,	167,
922,	38092,	403727,	0,156	0,000							
3200,00	15,40	49,97	29,583,	1,92	9,39	0,027	0,018	0,010	0,109	379472,	88,
308,	25715,	405584,	0,109	0,000							
D = 23,00											
25,00	12,16	36,33	21,691,	1,92	9,35	0,105	0,077	0,047	0,333	302879,	881,
5201,	101643,	410604,	0,333	0,000							
50,00	12,71	37,98	22,687,	1,92	9,36	0,061	0,048	0,028	0,260	312154,	458,
2628,	73793,	389033,	0,260	0,000							
100,00	13,23	39,54	22,682,	1,92	9,36	0,074	0,058	0,039	0,231	320920,	573,
4246,	68900,	394639,	0,231	0,000							
200,00	13,71	41,04	23,678,	1,92	9,33	0,044	0,030	0,021	0,184	329296,	290,
2212,	53495,	385293,	0,184	0,000							
400,00	14,16	42,48	24,675,	1,92	9,35	0,040	0,023	0,014	0,177	337364,	225,
1748,	48610,	387947,	0,177	0,000							
1000,00	14,73	44,31	25,670,	1,92	9,30	0,027	0,021	0,010	0,115	347654,	135,
677,	29823,	378290,	0,115	0,000							

1600,00	15,01	45,23	25, 667,	1,92	9,38	0,022	0,013	0,004	0,109	352796,	126,
393,	24844,	378158,	0,109	0,000							
3200,00	15,40	46,56	26, 664,	1,92	9,35	0,018	0,010	0,003	0,115	360237,	64,
93,	26302,	386696,	0,115	0,000							

S1b-45

----- ICASE S,1

D = 15,00

25,00	12,16	40,70	25, 494,	1,92	9,34	0,355	0,297	0,230	0,568	317466,	2051,
22686,	163031,	505234,	0,568	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,37	0,266	0,221	0,165	0,503	338829,	1212,
12297,	131305,	483643,	0,503	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,36	0,177	0,140	0,094	0,346	360276,	860,
7642,	75986,	444765,	0,346	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,39	0,134	0,099	0,063	0,283	381926,	553,
5015,	55088,	442582,	0,283	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,38	0,089	0,067	0,042	0,203	403859,	365,
2837,	36258,	443319,	0,203	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,32	0,049	0,037	0,017	0,117	433385,	228,
1669,	20199,	455481,	0,117	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,38	0,050	0,039	0,021	0,094	448794,	151,
939,	14433,	464316,	0,094	0,000							
3200,00	15,40	73,52	52, 384,	1,92	9,37	0,033	0,025	0,010	0,054	471875,	57,
203,	8656,	480791,	0,054	0,000							

D = 17,00

25,00	12,16	36,90	21, 577,	1,92	9,31	0,284	0,236	0,178	0,581	296279,	2036,
16614,	177991,	492920,	0,581	0,000							
50,00	12,71	39,80	23, 555,	1,92	9,38	0,256	0,208	0,145	0,463	310585,	1644,
13419,	131387,	457035,	0,463	0,000							
100,00	13,23	43,55	26, 525,	1,92	9,38	0,198	0,154	0,100	0,409	329037,	1165,
8519,	107412,	446133,	0,409	0,000							
200,00	13,71	47,30	29, 501,	1,92	9,34	0,120	0,091	0,064	0,312	347539,	600,
4504,	77239,	429882,	0,312	0,000							
400,00	14,16	51,08	32, 482,	1,92	9,39	0,089	0,075	0,043	0,195	366168,	586,
4404,	41883,	413041,	0,195	0,000							
1000,00	14,73	56,13	37, 461,	1,92	9,38	0,051	0,036	0,024	0,148	391078,	204,
1698,	32169,	425149,	0,148	0,000							
1600,00	15,01	58,75	39, 452,	1,92	9,33	0,042	0,026	0,018	0,085	404009,	140,
1048,	14384,	419581,	0,085	0,000							
3200,00	15,40	62,66	42, 440,	1,92	9,36	0,028	0,019	0,009	0,084	423295,	96,
455,	15784,	439630,	0,084	0,000							

D = 19,00

25,00	12,16	36,44	21, 615,	1,92	9,36	0,217	0,177	0,121	0,524	291024,	1744,
11695,	164487,	468950,	0,524	0,000							
50,00	12,71	38,28	21, 610,	1,92	9,36	0,188	0,150	0,103	0,402	300519,	1670,
12650,	120364,	435203,	0,402	0,000							
100,00	13,23	40,04	22, 606,	1,92	9,35	0,151	0,122	0,085	0,365	309567,	1087,
7850,	99990,	418495,	0,365	0,000							
200,00	13,71	42,42	24, 589,	1,92	9,34	0,125	0,098	0,069	0,261	321845,	947,
6498,	70359,	399649,	0,261	0,000							
400,00	14,16	45,60	27, 562,	1,92	9,33	0,069	0,055	0,035	0,207	338244,	473,
2995,	50550,	392261,	0,207	0,000							
1000,00	14,73	49,82	30, 534,	1,92	9,35	0,047	0,033	0,021	0,154	360035,	270,
1421,	35311,	397038,	0,154	0,000							
1600,00	15,01	52,01	32, 522,	1,92	9,40	0,038	0,024	0,016	0,122	371290,	188,
1241,	26281,	399000,	0,122	0,000							
3200,00	15,40	55,25	35, 506,	1,92	9,32	0,014	0,006	0,003	0,061	388009,	16,
117,	9055,	397198,	0,061	0,000							

D = 21,00

25,00	12,16	36,28	21, 653,	1,92	9,37	0,161	0,128	0,079	0,394	287627,	1303,
7485,	118744,	415159,	0,394	0,000							
50,00	12,71	38,02	21, 648,	1,92	9,37	0,108	0,086	0,054	0,276	296958,	804,
3836,	86432,	388029,	0,276	0,000							
100,00	13,23	39,66	22, 644,	1,92	9,38	0,092	0,066	0,044	0,274	305812,	671,
4121,	70426,	381029,	0,274	0,000							

200,00	13,71	41,24	23, 640,	1,92	9,35	0,078	0,057	0,031	0,212	314303,	571,
2034,	57428,	374336,	0,212	0,000							
400,00	14,16	42,76	24, 636,	1,92	9,35	0,063	0,045	0,024	0,190	322511,	403,
1788,	50046,	374748,	0,190	0,000							
1000,00	14,73	45,32	25, 621,	1,92	9,33	0,026	0,020	0,013	0,114	336301,	283,
1697,	28311,	366592,	0,114	0,000							
1600,00	15,01	47,20	27, 604,	1,92	9,37	0,026	0,020	0,009	0,101	346387,	120,
314,	20941,	367763,	0,101	0,000							
3200,00	15,40	49,97	29, 583,	1,92	9,34	0,024	0,015	0,007	0,063	361314,	222,
943,	14459,	376938,	0,063	0,000							
D =	23,00										
25,00	12,16	36,33	21, 691,	1,92	9,36	0,112	0,093	0,051	0,265	285757,	1095,
4359,	82546,	373756,	0,265	0,000							
50,00	12,71	37,98	22, 687,	1,92	9,38	0,077	0,058	0,036	0,216	295032,	828,
4237,	65591,	365688,	0,216	0,000							
100,00	13,23	39,54	22, 682,	1,92	9,38	0,064	0,042	0,022	0,184	303798,	422,
2144,	53367,	359732,	0,184	0,000							
200,00	13,71	41,04	23, 678,	1,92	9,32	0,038	0,032	0,022	0,137	312174,	361,
1857,	40160,	354552,	0,137	0,000							
400,00	14,16	42,48	24, 675,	1,92	9,37	0,040	0,029	0,010	0,134	320242,	302,
949,	36538,	358032,	0,134	0,000							
1000,00	14,73	44,31	25, 670,	1,92	9,36	0,027	0,018	0,011	0,083	330532,	151,
761,	20899,	352343,	0,083	0,000							
1600,00	15,01	45,23	25, 667,	1,92	9,37	0,026	0,022	0,006	0,074	335674,	252,
635,	19999,	356559,	0,074	0,000							
3200,00	15,40	46,56	26, 664,	1,92	9,33	0,019	0,014	0,006	0,053	343115,	160,
311,	11221,	354807,	0,053	0,000							

S2-b-45

ERUBLE 45,000000000000

RLS repair: blocks behind

----- ICASE S

D =	15,00										
25,00	12,16	40,70	25, 494,	1,92	9,35	0,362	0,317	0,246	0,456	338732,	1,
20626,	107972,	467330,	0,456	0,000							
50,00	12,71	45,24	29, 466,	1,92	9,32	0,245	0,211	0,164	0,339	360095,	0,
13321,	76584,	450000,	0,339	0,000							
100,00	13,23	49,80	32, 445,	1,92	9,37	0,187	0,153	0,113	0,241	381542,	0,
7801,	47274,	436617,	0,241	0,000							
200,00	13,71	54,40	36, 428,	1,92	9,40	0,159	0,131	0,092	0,175	403192,	0,
6823,	33717,	443732,	0,175	0,000							
400,00	14,16	59,06	40, 415,	1,92	9,37	0,099	0,073	0,049	0,136	425125,	0,
2893,	21417,	449436,	0,136	0,000							
1000,00	14,73	65,34	45, 399,	1,92	9,33	0,060	0,045	0,023	0,070	454651,	0,
871,	13017,	468539,	0,070	0,000							
1600,00	15,01	68,62	48, 393,	1,92	9,32	0,046	0,037	0,024	0,053	470060,	0,
1372,	8331,	479763,	0,053	0,000							
3200,00	15,40	73,52	52, 384,	1,92	9,31	0,022	0,011	0,007	0,049	493141,	0,
425,	8134,	501700,	0,049	0,000							
D =	17,00										
25,00	12,16	36,90	21, 577,	1,92	9,36	0,303	0,250	0,201	0,417	316509,	722,
16850,	108340,	442421,	0,417	0,000							
50,00	12,71	39,80	23, 555,	1,92	9,34	0,275	0,219	0,152	0,341	330815,	551,
12961,	86358,	430685,	0,341	0,000							
100,00	13,23	43,55	26, 525,	1,92	9,36	0,181	0,138	0,097	0,254	349267,	392,
8302,	60537,	418497,	0,254	0,000							
200,00	13,71	47,30	29, 501,	1,92	9,38	0,103	0,077	0,059	0,207	367769,	172,
3984,	43878,	415804,	0,207	0,000							
400,00	14,16	51,08	32, 482,	1,92	9,34	0,094	0,073	0,050	0,121	386398,	206,
4452,	24823,	415878,	0,121	0,000							
1000,00	14,73	56,13	37, 461,	1,92	9,37	0,059	0,045	0,025	0,083	411308,	89,
1854,	14193,	427444,	0,083	0,000							
1600,00	15,01	58,75	39, 452,	1,92	9,34	0,046	0,035	0,014	0,079	424239,	44,
801,	10656,	435740,	0,079	0,000							
3200,00	15,40	62,66	42, 440,	1,92	9,34	0,027	0,014	0,008	0,046	443525,	23,
616,	7739,	451903,	0,046	0,000							

D = 19,00  
 25,00 12,16 36,44 21, 615, 1,92 9,31 0,195 0,154 0,112 0,327 310218, 850,  
 10720, 81860, 403648, 0,327 0,000  
 50,00 12,71 38,28 21, 610, 1,92 9,40 0,160 0,131 0,091 0,286 319713, 676,  
 7317, 73647, 401353, 0,286 0,000  
 100,00 13,23 40,04 22, 606, 1,92 9,30 0,143 0,111 0,079 0,253 328761, 574,  
 7266, 59384, 395985, 0,253 0,000  
 200,00 13,71 42,42 24, 589, 1,92 9,35 0,118 0,093 0,065 0,165 341039, 435,  
 6028, 39548, 387050, 0,165 0,000  
 400,00 14,16 45,60 27, 562, 1,92 9,37 0,090 0,064 0,032 0,114 357438, 295,  
 2986, 21443, 382161, 0,114 0,000  
 1000,00 14,73 49,82 30, 534, 1,92 9,41 0,054 0,033 0,019 0,079 379229, 149,  
 1624, 13994, 394996, 0,079 0,000  
 1600,00 15,01 52,01 32, 522, 1,92 9,36 0,050 0,035 0,019 0,058 390484, 117,  
 1319, 10113, 402033, 0,058 0,000  
 3200,00 15,40 55,25 35, 506, 1,92 9,40 0,021 0,015 0,010 0,050 407203, 74,  
 571, 8631, 416479, 0,050 0,000

D = 21,00  
 25,00 12,16 36,28 21, 653, 1,92 9,35 0,148 0,116 0,078 0,238 305785, 842,  
 7691, 65698, 380016, 0,238 0,000  
 50,00 12,71 38,02 21, 648, 1,92 9,38 0,106 0,082 0,054 0,215 315116, 474,  
 3948, 52837, 372375, 0,215 0,000  
 100,00 13,23 39,66 22, 644, 1,92 9,39 0,097 0,072 0,050 0,173 323970, 445,  
 4333, 47398, 376146, 0,173 0,000  
 200,00 13,71 41,24 23, 640, 1,92 9,33 0,081 0,052 0,039 0,132 332461, 328,  
 2974, 32078, 367841, 0,132 0,000  
 400,00 14,16 42,76 24, 636, 1,92 9,35 0,062 0,047 0,030 0,099 340669, 298,  
 1950, 24549, 367467, 0,099 0,000  
 1000,00 14,73 45,32 25, 621, 1,92 9,32 0,045 0,033 0,014 0,071 354459, 171,  
 620, 13561, 368811, 0,071 0,000  
 1600,00 15,01 47,20 27, 604, 1,92 9,38 0,039 0,029 0,009 0,056 364545, 142,  
 1032, 11809, 377529, 0,056 0,000  
 3200,00 15,40 49,97 29, 583, 1,92 9,37 0,027 0,018 0,007 0,037 379472, 105,  
 562, 6211, 386350, 0,037 0,000

D = 23,00  
 25,00 12,16 36,33 21, 691, 1,92 9,31 0,086 0,066 0,039 0,134 302879, 587,  
 4279, 35095, 342840, 0,134 0,000  
 50,00 12,71 37,98 22, 687, 1,92 9,33 0,072 0,052 0,032 0,123 312154, 561,  
 3141, 30686, 346541, 0,123 0,000  
 100,00 13,23 39,54 22, 682, 1,92 9,31 0,053 0,036 0,020 0,094 320920, 338,  
 2124, 23760, 347143, 0,094 0,000  
 200,00 13,71 41,04 23, 678, 1,92 9,37 0,047 0,035 0,019 0,083 329296, 283,  
 2130, 25311, 357020, 0,083 0,000  
 400,00 14,16 42,48 24, 675, 1,92 9,34 0,045 0,032 0,015 0,061 337364, 217,  
 981, 11688, 350250, 0,061 0,000  
 1000,00 14,73 44,31 25, 670, 1,92 9,37 0,029 0,019 0,009 0,041 347654, 125,  
 702, 7611, 356092, 0,041 0,000  
 1600,00 15,01 45,23 25, 667, 1,92 9,32 0,015 0,010 0,007 0,048 352796, 73,  
 661, 12121, 365650, 0,048 0,000  
 3200,00 15,40 46,56 26, 664, 1,92 9,35 0,024 0,016 0,011 0,034 360237, 90,  
 866, 6344, 367538, 0,034 0,000

FD-b-40

ERUBLE 40,00000000000000

RLS repair: blocks behind

----- ICASE F,1

D = 21,00  
 25,00 5,07 17,26 10, 543, 1,92 3,23 0,000 0,000 0,000 0,136 151739, 0,  
 0, 28261, 180000, 0,136 0,000  
 50,00 5,36 17,95 11, 542, 1,92 3,24 0,000 0,000 0,000 0,094 154983, 0,  
 0, 23468, 178451, 0,094 0,000  
 100,00 5,64 18,63 11, 540, 1,92 3,25 0,000 0,000 0,000 0,078 158192, 0,  
 0, 19559, 177752, 0,078 0,000  
 200,00 5,92 19,31 11, 539, 1,92 3,23 0,000 0,000 0,000 0,057 161386, 0,  
 0, 12215, 173601, 0,057 0,000

400,00	6,20	19,99	12,	537,	1,92	3,24	0,000	0,000	0,000	0,043	164575,	0,
0, 10978,	175554,	0,043	0,000									
1000,00	6,56	20,89	12,	535,	1,92	3,25	0,000	0,000	0,000	0,032	168795,	0,
0, 4754,	173549,	0,032	0,000									
1600,00	6,74	21,35	12,	534,	1,92	3,25	0,000	0,000	0,000	0,027	170965,	0,
0, 4419,	175384,	0,027	0,000									
3200,00	7,01	22,03	13,	532,	1,92	3,24	0,000	0,000	0,000	0,027	174173,	0,
0, 5498,	179671,	0,027	0,000									
D = 24,00												
25,00	5,07	17,85	11,	600,	1,92	3,25	0,000	0,000	0,000	0,036	147596,	0,
0, 9655,	157252,	0,036	0,000									
50,00	5,36	18,55	11,	599,	1,92	3,23	0,000	0,000	0,000	0,022	151104,	0,
0, 3446,	154551,	0,022	0,000									
100,00	5,64	19,23	11,	597,	1,92	3,22	0,000	0,000	0,000	0,026	154564,	0,
0, 4877,	159441,	0,026	0,000									
200,00	5,92	19,91	12,	596,	1,92	3,23	0,000	0,000	0,000	0,022	157996,	0,
0, 4212,	162209,	0,022	0,000									
400,00	6,20	20,59	12,	594,	1,92	3,24	0,000	0,000	0,000	0,011	161413,	0,
0, 2365,	163779,	0,011	0,000									
1000,00	6,56	21,49	13,	592,	1,92	3,24	0,000	0,000	0,000	0,011	165918,	0,
0, 3662,	169580,	0,011	0,000									
1600,00	6,74	21,94	13,	591,	1,92	3,25	0,000	0,000	0,000	0,006	168227,	0,
0, 1130,	169357,	0,006	0,000									
3200,00	7,01	22,62	13,	589,	1,92	3,24	0,000	0,000	0,000	0,005	171632,	0,
0, 726,	172358,	0,005	0,000									
D = 27,00												
25,00	5,07	18,42	11,	657,	1,92	3,24	0,000	0,000	0,000	0,018	144725,	0,
0, 2867,	147592,	0,018	0,000									
50,00	5,36	19,13	11,	656,	1,92	3,25	0,000	0,000	0,000	0,016	148530,	0,
0, 2079,	150610,	0,016	0,000									
100,00	5,64	19,82	12,	654,	1,92	3,24	0,000	0,000	0,000	0,006	152276,	0,
0, 1336,	153612,	0,006	0,000									
200,00	5,92	20,51	12,	653,	1,92	3,25	0,000	0,000	0,000	0,003	155982,	0,
0, 839,	156822,	0,003	0,000									
400,00	6,20	21,20	13,	651,	1,92	3,25	0,000	0,000	0,000	0,000	159664,	0,
0, 0,	159664,	0,000	0,000									
1000,00	6,56	22,10	13,	649,	1,92	3,23	0,000	0,000	0,000	0,003	164505,	0,
0, 498,	165002,	0,003	0,000									
1600,00	6,74	22,56	13,	648,	1,92	3,26	0,000	0,000	0,000	0,000	166979,	0,
0, 0,	166979,	0,000	0,000									
3200,00	7,01	23,23	14,	646,	1,92	3,24	0,000	0,000	0,000	0,001	170622,	0,
0, 12,	170634,	0,001	0,000									
D = 30,00												
25,00	5,07	18,95	11,	714,	1,92	3,26	0,000	0,000	0,000	0,007	143054,	0,
0, 471,	143525,	0,007	0,000									
50,00	5,36	19,68	12,	713,	1,92	3,23	0,000	0,000	0,000	0,000	147185,	0,
0, 0,	147185,	0,000	0,000									
100,00	5,64	20,39	12,	711,	1,92	3,25	0,000	0,000	0,000	0,000	151243,	0,
0, 0,	151243,	0,000	0,000									
200,00	5,92	21,09	13,	710,	1,92	3,23	0,000	0,000	0,000	0,000	155253,	0,
0, 0,	155253,	0,000	0,000									
400,00	6,20	21,78	13,	708,	1,92	3,24	0,000	0,000	0,000	0,000	159229,	0,
0, 0,	159229,	0,000	0,000									
1000,00	6,56	22,70	13,	706,	1,92	3,25	0,000	0,000	0,000	0,000	164445,	0,
0, 0,	164445,	0,000	0,000									
1600,00	6,74	23,16	14,	705,	1,92	3,25	0,000	0,000	0,000	0,000	167106,	0,
0, 0,	167106,	0,000	0,000									
3200,00	7,01	23,85	14,	703,	1,92	3,22	0,000	0,000	0,000	0,000	171018,	0,
0, 0,	171018,	0,000	0,000									
D = 33,00												
25,00	5,07	19,46	12,	771,	1,92	3,24	0,000	0,000	0,000	0,000	142531,	0,
0, 0,	142531,	0,000	0,000									
50,00	5,36	20,20	12,	770,	1,92	3,25	0,000	0,000	0,000	0,000	147010,	0,
0, 0,	147010,	0,000	0,000									
100,00	5,64	20,92	12,	768,	1,92	3,26	0,000	0,000	0,000	0,000	151406,	0,
0, 0,	151406,	0,000	0,000									

200,00	5,92	21,64	13,	767,	1,92	3,23	0,000	0,000	0,000	0,000	155743,	0,
0,	0,	155743,	0,000	0,000								
400,00	6,20	22,35	13,	765,	1,92	3,26	0,000	0,000	0,000	0,000	160037,	0,
0,	0,	160037,	0,000	0,000								
1000,00	6,56	23,28	14,	763,	1,92	3,23	0,000	0,000	0,000	0,000	165662,	0,
0,	0,	165662,	0,000	0,000								
1600,00	6,74	23,75	14,	762,	1,92	3,24	0,000	0,000	0,000	0,000	168528,	0,
0,	0,	168528,	0,000	0,000								
3200,00	7,01	24,44	14,	761,	1,92	3,24	0,000	0,000	0,000	0,000	172734,	0,
0,	0,	172734,	0,000	0,000								

## D2.2 Caissons on rubble foundation on sand seabed

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Sand Subsoil                F1-S30-R37
ERUBBLE 37,00000000000000
ESAND 30,00000000000000
RLS repair: blocks behind
----- ICASE F,1
D = 9,00
  TDES  HSD  B    bz sigma  EH1  EH2  PFS  PFR  PFU  PFF  CIN  ERR  EUU
EFF    CTOT  PFrubble PFSand
25,00  5,07  15,27  9, 284,  1,92  3,23  0,197  0,170  0,142  0,421  51473,  285,
3124,  24127,  79009,  0,421  0,001
50,00  5,36  16,16  9, 281,  1,92  3,24  0,163  0,141  0,117  0,336  53480,  220,
2404,  18711,  74815,  0,330  0,026
100,00  5,64  17,06  10, 279,  1,92  3,25  0,097  0,082  0,062  0,288  55496,  131,
1358,  14466,  71451,  0,287  0,027
200,00  5,92  17,96  10, 276,  1,92  3,23  0,082  0,071  0,053  0,232  57531,  99,
999,  12015,  70645,  0,229  0,035
400,00  6,20  18,88  10, 274,  1,92  3,24  0,046  0,039  0,029  0,154  59596,  45,
405,  8522,  68568,  0,151  0,020
1000,00  6,56  20,91  12, 258,  1,92  3,25  0,027  0,023  0,013  0,079  64157,  41,
295,  3658,  68151,  0,077  0,007
1600,00  6,74  22,18  13, 249,  1,92  3,25  0,013  0,010  0,005  0,059  67004,  14,
89,  3041,  70149,  0,057  0,015
3200,00  7,01  24,13  15, 237,  1,92  3,24  0,006  0,003  0,003  0,031  71401,  4,
55,  1237,  72696,  0,027  0,013
D = 10,00
  25,00  5,07  15,33  9, 303,  1,92  3,25  0,131  0,115  0,085  0,291  50965,  230,
2093,  16538,  69826,  0,263  0,195
50,00  5,36  16,18  9, 300,  1,92  3,23  0,101  0,090  0,075  0,225  52967,  191,
1612,  11242,  66012,  0,192  0,151
100,00  5,64  17,03  10, 298,  1,92  3,22  0,064  0,056  0,048  0,160  54965,  104,
843,  8362,  64273,  0,142  0,095
200,00  5,92  17,87  10, 296,  1,92  3,23  0,042  0,031  0,026  0,124  56971,  74,
601,  6018,  63663,  0,114  0,069
400,00  6,20  18,73  10, 293,  1,92  3,24  0,038  0,030  0,022  0,083  58993,  29,
223,  3677,  62921,  0,076  0,044
1000,00  6,56  19,88  11, 290,  1,92  3,24  0,014  0,011  0,007  0,057  61701,  20,
122,  3171,  65013,  0,050  0,031
1600,00  6,74  20,47  11, 288,  1,92  3,25  0,016  0,012  0,006  0,045  63109,  18,
129,  1855,  65112,  0,034  0,030
3200,00  7,01  21,86  12, 278,  1,92  3,24  0,009  0,005  0,002  0,029  66393,  6,
65,  1283,  67746,  0,015  0,027
D = 11,00
  25,00  5,07  15,46  9, 322,  1,92  3,24  0,090  0,080  0,065  0,324  50759,  217,
1865,  20200,  73040,  0,137  0,322
50,00  5,36  16,28  9, 320,  1,92  3,25  0,059  0,048  0,039  0,211  52781,  120,
787,  13400,  67088,  0,087  0,211
100,00  5,64  17,09  10, 317,  1,92  3,24  0,035  0,025  0,015  0,132  54787,  52,
268,  7020,  62129,  0,052  0,132

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200,00	5,92	17,90	10,	315,	1,92	3,25	0,028	0,022	0,018	0,112	56791,	43,
344,	6034,	63211,	0,035	0,112								
400,00	6,20	18,71	10,	312,	1,92	3,25	0,022	0,014	0,010	0,094	58799,	29,
150,	5169,	64146,	0,030	0,094								
1000,00	6,56	19,79	11,	309,	1,92	3,23	0,013	0,009	0,005	0,065	61471,	16,
99,	4494,	66080,	0,016	0,065								
1600,00	6,74	20,35	11,	308,	1,92	3,26	0,007	0,006	0,005	0,068	62854,	14,
66,	3945,	66879,	0,012	0,068								
3200,00	7,01	21,18	12,	305,	1,92	3,24	0,008	0,007	0,004	0,059	64910,	9,
84,	3272,	68276,	0,006	0,059								
D = 12,00												
25,00	5,07	15,64	9,	341,	1,92	3,26	0,059	0,049	0,036	0,346	50815,	138,
918,	25129,	77000,	0,037	0,346								
50,00	5,36	16,44	9,	339,	1,92	3,23	0,039	0,031	0,024	0,247	52876,	68,
522,	15437,	68903,	0,022	0,247								
100,00	5,64	17,23	10,	336,	1,92	3,25	0,023	0,019	0,015	0,191	54911,	43,
236,	12024,	67213,	0,016	0,191								
200,00	5,92	18,01	10,	334,	1,92	3,23	0,012	0,008	0,007	0,134	56932,	29,
273,	8887,	66121,	0,011	0,134								
400,00	6,20	18,79	11,	331,	1,92	3,24	0,015	0,009	0,004	0,122	58949,	16,
53,	6785,	65803,	0,008	0,122								
1000,00	6,56	19,82	11,	328,	1,92	3,25	0,005	0,004	0,001	0,093	61617,	3,
11,	5540,	67171,	0,002	0,093								
1600,00	6,74	20,35	11,	327,	1,92	3,25	0,005	0,003	0,002	0,092	62991,	3,
19,	6545,	69558,	0,001	0,092								
3200,00	7,01	21,14	12,	324,	1,92	3,22	0,002	0,001	0,001	0,065	65026,	0,
3,	3812,	68842,	0,000	0,065								
D = 13,00												
25,00	5,07	15,85	9,	360,	1,92	3,24	0,041	0,030	0,022	0,418	51104,	55,
276,	31903,	83338,	0,010	0,418								
50,00	5,36	16,64	10,	358,	1,92	3,25	0,018	0,016	0,012	0,305	53218,	53,
314,	21435,	75020,	0,002	0,305								
100,00	5,64	17,41	10,	356,	1,92	3,26	0,017	0,016	0,009	0,256	55297,	30,
82,	17552,	72961,	0,001	0,256								
200,00	5,92	18,17	10,	353,	1,92	3,23	0,009	0,006	0,003	0,189	57354,	14,
101,	13099,	70568,	0,002	0,189								
400,00	6,20	18,92	11,	351,	1,92	3,26	0,004	0,003	0,001	0,162	59396,	3,
3,	11048,	70451,	0,000	0,162								
1000,00	6,56	19,92	11,	348,	1,92	3,23	0,003	0,001	0,001	0,145	62086,	0,
4,	9101,	71192,	0,000	0,145								
1600,00	6,74	20,43	11,	346,	1,92	3,24	0,000	0,000	0,000	0,132	63464,	0,
0,	9579,	73044,	0,000	0,132								
3200,00	7,01	21,18	12,	344,	1,92	3,24	0,001	0,001	0,001	0,120	65499,	1,
6,	8427,	73932,	0,000	0,120								

Sand Subsoil F1-S35-R37

ESAND 35,00000000000000

RLS repair: blocks behind

----- ICASE F,1

D = 9,00

25,00	5,07	15,27	9,	284,	1,92	3,24	0,182	0,164	0,131	0,412	51473,	284,
2969,	23441,	78167,	0,412	0,000								
50,00	5,36	16,16	9,	281,	1,92	3,23	0,150	0,132	0,112	0,356	53480,	232,
2441,	20598,	76752,	0,355	0,002								
100,00	5,64	17,06	10,	279,	1,92	3,24	0,089	0,081	0,059	0,264	55496,	120,
1129,	14575,	71320,	0,264	0,008								
200,00	5,92	17,96	10,	276,	1,92	3,24	0,072	0,059	0,047	0,230	57531,	114,
1152,	13181,	71979,	0,229	0,009								
400,00	6,20	18,88	10,	274,	1,92	3,24	0,049	0,041	0,029	0,160	59596,	64,
564,	8169,	68393,	0,160	0,008								
1000,00	6,56	20,91	12,	258,	1,92	3,23	0,028	0,021	0,011	0,083	64157,	31,
237,	3761,	68185,	0,082	0,003								
1600,00	6,74	22,18	13,	249,	1,92	3,24	0,009	0,007	0,004	0,053	67004,	4,
43,	2361,	69411,	0,053	0,004								
3200,00	7,01	24,13	15,	237,	1,92	3,25	0,002	0,002	0,001	0,027	71401,	4,
31,	1156,	72591,	0,026	0,004								

D = 10,00

25,00	5,07	15,33	9, 303,	1,92	3,25	0,121	0,106	0,088	0,284	50965,	241,
2235,	17208,	70648,	0,266	0,108							
50,00	5,36	16,18	9, 300,	1,92	3,25	0,091	0,080	0,065	0,215	52967,	175,
1703,	12608,	67453,	0,199	0,088							
100,00	5,64	17,03	10, 298,	1,92	3,26	0,052	0,038	0,032	0,168	54965,	74,
739,	9543,	65321,	0,162	0,054							
200,00	5,92	17,87	10, 296,	1,92	3,24	0,051	0,044	0,033	0,110	56971,	81,
663,	5104,	62819,	0,104	0,035							
400,00	6,20	18,73	10, 293,	1,92	3,24	0,036	0,025	0,014	0,066	58993,	52,
490,	2746,	62280,	0,065	0,013							
1000,00	6,56	19,88	11, 290,	1,92	3,23	0,026	0,021	0,015	0,048	61701,	40,
366,	2323,	64429,	0,047	0,016							
1600,00	6,74	20,47	11, 288,	1,92	3,24	0,012	0,012	0,006	0,044	63109,	7,
27,	2042,	65185,	0,044	0,016							
3200,00	7,01	21,86	12, 278,	1,92	3,24	0,007	0,005	0,002	0,016	66393,	5,
11,	826,	67234,	0,014	0,009							
D = 11,00											
25,00	5,07	15,46	9, 322,	1,92	3,23	0,074	0,064	0,049	0,202	50759,	137,
1224,	11938,	64058,	0,111	0,194							
50,00	5,36	16,28	9, 320,	1,92	3,23	0,056	0,036	0,028	0,142	52781,	98,
782,	7751,	61411,	0,087	0,131							
100,00	5,64	17,09	10, 317,	1,92	3,25	0,035	0,027	0,020	0,089	54787,	61,
465,	4139,	59453,	0,056	0,083							
200,00	5,92	17,90	10, 315,	1,92	3,24	0,029	0,022	0,013	0,071	56791,	38,
194,	2938,	59960,	0,044	0,065							
400,00	6,20	18,71	10, 312,	1,92	3,24	0,015	0,008	0,005	0,043	58799,	18,
56,	2632,	61505,	0,027	0,038							
1000,00	6,56	19,79	11, 309,	1,92	3,23	0,006	0,004	0,004	0,025	61471,	5,
51,	1654,	63181,	0,009	0,024							
1600,00	6,74	20,35	11, 308,	1,92	3,23	0,004	0,004	0,004	0,017	62854,	10,
101,	1377,	64341,	0,006	0,017							
3200,00	7,01	21,18	12, 305,	1,92	3,24	0,006	0,004	0,002	0,016	64910,	2,
15,	660,	65587,	0,007	0,015							
D = 12,00											
25,00	5,07	15,64	9, 341,	1,92	3,24	0,057	0,046	0,028	0,230	50815,	84,
572,	13857,	65328,	0,043	0,230							
50,00	5,36	16,44	9, 339,	1,92	3,23	0,036	0,028	0,019	0,147	52876,	76,
455,	8317,	61724,	0,020	0,147							
100,00	5,64	17,23	10, 336,	1,92	3,26	0,030	0,024	0,015	0,113	54911,	68,
393,	5786,	61156,	0,019	0,113							
200,00	5,92	18,01	10, 334,	1,92	3,23	0,014	0,007	0,005	0,046	56932,	12,
103,	2263,	59310,	0,007	0,046							
400,00	6,20	18,79	11, 331,	1,92	3,22	0,010	0,008	0,003	0,036	58949,	12,
11,	2096,	61067,	0,002	0,036							
1000,00	6,56	19,82	11, 328,	1,92	3,24	0,005	0,003	0,002	0,028	61617,	9,
64,	1692,	63382,	0,004	0,028							
1600,00	6,74	20,35	11, 327,	1,92	3,26	0,002	0,002	0,002	0,025	62991,	5,
36,	1341,	64373,	0,000	0,025							
3200,00	7,01	21,14	12, 324,	1,92	3,24	0,005	0,002	0,000	0,033	65026,	1,
0,	1650,	66677,	0,000	0,033							
D = 13,00											
25,00	5,07	15,85	9, 360,	1,92	3,25	0,039	0,029	0,020	0,265	51104,	52,
315,	16673,	68144,	0,007	0,265							
50,00	5,36	16,64	10, 358,	1,92	3,24	0,013	0,010	0,006	0,176	53218,	28,
157,	11534,	64937,	0,013	0,176							
100,00	5,64	17,41	10, 356,	1,92	3,24	0,008	0,008	0,005	0,110	55297,	19,
143,	6937,	62397,	0,003	0,110							
200,00	5,92	18,17	10, 353,	1,92	3,23	0,009	0,008	0,003	0,070	57354,	15,
12,	3357,	60737,	0,000	0,070							
400,00	6,20	18,92	11, 351,	1,92	3,26	0,002	0,002	0,002	0,069	59396,	0,
2,	4295,	63693,	0,001	0,069							
1000,00	6,56	19,92	11, 348,	1,92	3,25	0,002	0,002	0,001	0,038	62086,	5,
1,	1792,	63885,	0,000	0,038							
1600,00	6,74	20,43	11, 346,	1,92	3,24	0,002	0,001	0,000	0,034	63464,	2,
0,	2207,	65673,	0,002	0,034							



3200,00 7,01 21,18 12, 344, 1,92 3,24 0,002 0,001 0,001 0,029 65499, 4,  
36, 1673, 67212, 0,000 0,029

Sand Subsoil F1-S35-R40

ESAND 35,00000000000000

RLS repair: blocks behind

----- ICASE F,1

D = 9,00

25,00 5,07 15,27 9, 284, 1,92 3,23 0,197 0,170 0,142 0,277 51473, 285,  
3124, 14059, 68942, 0,277 0,000  
50,00 5,36 16,16 9, 281, 1,92 3,24 0,163 0,141 0,117 0,197 53480, 220,  
2404, 10308, 66412, 0,197 0,000  
100,00 5,64 17,06 10, 279, 1,92 3,25 0,097 0,082 0,062 0,162 55496, 131,  
1358, 7920, 64905, 0,162 0,000  
200,00 5,92 17,96 10, 276, 1,92 3,23 0,082 0,071 0,053 0,123 57531, 99,  
999, 6092, 64722, 0,123 0,007  
400,00 6,20 18,88 10, 274, 1,92 3,24 0,046 0,039 0,029 0,075 59596, 45,  
405, 3408, 63454, 0,074 0,002  
1000,00 6,56 20,91 12, 258, 1,92 3,25 0,027 0,023 0,013 0,028 64157, 41,  
295, 920, 65413, 0,028 0,001  
1600,00 6,74 22,18 13, 249, 1,92 3,25 0,013 0,010 0,005 0,030 67004, 14,  
89, 968, 68075, 0,030 0,001  
3200,00 7,01 24,13 15, 237, 1,92 3,24 0,006 0,003 0,003 0,012 71401, 4,  
55, 354, 71813, 0,012 0,001

D = 10,00

25,00 5,07 15,33 9, 303, 1,92 3,25 0,131 0,115 0,085 0,150 50965, 230,  
2093, 8077, 61365, 0,136 0,054  
50,00 5,36 16,18 9, 300, 1,92 3,23 0,101 0,090 0,075 0,112 52967, 191,  
1612, 5272, 60041, 0,101 0,039  
100,00 5,64 17,03 10, 298, 1,92 3,22 0,064 0,056 0,048 0,070 54965, 104,  
843, 3448, 59359, 0,064 0,027  
200,00 5,92 17,87 10, 296, 1,92 3,23 0,042 0,031 0,026 0,054 56971, 74,  
601, 2601, 60246, 0,049 0,012  
400,00 6,20 18,73 10, 293, 1,92 3,24 0,038 0,030 0,022 0,029 58993, 29,  
223, 1204, 60449, 0,029 0,005  
1000,00 6,56 19,88 11, 290, 1,92 3,24 0,014 0,011 0,007 0,025 61701, 20,  
122, 1456, 63298, 0,025 0,008  
1600,00 6,74 20,47 11, 288, 1,92 3,25 0,016 0,012 0,006 0,013 63109, 18,  
129, 547, 63804, 0,012 0,002  
3200,00 7,01 21,86 12, 278, 1,92 3,24 0,009 0,005 0,002 0,006 66393, 6,  
65, 273, 66737, 0,006 0,004

D = 11,00

25,00 5,07 15,46 9, 322, 1,92 3,24 0,090 0,080 0,065 0,155 50759, 217,  
1865, 8321, 61161, 0,061 0,153  
50,00 5,36 16,28 9, 320, 1,92 3,25 0,059 0,048 0,039 0,086 52781, 120,  
787, 4483, 58170, 0,042 0,083  
100,00 5,64 17,09 10, 317, 1,92 3,24 0,035 0,025 0,015 0,040 54787, 52,  
268, 2233, 57341, 0,022 0,039  
200,00 5,92 17,90 10, 315, 1,92 3,25 0,028 0,022 0,018 0,021 56791, 43,  
344, 882, 58059, 0,010 0,019  
400,00 6,20 18,71 10, 312, 1,92 3,25 0,022 0,014 0,010 0,022 58799, 29,  
150, 942, 59919, 0,012 0,018  
1000,00 6,56 19,79 11, 309, 1,92 3,23 0,013 0,009 0,005 0,014 61471, 16,  
99, 873, 62459, 0,008 0,014  
1600,00 6,74 20,35 11, 308, 1,92 3,26 0,007 0,006 0,005 0,010 62854, 14,  
66, 506, 63440, 0,004 0,009  
3200,00 7,01 21,18 12, 305, 1,92 3,24 0,008 0,007 0,004 0,004 64910, 9,  
84, 397, 65401, 0,001 0,004

D = 12,00

25,00 5,07 15,64 9, 341, 1,92 3,26 0,059 0,049 0,036 0,154 50815, 138,  
918, 9604, 61475, 0,015 0,154  
50,00 5,36 16,44 9, 339, 1,92 3,23 0,039 0,031 0,024 0,095 52876, 68,  
522, 5125, 58590, 0,013 0,095  
100,00 5,64 17,23 10, 336, 1,92 3,25 0,023 0,019 0,015 0,053 54911, 43,  
236, 2747, 57936, 0,004 0,053

200,00	5,92	18,01	10,334	1,92	3,23	0,012	0,008	0,007	0,042	56932,	29,
273,	2219,	59453,	0,001	0,042							
400,00	6,20	18,79	11,331	1,92	3,24	0,015	0,009	0,004	0,023	58949,	16,
53,	999,	60016,	0,001	0,023							
1000,00	6,56	19,82	11,328	1,92	3,25	0,005	0,004	0,001	0,015	61617,	3,
11,	415,	62046,	0,001	0,015							
1600,00	6,74	20,35	11,327	1,92	3,25	0,005	0,003	0,002	0,012	62991,	3,
19,	722,	63735,	0,000	0,012							
3200,00	7,01	21,14	12,324	1,92	3,22	0,002	0,001	0,001	0,006	65026,	0,
3,	458,	65488,	0,000	0,006							
D = 13,00											
25,00	5,07	15,85	9,360	1,92	3,24	0,041	0,030	0,022	0,193	51104,	55,
276,	11462,	62897,	0,003	0,193							
50,00	5,36	16,64	10,358	1,92	3,25	0,018	0,016	0,012	0,115	53218,	53,
314,	6663,	60247,	0,001	0,115							
100,00	5,64	17,41	10,356	1,92	3,26	0,017	0,016	0,009	0,073	55297,	30,
82,	4013,	59422,	0,000	0,073							
200,00	5,92	18,17	10,353	1,92	3,23	0,009	0,006	0,003	0,056	57354,	14,
101,	3223,	60691,	0,001	0,056							
400,00	6,20	18,92	11,351	1,92	3,26	0,004	0,003	0,001	0,029	59396,	3,
3,	1341,	60743,	0,000	0,029							
1000,00	6,56	19,92	11,348	1,92	3,23	0,003	0,001	0,001	0,020	62086,	0,
4,	1225,	63316,	0,000	0,020							
1600,00	6,74	20,43	11,346	1,92	3,24	0,000	0,000	0,000	0,019	63464,	0,
0,	743,	64208,	0,000	0,019							
3200,00	7,01	21,18	12,344	1,92	3,24	0,001	0,001	0,001	0,016	65499,	1,
6,	743,	66248,	0,000	0,016							

Sand Subsoil F1-S35-R45

ESAND 35,00000000000000

RLS repair: blocks behind

----- ICASE F,1

D = 9,00											
25,00	5,07	15,27	9,284	1,92	3,24	0,182	0,164	0,131	0,090	51473,	284,
2969,	4648,	59374,	0,090	0,000							
50,00	5,36	16,16	9,281	1,92	3,23	0,150	0,132	0,112	0,086	53480,	232,
2441,	4302,	60456,	0,086	0,000							
100,00	5,64	17,06	10,279	1,92	3,24	0,089	0,081	0,059	0,056	55496,	120,
1129,	2805,	59549,	0,056	0,000							
200,00	5,92	17,96	10,276	1,92	3,24	0,072	0,059	0,047	0,043	57531,	114,
1152,	1388,	60185,	0,043	0,002							
400,00	6,20	18,88	10,274	1,92	3,24	0,049	0,041	0,029	0,022	59596,	64,
564,	874,	61098,	0,022	0,000							
1000,00	6,56	20,91	12,258	1,92	3,23	0,028	0,021	0,011	0,004	64157,	31,
237,	60,	64485,	0,004	0,000							
1600,00	6,74	22,18	13,249	1,92	3,24	0,009	0,007	0,004	0,003	67004,	4,
43,	83,	67134,	0,003	0,000							
3200,00	7,01	24,13	15,237	1,92	3,25	0,002	0,002	0,001	0,000	71401,	4,
31,	0,	71435,	0,000	0,000							
D = 10,00											
25,00	5,07	15,33	9,303	1,92	3,25	0,121	0,106	0,088	0,051	50965,	241,
2235,	2674,	56115,	0,047	0,018							
50,00	5,36	16,18	9,300	1,92	3,25	0,091	0,080	0,065	0,032	52967,	175,
1703,	1708,	56553,	0,024	0,019							
100,00	5,64	17,03	10,298	1,92	3,26	0,052	0,038	0,032	0,019	54965,	74,
739,	957,	56735,	0,017	0,007							
200,00	5,92	17,87	10,296	1,92	3,24	0,051	0,044	0,033	0,009	56971,	81,
663,	247,	57961,	0,008	0,002							
400,00	6,20	18,73	10,293	1,92	3,24	0,036	0,025	0,014	0,004	58993,	52,
490,	153,	59688,	0,004	0,001							
1000,00	6,56	19,88	11,290	1,92	3,23	0,026	0,021	0,015	0,003	61701,	40,
366,	121,	62227,	0,003	0,001							
1600,00	6,74	20,47	11,288	1,92	3,24	0,012	0,012	0,006	0,002	63109,	7,
27,	127,	63270,	0,002	0,001							
3200,00	7,01	21,86	12,278	1,92	3,24	0,007	0,005	0,002	0,000	66393,	5,
11,	0,	66408,	0,000	0,000							

D = 11,00

25,00	5,07	15,46	9, 322,	1,92	3,23	0,074	0,064	0,049	0,057	50759,	137,
1224,	2716,	54836,	0,012	0,056							
50,00	5,36	16,28	9, 320,	1,92	3,23	0,056	0,036	0,028	0,032	52781,	98,
782,	1909,	55569,	0,010	0,031							
100,00	5,64	17,09	10, 317,	1,92	3,25	0,035	0,027	0,020	0,012	54787,	61,
465,	499,	55812,	0,004	0,012							
200,00	5,92	17,90	10, 315,	1,92	3,24	0,029	0,022	0,013	0,003	56791,	38,
194,	184,	57207,	0,002	0,002							
400,00	6,20	18,71	10, 312,	1,92	3,24	0,015	0,008	0,005	0,003	58799,	18,
56,	65,	58938,	0,001	0,003							
1000,00	6,56	19,79	11, 309,	1,92	3,23	0,006	0,004	0,004	0,001	61471,	5,
51,	75,	61602,	0,001	0,000							
1600,00	6,74	20,35	11, 308,	1,92	3,23	0,004	0,004	0,004	0,001	62854,	10,
101,	5,	62969,	0,000	0,001							
3200,00	7,01	21,18	12, 305,	1,92	3,24	0,006	0,004	0,002	0,001	64910,	2,
15,	101,	65028,	0,000	0,001							

D = 12,00

25,00	5,07	15,64	9, 341,	1,92	3,24	0,057	0,046	0,028	0,073	50815,	84,
572,	4169,	55641,	0,005	0,073							
50,00	5,36	16,44	9, 339,	1,92	3,23	0,036	0,028	0,019	0,041	52876,	76,
455,	2177,	55584,	0,002	0,041							
100,00	5,64	17,23	10, 336,	1,92	3,26	0,030	0,024	0,015	0,026	54911,	68,
393,	1543,	56913,	0,000	0,026							
200,00	5,92	18,01	10, 334,	1,92	3,23	0,014	0,007	0,005	0,006	56932,	12,
103,	64,	57110,	0,000	0,006							
400,00	6,20	18,79	11, 331,	1,92	3,22	0,010	0,008	0,003	0,005	58949,	12,
11,	325,	59297,	0,000	0,005							
1000,00	6,56	19,82	11, 328,	1,92	3,24	0,005	0,003	0,002	0,004	61617,	9,
64,	477,	62168,	0,001	0,004							
1600,00	6,74	20,35	11, 327,	1,92	3,26	0,002	0,002	0,002	0,003	62991,	5,
36,	260,	63292,	0,000	0,003							
3200,00	7,01	21,14	12, 324,	1,92	3,24	0,005	0,002	0,000	0,001	65026,	1,
0,	3,	65031,	0,000	0,001							

D = 13,00

25,00	5,07	15,85	9, 360,	1,92	3,25	0,039	0,029	0,020	0,125	51104,	52,
315,	7014,	58484,	0,000	0,125							
50,00	5,36	16,64	10, 358,	1,92	3,24	0,013	0,010	0,006	0,071	53218,	28,
157,	3926,	57329,	0,000	0,071							
100,00	5,64	17,41	10, 356,	1,92	3,24	0,008	0,008	0,005	0,043	55297,	19,
143,	1807,	57267,	0,000	0,043							
200,00	5,92	18,17	10, 353,	1,92	3,23	0,009	0,008	0,003	0,016	57354,	15,
12,	856,	58237,	0,000	0,016							
400,00	6,20	18,92	11, 351,	1,92	3,26	0,002	0,002	0,002	0,030	59396,	0,
2,	1418,	60816,	0,000	0,030							
1000,00	6,56	19,92	11, 348,	1,92	3,25	0,002	0,002	0,001	0,005	62086,	5,
1,	188,	62281,	0,000	0,005							
1600,00	6,74	20,43	11, 346,	1,92	3,24	0,002	0,001	0,000	0,005	63464,	2,
0,	132,	63599,	0,000	0,005							
3200,00	7,01	21,18	12, 344,	1,92	3,24	0,002	0,001	0,001	0,004	65499,	4,
36,	173,	65712,	0,000	0,004							

Sand Subsoil F2-S35-R45

ERUBLE 45,000000000000

ESAND 35,000000000000

RLS repair: blocks behind

----- ICASE F

D = 9,00

25,00	5,07	15,27	9, 284,	1,92	3,23	0,197	0,170	0,142	0,040	56663,	110,
2978,	1468,	61219,	0,040	0,000							
50,00	5,36	16,16	9, 281,	1,92	3,24	0,163	0,141	0,117	0,020	58670,	85,
2291,	1083,	62130,	0,020	0,000							
100,00	5,64	17,06	10, 279,	1,92	3,25	0,097	0,082	0,062	0,019	60686,	50,
1294,	1062,	63092,	0,019	0,000							
200,00	5,92	17,96	10, 276,	1,92	3,23	0,082	0,071	0,053	0,016	62721,	38,
953,	549,	64261,	0,016	0,000							

400,00	6,20	18,88	10,274	1,92	3,24	0,046	0,039	0,029	0,007	64786,	17,
386,	337,	65526,	0,007	0,000							
1000,00	6,56	20,91	12,258	1,92	3,25	0,027	0,023	0,013	0,001	69347,	16,
281,	106,	69750,	0,001	0,000							
1600,00	6,74	22,18	13,249	1,92	3,25	0,013	0,010	0,005	0,001	72194,	5,
85,	5,	72289,	0,001	0,000							
3200,00	7,01	24,13	15,237	1,92	3,24	0,006	0,003	0,003	0,000	76591,	2,
52,	0,	76644,	0,000	0,000							
D = 10,00											
25,00	5,07	15,33	9,303	1,92	3,25	0,131	0,115	0,085	0,016	55785,	134,
2018,	751,	58688,	0,016	0,000							
50,00	5,36	16,18	9,300	1,92	3,23	0,101	0,090	0,075	0,007	57787,	111,
1554,	106,	59558,	0,007	0,000							
100,00	5,64	17,03	10,298	1,92	3,22	0,064	0,056	0,048	0,008	59785,	60,
812,	119,	60777,	0,008	0,000							
200,00	5,92	17,87	10,296	1,92	3,23	0,042	0,031	0,026	0,002	61791,	43,
579,	51,	62464,	0,002	0,000							
400,00	6,20	18,73	10,293	1,92	3,24	0,038	0,030	0,022	0,002	63813,	17,
215,	186,	64231,	0,002	0,000							
1000,00	6,56	19,88	11,290	1,92	3,24	0,014	0,011	0,007	0,002	66521,	11,
117,	165,	66815,	0,002	0,000							
1600,00	6,74	20,47	11,288	1,92	3,25	0,016	0,012	0,006	0,000	67929,	10,
125,	0,	68065,	0,000	0,000							
3200,00	7,01	21,86	12,278	1,92	3,24	0,009	0,005	0,002	0,000	71213,	3,
63,	0,	71279,	0,000	0,000							
D = 11,00											
25,00	5,07	15,46	9,322	1,92	3,24	0,090	0,080	0,065	0,009	55209,	155,
1815,	258,	57437,	0,005	0,005							
50,00	5,36	16,28	9,320	1,92	3,25	0,059	0,048	0,039	0,009	57231,	86,
766,	332,	58415,	0,007	0,005							
100,00	5,64	17,09	10,317	1,92	3,24	0,035	0,025	0,015	0,001	59237,	38,
261,	85,	59621,	0,001	0,001							
200,00	5,92	17,90	10,315	1,92	3,25	0,028	0,022	0,018	0,000	61241,	30,
335,	0,	61606,	0,000	0,000							
400,00	6,20	18,71	10,312	1,92	3,25	0,022	0,014	0,010	0,000	63249,	21,
146,	0,	63415,	0,000	0,000							
1000,00	6,56	19,79	11,309	1,92	3,23	0,013	0,009	0,005	0,001	65921,	11,
96,	89,	66118,	0,001	0,000							
1600,00	6,74	20,35	11,308	1,92	3,26	0,007	0,006	0,005	0,000	67304,	10,
64,	0,	67378,	0,000	0,000							
3200,00	7,01	21,18	12,305	1,92	3,24	0,008	0,007	0,004	0,000	69360,	7,
82,	0,	69449,	0,000	0,000							
D = 12,00											
25,00	5,07	15,64	9,341	1,92	3,26	0,059	0,049	0,036	0,023	54895,	112,
900,	1349,	57256,	0,001	0,022							
50,00	5,36	16,44	9,339	1,92	3,23	0,039	0,031	0,024	0,014	56956,	55,
512,	391,	57914,	0,000	0,014							
100,00	5,64	17,23	10,336	1,92	3,25	0,023	0,019	0,015	0,007	58991,	35,
231,	255,	59511,	0,000	0,007							
200,00	5,92	18,01	10,334	1,92	3,23	0,012	0,008	0,007	0,003	61012,	24,
268,	8,	61311,	0,000	0,003							
400,00	6,20	18,79	11,331	1,92	3,24	0,015	0,009	0,004	0,000	63029,	13,
52,	0,	63093,	0,000	0,000							
1000,00	6,56	19,82	11,328	1,92	3,25	0,005	0,004	0,001	0,000	65697,	2,
10,	0,	65710,	0,000	0,000							
1600,00	6,74	20,35	11,327	1,92	3,25	0,005	0,003	0,002	0,001	67071,	2,
19,	4,	67097,	0,000	0,001							
3200,00	7,01	21,14	12,324	1,92	3,22	0,002	0,001	0,001	0,000	69106,	0,
3,	0,	69110,	0,000	0,000							
D = 13,00											
25,00	5,07	15,85	9,360	1,92	3,24	0,041	0,030	0,022	0,094	54814,	48,
273,	4305,	59440,	0,000	0,094							
50,00	5,36	16,64	10,358	1,92	3,25	0,018	0,016	0,012	0,045	56928,	47,
310,	2500,	59785,	0,000	0,045							
100,00	5,64	17,41	10,356	1,92	3,26	0,017	0,016	0,009	0,020	59007,	26,
81,	998,	60113,	0,000	0,020							





1000,00	9,77	29,36	16,458	1,92	5,89	0,020	0,013	0,005	0,168	142331,	43,
134,24280,	166788,	0,166	0,045								
1600,00	9,97	29,98	17,456	1,92	5,87	0,012	0,009	0,004	0,154	144655,	10,
28,18517,	163210,	0,151	0,050								
3200,00	10,25	30,89	17,453	1,92	5,85	0,014	0,010	0,004	0,133	148065,	25,
99,17284,	165473,	0,129	0,038								
D = 18,00											
25,00	8,09	24,58	14,510	1,92	5,85	0,026	0,015	0,004	0,242	123629,	88,
339,40722,	164777,	0,216	0,213								
50,00	8,43	25,53	15,507	1,92	5,90	0,018	0,015	0,006	0,215	127410,	53,
181,37370,	165014,	0,186	0,189								
100,00	8,76	26,46	15,505	1,92	5,87	0,016	0,007	0,001	0,173	131070,	35,
102,28844,	160051,	0,130	0,163								
200,00	9,08	27,35	16,502	1,92	5,86	0,020	0,009	0,003	0,166	134639,	37,
181,28276,	163133,	0,101	0,161								
400,00	9,38	28,23	16,499	1,92	5,86	0,009	0,006	0,001	0,142	138140,	25,
52,21590,	159807,	0,079	0,137								
1000,00	9,77	29,38	17,496	1,92	5,88	0,005	0,004	0,001	0,140	142684,	24,
18,22592,	165317,	0,053	0,140								
1600,00	9,97	29,96	17,494	1,92	5,83	0,006	0,004	0,001	0,144	144986,	8,
6,23986,	168986,	0,045	0,142								
3200,00	10,25	30,80	17,492	1,92	5,89	0,002	0,002	0,001	0,118	148351,	4,
8,19199,	167562,	0,039	0,118								
D = 20,00											
25,00	8,09	24,97	14,549	1,92	5,87	0,013	0,010	0,004	0,296	124902,	102,
506,53563,	179072,	0,070	0,296								
50,00	8,43	25,89	15,546	1,92	5,84	0,017	0,007	0,002	0,258	128790,	23,
54,48320,	177187,	0,056	0,258								
100,00	8,76	26,79	15,543	1,92	5,88	0,005	0,003	0,000	0,236	132537,	2,
0,42154,	174694,	0,038	0,236								
200,00	9,08	27,65	16,540	1,92	5,87	0,005	0,002	0,000	0,217	136177,	3,
0,42673,	178853,	0,034	0,217								
400,00	9,38	28,50	16,538	1,92	5,86	0,001	0,000	0,000	0,206	139732,	0,
0,39194,	178925,	0,017	0,206								
1000,00	9,77	29,59	17,534	1,92	5,89	0,000	0,000	0,000	0,183	144325,	0,
0,34673,	178999,	0,012	0,183								
1600,00	9,97	30,15	17,533	1,92	5,87	0,003	0,002	0,000	0,176	146643,	1,
0,33329,	179973,	0,006	0,176								
3200,00	10,25	30,95	17,530	1,92	5,85	0,002	0,000	0,000	0,169	150021,	0,
0,35919,	185940,	0,011	0,169								
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,87	0,011	0,007	0,001	0,264	127059,	31,
30,55218,	182338,	0,014	0,264								
50,00	8,43	26,32	15,584	1,92	5,86	0,003	0,001	0,000	0,239	131092,	4,
0,50142,	181238,	0,008	0,239								
100,00	8,76	27,20	16,581	1,92	5,88	0,004	0,003	0,001	0,209	134965,	4,
10,41891,	176870,	0,003	0,209								
200,00	9,08	28,05	16,579	1,92	5,86	0,002	0,000	0,000	0,219	138715,	0,
0,45456,	184171,	0,002	0,219								
400,00	9,38	28,87	17,576	1,92	5,88	0,001	0,000	0,000	0,204	142365,	0,
0,39400,	181765,	0,005	0,204								
1000,00	9,77	29,93	17,573	1,92	5,85	0,000	0,000	0,000	0,166	147063,	0,
0,31331,	178394,	0,000	0,166								
1600,00	9,97	30,47	17,571	1,92	5,83	0,001	0,000	0,000	0,163	149425,	0,
0,33808,	183233,	0,000	0,163								
3200,00	10,25	31,24	18,568	1,92	5,85	0,001	0,000	0,000	0,148	152859,	0,
0,27657,	180516,	0,002	0,148								

Sand Subsoil B2-S35-R37

ERUBLE 37,0000000000000

ESAND 35,0000000000000

RLS repair: blocks behind

----- ICASE B

D = 15,00

25,00	8,09	24,22	14,453	1,92	5,87	0,084	0,055	0,024	0,349	132858,	142,
1012,	50394,	184406,	0,349	0,000							
50,00	8,43	25,25	14,450	1,92	5,89	0,059	0,040	0,026	0,331	136580,	148,
1311,	44159,	182198,	0,331	0,000							
100,00	8,76	26,25	15,447	1,92	5,86	0,044	0,030	0,010	0,240	140211,	104,
663,	31142,	172120,	0,240	0,000							
200,00	9,08	27,23	15,444	1,92	5,87	0,051	0,030	0,014	0,237	143780,	90,
518,	30846,	175234,	0,237	0,000							
400,00	9,38	28,20	16,442	1,92	5,86	0,043	0,029	0,014	0,191	147304,	91,
785,	23870,	172050,	0,191	0,000							
1000,00	9,77	29,47	16,438	1,92	5,82	0,019	0,011	0,004	0,151	151918,	24,
328,	18493,	170762,	0,151	0,000							
1600,00	9,97	30,11	17,437	1,92	5,86	0,018	0,009	0,003	0,116	154271,	21,
138,	15212,	169642,	0,116	0,000							
3200,00	10,25	31,19	17,432	1,92	5,85	0,022	0,012	0,004	0,101	158193,	38,
224,	12736,	171192,	0,101	0,000							

D = 16,00

25,00	8,09	24,30	14,472	1,92	5,89	0,067	0,038	0,020	0,284	132112,	156,
1358,	41179,	174805,	0,283	0,001							
50,00	8,43	25,30	14,469	1,92	5,91	0,060	0,041	0,017	0,247	135837,	144,
577,	35425,	171983,	0,247	0,000							
100,00	8,76	26,26	15,466	1,92	5,83	0,030	0,023	0,011	0,181	139461,	67,
235,	25008,	164771,	0,181	0,000							
200,00	9,08	27,21	15,464	1,92	5,86	0,027	0,021	0,012	0,143	143013,	74,
572,	19405,	163065,	0,143	0,000							
400,00	9,38	28,14	16,461	1,92	5,91	0,025	0,016	0,007	0,129	146513,	48,
340,	15033,	161934,	0,129	0,000							
1000,00	9,77	29,36	16,458	1,92	5,88	0,012	0,010	0,002	0,096	151079,	30,
123,	11812,	163045,	0,096	0,000							
1600,00	9,97	29,98	17,456	1,92	5,81	0,021	0,011	0,004	0,085	153403,	19,
54,	9436,	162911,	0,085	0,000							
3200,00	10,25	30,89	17,453	1,92	5,84	0,015	0,010	0,002	0,060	156813,	18,
41,	7770,	164642,	0,060	0,000							

D = 18,00

25,00	8,09	24,58	14,510	1,92	5,85	0,029	0,018	0,008	0,127	131489,	75,
383,	18027,	149973,	0,125	0,028							
50,00	8,43	25,53	15,507	1,92	5,90	0,030	0,013	0,005	0,094	135270,	70,
386,	14554,	150280,	0,092	0,032							
100,00	8,76	26,46	15,505	1,92	5,86	0,020	0,014	0,004	0,079	138930,	62,
378,	10031,	149401,	0,078	0,018							
200,00	9,08	27,35	16,502	1,92	5,88	0,013	0,009	0,002	0,066	142499,	40,
144,	8101,	150784,	0,066	0,017							
400,00	9,38	28,23	16,499	1,92	5,91	0,012	0,007	0,001	0,037	146000,	22,
86,	4745,	150852,	0,037	0,006							
1000,00	9,77	29,38	17,496	1,92	5,89	0,006	0,003	0,002	0,038	150544,	18,
83,	5089,	155734,	0,038	0,004							
1600,00	9,97	29,96	17,494	1,92	5,87	0,004	0,002	0,000	0,025	152846,	3,
0,	3687,	156536,	0,025	0,001							
3200,00	10,25	30,80	17,492	1,92	5,88	0,005	0,002	0,000	0,022	156211,	10,
0,	3260,	159481,	0,022	0,002							

D = 20,00

25,00	8,09	24,97	14,549	1,92	5,89	0,018	0,008	0,002	0,110	131874,	25,
31,	19206,	151137,	0,044	0,109							
50,00	8,43	25,89	15,546	1,92	5,90	0,011	0,006	0,002	0,087	135762,	18,
23,	10371,	146174,	0,028	0,085							
100,00	8,76	26,79	15,543	1,92	5,87	0,010	0,003	0,001	0,052	139509,	6,
24,	6862,	146401,	0,026	0,049							
200,00	9,08	27,65	16,540	1,92	5,86	0,003	0,003	0,001	0,047	143149,	12,
3,	7215,	150379,	0,022	0,045							



400,00	9,38	28,50	16,538	1,92	5,85	0,005	0,002	0,001	0,026	146704,	7,
52,4003	150766,	0,007	0,026								
1000,00	9,77	29,59	17,534	1,92	5,88	0,003	0,000	0,000	0,017	151297,	0,
0,2182	153479,	0,011	0,014								
1600,00	9,97	30,15	17,533	1,92	5,85	0,001	0,001	0,000	0,009	153615,	0,
0,412	154027,	0,003	0,007								
3200,00	10,25	30,95	17,530	1,92	5,88	0,003	0,002	0,001	0,006	156993,	12,
4,768	157777,	0,002	0,006								
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,84	0,010	0,008	0,004	0,164	133143,	46,
97,28528	161815,	0,004	0,164								
50,00	8,43	26,32	15,584	1,92	5,87	0,002	0,002	0,000	0,114	137176,	4,
0,16114	153294,	0,002	0,114								
100,00	8,76	27,20	16,581	1,92	5,86	0,003	0,000	0,000	0,076	141049,	0,
0,11724	152773,	0,002	0,076								
200,00	9,08	28,05	16,579	1,92	5,87	0,004	0,001	0,000	0,048	144799,	1,
0,7001	151800,	0,003	0,048								
400,00	9,38	28,87	17,576	1,92	5,84	0,002	0,000	0,000	0,036	148449,	0,
0,6364	154813,	0,001	0,036								
1000,00	9,77	29,93	17,573	1,92	5,89	0,001	0,001	0,001	0,028	153147,	1,
6,3672	156826,	0,000	0,028								
1600,00	9,97	30,47	17,571	1,92	5,86	0,001	0,000	0,000	0,021	155509,	0,
0,2439	157948,	0,000	0,021								
3200,00	10,25	31,24	18,568	1,92	5,84	0,000	0,000	0,000	0,006	158943,	0,
0,825	159769,	0,000	0,006								

Sand Subsoil

B1-S35-R40

ICASE B,1

D = 15,00											
25,00	8,09	24,22	14,453	1,92	5,88	0,087	0,064	0,042	0,378	123666,	296,
1843,58878	184683,	0,378	0,000								
50,00	8,43	25,25	14,450	1,92	5,86	0,080	0,061	0,026	0,314	127388,	250,
1197,44403	173237,	0,314	0,000								
100,00	8,76	26,25	15,447	1,92	5,86	0,057	0,038	0,022	0,276	131019,	211,
1476,40123	172829,	0,276	0,005								
200,00	9,08	27,23	15,444	1,92	5,86	0,053	0,034	0,018	0,213	134588,	173,
970,28621	164352,	0,213	0,002								
400,00	9,38	28,20	16,442	1,92	5,85	0,026	0,016	0,007	0,195	138112,	60,
299,25282	163754,	0,195	0,011								
1000,00	9,77	29,47	16,438	1,92	5,86	0,026	0,017	0,008	0,141	142726,	82,
192,17792	160792,	0,141	0,005								
1600,00	9,97	30,11	17,437	1,92	5,87	0,027	0,016	0,006	0,122	145079,	66,
345,14630	160120,	0,122	0,008								
3200,00	10,25	31,19	17,432	1,92	5,86	0,015	0,010	0,005	0,092	149001,	58,
388,10267	159714,	0,091	0,011								
D = 16,00											
25,00	8,09	24,30	14,472	1,92	5,87	0,077	0,056	0,024	0,298	123364,	347,
1133,48386	173228,	0,298	0,021								
50,00	8,43	25,30	14,469	1,92	5,88	0,046	0,035	0,018	0,235	127089,	172,
934,35500	163696,	0,233	0,035								
100,00	8,76	26,26	15,466	1,92	5,90	0,037	0,020	0,012	0,196	130713,	90,
284,29470	160558,	0,196	0,026								
200,00	9,08	27,21	15,464	1,92	5,87	0,032	0,019	0,007	0,177	134265,	74,
243,25738	160320,	0,175	0,040								
400,00	9,38	28,14	16,461	1,92	5,89	0,018	0,011	0,007	0,127	137765,	49,
331,16153	154298,	0,126	0,031								
1000,00	9,77	29,36	16,458	1,92	5,88	0,015	0,011	0,002	0,076	142331,	23,
4,11320	153679,	0,074	0,025								
1600,00	9,97	29,98	17,456	1,92	5,87	0,007	0,004	0,001	0,080	144655,	9,
18,9033	153715,	0,079	0,022								
3200,00	10,25	30,89	17,453	1,92	5,85	0,010	0,010	0,001	0,055	148065,	19,
9,7413	155506,	0,053	0,017								
D = 18,00											
25,00	8,09	24,58	14,510	1,92	5,84	0,040	0,027	0,010	0,142	123629,	124,
456,21315	145523,	0,108	0,129								



1600,00	9,97	30,11	17,437	1,92	5,87	0,024	0,014	0,009	0,040	145079,	86,
439,	4316,	149920,	0,040	0,001							
3200,00	10,25	31,19	17,432	1,92	5,89	0,015	0,011	0,003	0,028	149001,	49,
126,	3496,	152672,	0,028	0,001							
D = 16,00											
25,00	8,09	24,30	14,472	1,92	5,89	0,066	0,051	0,032	0,130	123364,	256,
1126,	18883,	143629,	0,130	0,003							
50,00	8,43	25,30	14,469	1,92	5,89	0,052	0,036	0,012	0,098	127089,	155,
337,	11551,	139131,	0,098	0,003							
100,00	8,76	26,26	15,466	1,92	5,87	0,029	0,019	0,011	0,078	130713,	101,
443,	9286,	140544,	0,077	0,003							
200,00	9,08	27,21	15,464	1,92	5,84	0,026	0,015	0,004	0,044	134265,	36,
43,	5041,	139385,	0,044	0,005							
400,00	9,38	28,14	16,461	1,92	5,85	0,020	0,011	0,007	0,035	137765,	67,
111,	4130,	142072,	0,035	0,005							
1000,00	9,77	29,36	16,458	1,92	5,89	0,020	0,013	0,005	0,025	142331,	43,
134,	3791,	146299,	0,025	0,004							
1600,00	9,97	29,98	17,456	1,92	5,87	0,012	0,009	0,004	0,022	144655,	10,
28,	2561,	147254,	0,022	0,003							
3200,00	10,25	30,89	17,453	1,92	5,85	0,014	0,010	0,004	0,019	148065,	25,
99,	1992,	150181,	0,018	0,007							
D = 18,00											
25,00	8,09	24,58	14,510	1,92	5,85	0,026	0,015	0,004	0,061	123629,	88,
339,	8877,	132933,	0,045	0,056							
50,00	8,43	25,53	15,507	1,92	5,90	0,018	0,015	0,006	0,039	127410,	53,
181,	4018,	131662,	0,028	0,036							
100,00	8,76	26,46	15,505	1,92	5,87	0,016	0,007	0,001	0,032	131070,	35,
102,	4307,	135513,	0,021	0,027							
200,00	9,08	27,35	16,502	1,92	5,86	0,020	0,009	0,003	0,021	134639,	37,
181,	2217,	137075,	0,009	0,021							
400,00	9,38	28,23	16,499	1,92	5,86	0,009	0,006	0,001	0,017	138140,	25,
52,	2617,	140833,	0,005	0,017							
1000,00	9,77	29,38	17,496	1,92	5,88	0,005	0,004	0,001	0,007	142684,	24,
18,	1194,	143919,	0,002	0,007							
1600,00	9,97	29,96	17,494	1,92	5,83	0,006	0,004	0,001	0,018	144986,	8,
6,	1927,	146927,	0,005	0,018							
3200,00	10,25	30,80	17,492	1,92	5,89	0,002	0,002	0,001	0,011	148351,	4,
8,	2090,	150453,	0,003	0,011							
D = 20,00											
25,00	8,09	24,97	14,549	1,92	5,87	0,013	0,010	0,004	0,081	124902,	102,
506,	13259,	138768,	0,005	0,081							
50,00	8,43	25,89	15,546	1,92	5,84	0,017	0,007	0,002	0,056	128790,	23,
54,	9003,	137870,	0,007	0,056							
100,00	8,76	26,79	15,543	1,92	5,88	0,005	0,003	0,000	0,038	132537,	2,
0,	6464,	139003,	0,002	0,038							
200,00	9,08	27,65	16,540	1,92	5,87	0,005	0,002	0,000	0,039	136177,	3,
0,	5308,	141488,	0,001	0,039							
400,00	9,38	28,50	16,538	1,92	5,86	0,001	0,000	0,000	0,021	139732,	0,
0,	4005,	143737,	0,001	0,021							
1000,00	9,77	29,59	17,534	1,92	5,89	0,000	0,000	0,000	0,017	144325,	0,
0,	3378,	147704,	0,000	0,017							
1600,00	9,97	30,15	17,533	1,92	5,87	0,003	0,002	0,000	0,016	146643,	1,
0,	2489,	149133,	0,000	0,016							
3200,00	10,25	30,95	17,530	1,92	5,85	0,002	0,000	0,000	0,030	150021,	0,
0,	4975,	154996,	0,000	0,030							
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,87	0,011	0,007	0,001	0,112	127059,	31,
30,	20998,	148118,	0,000	0,112							
50,00	8,43	26,32	15,584	1,92	5,86	0,003	0,001	0,000	0,071	131092,	4,
0,	14072,	145168,	0,000	0,071							
100,00	8,76	27,20	16,581	1,92	5,88	0,004	0,003	0,001	0,065	134965,	4,
10,	9996,	144975,	0,000	0,065							
200,00	9,08	28,05	16,579	1,92	5,86	0,002	0,000	0,000	0,054	138715,	0,
0,	9463,	148178,	0,000	0,054							
400,00	9,38	28,87	17,576	1,92	5,88	0,001	0,000	0,000	0,048	142365,	0,
0,	8558,	150923,	0,000	0,048							

1000,00	9,77	29,93	17, 573,	1,92	5,85	0,000	0,000	0,000	0,032	147063,	0,
0, 5368,	152431,	0,000	0,032								
1600,00	9,97	30,47	17, 571,	1,92	5,83	0,001	0,000	0,000	0,035	149425,	0,
0, 5240,	154665,	0,000	0,035								
3200,00	10,25	31,24	18, 568,	1,92	5,85	0,001	0,000	0,000	0,021	152859,	0,
0, 3615,	156474,	0,000	0,021								

Sand Subsoil B2-S35-R45  
----- ICASE B

D = 15,00											
25,00	8,09	24,22	14, 453,	1,92	5,88	0,087	0,064	0,042	0,078	132858,	183,
1774,	10643,	145458,	0,078	0,000							
50,00	8,43	25,25	14, 450,	1,92	5,86	0,080	0,061	0,026	0,055	136580,	155,
1152,	5924,	143811,	0,055	0,000							
100,00	8,76	26,25	15, 447,	1,92	5,86	0,057	0,038	0,022	0,056	140211,	131,
1420,	5518,	147280,	0,056	0,000							
200,00	9,08	27,23	15, 444,	1,92	5,86	0,053	0,034	0,018	0,038	143780,	107,
934,	4232,	149053,	0,038	0,000							
400,00	9,38	28,20	16, 442,	1,92	5,85	0,026	0,016	0,007	0,031	147304,	37,
287,	2900,	150528,	0,031	0,000							
1000,00	9,77	29,47	16, 438,	1,92	5,86	0,026	0,017	0,008	0,016	151918,	51,
184,	1467,	153620,	0,016	0,000							
1600,00	9,97	30,11	17, 437,	1,92	5,87	0,027	0,016	0,006	0,014	154271,	41,
332,	1109,	155752,	0,014	0,000							
3200,00	10,25	31,19	17, 432,	1,92	5,86	0,015	0,010	0,005	0,011	158193,	36,
373,	1010,	159612,	0,011	0,000							
D = 16,00											
25,00	8,09	24,30	14, 472,	1,92	5,87	0,077	0,056	0,024	0,068	132112,	239,
1096,	9294,	142741,	0,068	0,000							
50,00	8,43	25,30	14, 469,	1,92	5,88	0,046	0,035	0,018	0,048	135837,	118,
904,	5925,	142785,	0,048	0,000							
100,00	8,76	26,26	15, 466,	1,92	5,90	0,037	0,020	0,012	0,034	139461,	62,
275,	3248,	143047,	0,034	0,000							
200,00	9,08	27,21	15, 464,	1,92	5,87	0,032	0,019	0,007	0,025	143013,	51,
235,	3462,	146762,	0,025	0,000							
400,00	9,38	28,14	16, 461,	1,92	5,89	0,018	0,011	0,007	0,020	146513,	34,
320,	2127,	148994,	0,020	0,000							
1000,00	9,77	29,36	16, 458,	1,92	5,88	0,015	0,011	0,002	0,013	151079,	16,
4,	519,	151619,	0,013	0,000							
1600,00	9,97	29,98	17, 456,	1,92	5,87	0,007	0,004	0,001	0,005	153403,	6,
17,	491,	153917,	0,005	0,000							
3200,00	10,25	30,89	17, 453,	1,92	5,85	0,010	0,010	0,001	0,003	156813,	13,
9,	116,	156951,	0,003	0,000							
D = 18,00											
25,00	8,09	24,58	14, 510,	1,92	5,84	0,040	0,027	0,010	0,014	131489,	99,
446,	1613,	133646,	0,013	0,004							
50,00	8,43	25,53	15, 507,	1,92	5,85	0,023	0,011	0,004	0,008	135270,	47,
96,	824,	136237,	0,007	0,004							
100,00	8,76	26,46	15, 505,	1,92	5,86	0,022	0,008	0,004	0,008	138930,	39,
147,	1000,	140116,	0,007	0,003							
200,00	9,08	27,35	16, 502,	1,92	5,88	0,005	0,004	0,002	0,009	142499,	15,
132,	1286,	143933,	0,009	0,003							
400,00	9,38	28,23	16, 499,	1,92	5,86	0,008	0,006	0,002	0,000	146000,	12,
48,	0,	146060,	0,000	0,000							
1000,00	9,77	29,38	17, 496,	1,92	5,86	0,008	0,004	0,000	0,001	150544,	19,
0,	11,	150573,	0,001	0,000							
1600,00	9,97	29,96	17, 494,	1,92	5,86	0,006	0,004	0,001	0,002	152846,	9,
74,	186,	153115,	0,002	0,000							
3200,00	10,25	30,80	17, 492,	1,92	5,88	0,005	0,004	0,002	0,001	156211,	20,
88,	341,	156660,	0,000	0,001							
D = 20,00											
25,00	8,09	24,97	14, 549,	1,92	5,86	0,019	0,015	0,004	0,035	131874,	74,
139,	4937,	137024,	0,002	0,035							
50,00	8,43	25,89	15, 546,	1,92	5,83	0,014	0,009	0,004	0,022	135762,	38,
101,	2558,	138460,	0,002	0,022							

100,00	8,76	26,79	15,543	1,92	5,85	0,010	0,004	0,001	0,011	139509,	27,
39,1003	140577,	0,000	0,011								
200,00	9,08	27,65	16,540	1,92	5,89	0,009	0,002	0,000	0,007	143149,	7,
0,950	144106,	0,000	0,007								
400,00	9,38	28,50	16,538	1,92	5,86	0,004	0,002	0,000	0,003	146704,	0,
0,340	147044,	0,000	0,003								
1000,00	9,77	29,59	17,534	1,92	5,85	0,001	0,000	0,000	0,002	151297,	0,
0,86	151384,	0,000	0,002								
1600,00	9,97	30,15	17,533	1,92	5,85	0,002	0,000	0,000	0,000	153615,	0,
0,0	153615,	0,000	0,000								
3200,00	10,25	30,95	17,530	1,92	5,87	0,000	0,000	0,000	0,000	156993,	0,
0,0	156993,	0,000	0,000								
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,89	0,003	0,001	0,000	0,063	133143,	1,
0,7454	140599,	0,000	0,063								
50,00	8,43	26,32	15,584	1,92	5,88	0,005	0,003	0,000	0,051	137176,	2,
0,7591	144768,	0,000	0,051								
100,00	8,76	27,20	16,581	1,92	5,87	0,003	0,000	0,000	0,039	141049,	0,
0,4206	145255,	0,000	0,039								
200,00	9,08	28,05	16,579	1,92	5,87	0,001	0,001	0,000	0,018	144799,	0,
0,1956	146755,	0,000	0,018								
400,00	9,38	28,87	17,576	1,92	5,86	0,002	0,001	0,000	0,012	148449,	0,
0,1723	150172,	0,000	0,012								
1000,00	9,77	29,93	17,573	1,92	5,84	0,000	0,000	0,000	0,007	153147,	0,
0,1073	154220,	0,000	0,007								
1600,00	9,97	30,47	17,571	1,92	5,89	0,000	0,000	0,000	0,004	155509,	0,
0,380	155890,	0,000	0,004								
3200,00	10,25	31,24	18,568	1,92	5,87	0,000	0,000	0,000	0,001	158943,	0,
0,34	158978,	0,000	0,001								

Sand Subsoil S1-S35-R45  
Date , , , , , : 22,11,2013 Time , , , , , : 9: 9

ERUBLE 45,00000000000000

ESAND 35,00000000000000

RLS repair: blocks behind

EUU	EFF	TDES	HSD	B	CTOT	bbbz	sigma	EH1	EH2	PFS	PFR	PFU	PFF	CIN	ERR
						PFF3	PFF5								
----- ICASE S,1															
H,HM,TF,TR,BF,BR,HC,HW						40,00	24,00	3,00	3,00	12,00	14,00	7,94	0,00		
D = 15,00															
25,00	12,16	40,70	25,494	1,92	9,33	0,347	0,303	0,241	0,582	317466,	2036,				
28856,	212760,	561117,	0,581	0,008											
50,00	12,71	45,24	29,466	1,92	9,38	0,284	0,240	0,177	0,479	338829,	1359,				
18089,	164620,	522898,	0,479	0,000											
100,00	13,23	49,80	32,445	1,92	9,39	0,197	0,161	0,112	0,379	360276,	835,				
11759,	120199,	493068,	0,379	0,000											
200,00	13,71	54,40	36,428	1,92	9,33	0,126	0,113	0,079	0,239	381926,	645,				
7979,	70052,	460602,	0,239	0,000											
400,00	14,16	59,06	40,415	1,92	9,29	0,076	0,055	0,030	0,196	403859,	258,				
2794,	49701,	456613,	0,196	0,000											
1000,00	14,73	65,34	45,399	1,92	9,35	0,056	0,038	0,022	0,132	433385,	114,				
990,	28901,	463389,	0,132	0,000											
1600,00	15,01	68,62	48,393	1,92	9,29	0,046	0,034	0,025	0,084	448794,	180,				
1817,	17865,	468655,	0,084	0,000											
3200,00	15,40	73,52	52,384	1,92	9,34	0,038	0,023	0,014	0,059	471875,	161,				
1603,	12997,	486635,	0,059	0,000											
D = 17,00															
25,00	12,16	36,90	21,577	1,92	9,36	0,312	0,260	0,190	0,590	296279,	2070,				
21337,	238808,	558494,	0,589	0,010											
50,00	12,71	39,80	23,555	1,92	9,33	0,249	0,201	0,133	0,493	310585,	1563,				
14112,	186256,	512516,	0,493	0,003											
100,00	13,23	43,55	26,525	1,92	9,38	0,184	0,153	0,107	0,354	329037,	1180,				
11955,	117503,	459675,	0,354	0,000											
200,00	13,71	47,30	29,501	1,92	9,36	0,163	0,134	0,083	0,279	347539,	924,				
9058,	88142,	445663,	0,279	0,000											

400,00	14,16	51,08	32,482,	1,92	9,36	0,093	0,078	0,047	0,207	366168,	483,
3923,	59591,	430165,	0,207	0,000							
1000,00	14,73	56,13	37,461,	1,92	9,34	0,046	0,033	0,017	0,135	391078,	177,
1026,	35816,	428098,	0,135	0,000							
1600,00	15,01	58,75	39,452,	1,92	9,40	0,041	0,033	0,023	0,121	404009,	245,
2754,	29921,	436929,	0,121	0,000							
3200,00	15,40	62,66	42,440,	1,92	9,38	0,022	0,014	0,005	0,052	423295,	70,
569,	11827,	435761,	0,052	0,000							
D = 19,00											
25,00	12,16	36,44	21,615,	1,92	9,37	0,199	0,162	0,117	0,501	291024,	1582,
13342,	198983,	504931,	0,500	0,009							
50,00	12,71	38,28	21,610,	1,92	9,39	0,186	0,152	0,103	0,421	300519,	1403,
9173,	153140,	464234,	0,421	0,003							
100,00	13,23	40,04	22,606,	1,92	9,35	0,157	0,127	0,085	0,346	309567,	1322,
10693,	124721,	446302,	0,346	0,001							
200,00	13,71	42,42	24,589,	1,92	9,34	0,118	0,094	0,062	0,294	321845,	871,
5843,	90019,	418579,	0,294	0,000							
400,00	14,16	45,60	27,562,	1,92	9,33	0,086	0,065	0,042	0,234	338244,	488,
4379,	70833,	413943,	0,234	0,000							
1000,00	14,73	49,82	30,534,	1,92	9,32	0,048	0,034	0,014	0,129	360035,	310,
1655,	31264,	393264,	0,129	0,000							
1600,00	15,01	52,01	32,522,	1,92	9,38	0,030	0,017	0,009	0,103	371290,	87,
350,	24620,	396347,	0,103	0,000							
3200,00	15,40	55,25	35,506,	1,92	9,35	0,025	0,015	0,008	0,073	388009,	124,
976,	17404,	406514,	0,073	0,000							
D = 21,00											
25,00	12,16	36,28	21,653,	1,92	9,36	0,117	0,085	0,055	0,397	287627,	843,
6047,	150524,	445042,	0,396	0,005							
50,00	12,71	38,02	21,648,	1,92	9,38	0,124	0,086	0,055	0,321	296958,	878,
6431,	110364,	414632,	0,321	0,001							
100,00	13,23	39,66	22,644,	1,92	9,34	0,105	0,081	0,052	0,260	305812,	853,
5770,	95344,	407778,	0,260	0,000							
200,00	13,71	41,24	23,640,	1,92	9,37	0,082	0,059	0,041	0,213	314303,	511,
3535,	71645,	389995,	0,213	0,000							
400,00	14,16	42,76	24,636,	1,92	9,35	0,062	0,048	0,030	0,157	322511,	463,
3380,	48062,	374416,	0,157	0,000							
1000,00	14,73	45,32	25,621,	1,92	9,41	0,054	0,035	0,017	0,148	336301,	352,
1874,	42738,	381265,	0,148	0,000							
1600,00	15,01	47,20	27,604,	1,92	9,35	0,029	0,021	0,008	0,113	346387,	142,
428,	32216,	379174,	0,113	0,000							
3200,00	15,40	49,97	29,583,	1,92	9,32	0,022	0,014	0,006	0,065	361314,	127,
270,	18847,	380559,	0,065	0,000							
D = 23,00											
25,00	12,16	36,33	21,691,	1,92	9,35	0,103	0,063	0,029	0,256	285757,	625,
3889,	86095,	376365,	0,255	0,001							
50,00	12,71	37,98	22,687,	1,92	9,37	0,080	0,057	0,030	0,225	295032,	647,
3392,	72422,	371493,	0,225	0,001							
100,00	13,23	39,54	22,682,	1,92	9,39	0,051	0,040	0,023	0,167	303798,	408,
1680,	51758,	357643,	0,167	0,000							
200,00	13,71	41,04	23,678,	1,92	9,33	0,039	0,025	0,013	0,125	312174,	278,
1535,	32788,	346774,	0,125	0,000							
400,00	14,16	42,48	24,675,	1,92	9,37	0,039	0,020	0,006	0,130	320242,	166,
205,	38647,	359261,	0,130	0,000							
1000,00	14,73	44,31	25,670,	1,92	9,34	0,031	0,019	0,012	0,091	330532,	197,
1545,	24750,	357024,	0,091	0,000							
1600,00	15,01	45,23	25,667,	1,92	9,32	0,022	0,014	0,008	0,066	335674,	141,
991,	14592,	351397,	0,066	0,000							
3200,00	15,40	46,56	26,664,	1,92	9,36	0,024	0,017	0,008	0,064	343115,	102,
262,	20276,	363756,	0,064	0,000							

Date , , , , , : 19,11,2013 Time , , , , , : 22:35

Sand bound

ERUBLE 40,000000000000

ESAND 35,000000000000

RLS repair: blocks behind

EUU	TDES	HSD	B	bbbz	sigma	EH1	EH2	PFS	PFR	PFU	PPF	CIN	ERR	
EFF	CTOT	PPF3	PPF5	ICASE B,1										
H, HM, TF, TR, BF, BR, HC, HW	25,00	17,00	2,00	2,00	10,00	12,00	5,26	0,00						
D = 15,00														
25,00	8,09	24,22	14,453	1,92	5,87	0,084	0,055	0,024	0,363	123666,	230,			
1252,	66927,	192074,	0,363	0,000										
50,00	8,43	25,25	14,450	1,92	5,89	0,059	0,040	0,026	0,344	127388,	240,			
1620,	58233,	187481,	0,344	0,000										
100,00	8,76	26,25	15,447	1,92	5,86	0,044	0,030	0,010	0,246	131019,	167,			
820,	40462,	172468,	0,246	0,000										
200,00	9,08	27,23	15,444	1,92	5,87	0,051	0,030	0,014	0,239	134588,	145,			
641,	39441,	174815,	0,239	0,002										
400,00	9,38	28,20	16,442	1,92	5,86	0,043	0,029	0,014	0,192	138112,	147,			
971,	29625,	168855,	0,192	0,010										
1000,00	9,77	29,47	16,438	1,92	5,82	0,019	0,011	0,004	0,146	142726,	38,			
405,	22160,	165329,	0,146	0,004										
1600,00	9,97	30,11	17,437	1,92	5,86	0,018	0,009	0,003	0,109	145079,	34,			
171,	17951,	163235,	0,109	0,010										
3200,00	10,25	31,19	17,432	1,92	5,85	0,022	0,012	0,004	0,098	149001,	62,			
277,	15255,	164595,	0,095	0,011										
D = 16,00														
25,00	8,09	24,30	14,472	1,92	5,89	0,067	0,038	0,020	0,296	123364,	226,			
1644,	51890,	177124,	0,295	0,017										
50,00	8,43	25,30	14,469	1,92	5,91	0,060	0,041	0,017	0,257	127089,	208,			
699,	45913,	173909,	0,255	0,031										
100,00	8,76	26,26	15,466	1,92	5,83	0,030	0,023	0,011	0,185	130713,	97,			
284,	30404,	161498,	0,185	0,028										
200,00	9,08	27,21	15,464	1,92	5,86	0,027	0,021	0,012	0,148	134265,	107,			
693,	24392,	159458,	0,147	0,031										
400,00	9,38	28,14	16,461	1,92	5,91	0,025	0,016	0,007	0,129	137765,	70,			
412,	18477,	156723,	0,127	0,031										
1000,00	9,77	29,36	16,458	1,92	5,88	0,012	0,010	0,002	0,098	142331,	44,			
149,	13998,	156522,	0,096	0,030										
1600,00	9,97	29,98	17,456	1,92	5,81	0,021	0,011	0,004	0,085	144655,	27,			
65,	11486,	156233,	0,082	0,024										
3200,00	10,25	30,89	17,453	1,92	5,84	0,015	0,010	0,002	0,058	148065,	26,			
50,	8732,	156873,	0,057	0,019										
D = 18,00														
25,00	8,09	24,58	14,510	1,92	5,85	0,029	0,018	0,008	0,156	123629,	95,			
447,	27122,	151292,	0,126	0,136										
50,00	8,43	25,53	15,507	1,92	5,90	0,030	0,013	0,005	0,119	127410,	88,			
451,	19604,	147552,	0,092	0,113										
100,00	8,76	26,46	15,505	1,92	5,86	0,020	0,014	0,004	0,100	131070,	78,			
441,	17589,	149178,	0,077	0,096										
200,00	9,08	27,35	16,502	1,92	5,88	0,013	0,009	0,002	0,090	134639,	50,			
168,	14633,	149490,	0,059	0,085										
400,00	9,38	28,23	16,499	1,92	5,91	0,012	0,007	0,001	0,067	138140,	27,			
101,	11476,	149744,	0,035	0,062										
1000,00	9,77	29,38	17,496	1,92	5,89	0,006	0,003	0,002	0,072	142684,	23,			
97,	14411,	157215,	0,032	0,070										
1600,00	9,97	29,96	17,494	1,92	5,87	0,004	0,002	0,000	0,058	144986,	4,			
0,	9846,	154835,	0,021	0,056										
3200,00	10,25	30,80	17,492	1,92	5,88	0,005	0,002	0,000	0,064	148351,	13,			
0,	11937,	160301,	0,019	0,064										
D = 20,00														
25,00	8,09	24,97	14,549	1,92	5,89	0,018	0,008	0,002	0,188	124902,	29,			
36,	35745,	160711,	0,037	0,188										
50,00	8,43	25,89	15,546	1,92	5,90	0,011	0,006	0,002	0,159	128790,	21,			
26,	29361,	158197,	0,025	0,159										

100,00	8,76	26,79	15,543	1,92	5,87	0,010	0,003	0,001	0,124	132537,	7,
27, 24155,	156725,	0,019	0,124								
200,00	9,08	27,65	16,540	1,92	5,86	0,003	0,003	0,001	0,108	136177,	14,
3, 22552,	158746,	0,016	0,108								
400,00	9,38	28,50	16,538	1,92	5,85	0,005	0,002	0,001	0,092	139732,	8,
59, 18529,	158327,	0,007	0,092								
1000,00	9,77	29,59	17,534	1,92	5,88	0,003	0,000	0,000	0,100	144325,	0,
0, 17139,	161464,	0,004	0,100								
1600,00	9,97	30,15	17,533	1,92	5,85	0,001	0,001	0,000	0,086	146643,	0,
0, 16603,	163247,	0,000	0,086								
3200,00	10,25	30,95	17,530	1,92	5,88	0,003	0,002	0,001	0,081	150021,	13,
5, 16455,	166494,	0,002	0,081								
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,84	0,010	0,008	0,004	0,180	127059,	50,
107, 37513,	164729,	0,002	0,180								
50,00	8,43	26,32	15,584	1,92	5,87	0,002	0,002	0,000	0,164	131092,	4,
0, 30553,	161650,	0,000	0,164								
100,00	8,76	27,20	16,581	1,92	5,86	0,003	0,000	0,000	0,138	134965,	0,
0, 27764,	162729,	0,000	0,138								
200,00	9,08	28,05	16,579	1,92	5,87	0,004	0,001	0,000	0,124	138715,	1,
0, 23291,	162007,	0,001	0,124								
400,00	9,38	28,87	17,576	1,92	5,84	0,002	0,000	0,000	0,112	142365,	0,
0, 23562,	165927,	0,001	0,112								
1000,00	9,77	29,93	17,573	1,92	5,89	0,001	0,001	0,001	0,108	147063,	1,
7, 17491,	164562,	0,000	0,108								
1600,00	9,97	30,47	17,571	1,92	5,86	0,001	0,000	0,000	0,097	149425,	0,
0, 18770,	168195,	0,000	0,097								
3200,00	10,25	31,24	18,568	1,92	5,84	0,000	0,000	0,000	0,077	152859,	0,
0, 13831,	166690,	0,000	0,077								

----- with teta

divided in 10 steps

Date , , , , , : 20,11,2013 Time , , , , , : 9:42

Sand bound

ERUBLE 40,0000000000000

ESAND 35,0000000000000

RLS repair: blocks behind

EUU	EFF	TDES	HSD	B	CTOT	bbbz	sigma	EH1	EH2	PFS	PFR	PFU	PFF	CIN	ERR
						PFF3	PFF5								
----- ICASE B,1															
H, HM, TF, TR, BF, BR, HC, HW		25,00	17,00	2,00	2,00	10,00	12,00	5,26	0,00						
D = 15,00															
25,00	8,09	24,22	14,453	1,92	5,87	0,084	0,055	0,024	0,363	123666,	230,				
1252, 66927,	192074,	0,363	0,000												
50,00	8,43	25,25	14,450	1,92	5,89	0,059	0,040	0,026	0,344	127388,	240,				
1620, 58233,	187481,	0,344	0,000												
100,00	8,76	26,25	15,447	1,92	5,86	0,044	0,030	0,010	0,246	131019,	167,				
820, 40462,	172468,	0,246	0,000												
200,00	9,08	27,23	15,444	1,92	5,87	0,051	0,030	0,014	0,239	134588,	145,				
641, 39441,	174815,	0,239	0,002												
400,00	9,38	28,20	16,442	1,92	5,86	0,043	0,029	0,014	0,192	138112,	147,				
971, 29625,	168855,	0,192	0,010												
1000,00	9,77	29,47	16,438	1,92	5,82	0,019	0,011	0,004	0,146	142726,	38,				
405, 22160,	165329,	0,146	0,004												
1600,00	9,97	30,11	17,437	1,92	5,86	0,018	0,009	0,003	0,109	145079,	34,				
171, 17951,	163235,	0,109	0,010												
3200,00	10,25	31,19	17,432	1,92	5,85	0,022	0,012	0,004	0,098	149001,	62,				
277, 15255,	164595,	0,095	0,011												
D = 16,00															
25,00	8,09	24,30	14,472	1,92	5,89	0,067	0,038	0,020	0,296	123364,	226,				
1644, 51890,	177124,	0,295	0,017												
50,00	8,43	25,30	14,469	1,92	5,91	0,060	0,041	0,017	0,257	127089,	208,				
699, 45913,	173909,	0,255	0,031												
100,00	8,76	26,26	15,466	1,92	5,83	0,030	0,023	0,011	0,185	130713,	97,				
284, 30404,	161498,	0,185	0,028												



200,00	9,08	27,21	15,464	1,92	5,86	0,027	0,021	0,012	0,148	134265,	107,
693,	24392,	159458,	0,147	0,031							
400,00	9,38	28,14	16,461	1,92	5,91	0,025	0,016	0,007	0,129	137765,	70,
412,	18477,	156723,	0,127	0,031							
1000,00	9,77	29,36	16,458	1,92	5,88	0,012	0,010	0,002	0,098	142331,	44,
149,	13998,	156522,	0,096	0,030							
1600,00	9,97	29,98	17,456	1,92	5,81	0,021	0,011	0,004	0,085	144655,	27,
65,	11486,	156233,	0,082	0,024							
3200,00	10,25	30,89	17,453	1,92	5,84	0,015	0,010	0,002	0,058	148065,	26,
50,	8732,	156873,	0,057	0,019							
D = 18,00											
25,00	8,09	24,58	14,510	1,92	5,85	0,029	0,018	0,008	0,156	123629,	95,
447,	27122,	151292,	0,126	0,136							
50,00	8,43	25,53	15,507	1,92	5,90	0,030	0,013	0,005	0,119	127410,	88,
451,	19604,	147552,	0,092	0,113							
100,00	8,76	26,46	15,505	1,92	5,86	0,020	0,014	0,004	0,100	131070,	78,
441,	17589,	149178,	0,077	0,096							
200,00	9,08	27,35	16,502	1,92	5,88	0,013	0,009	0,002	0,090	134639,	50,
168,	14633,	149490,	0,059	0,085							
400,00	9,38	28,23	16,499	1,92	5,91	0,012	0,007	0,001	0,067	138140,	27,
101,	11476,	149744,	0,035	0,062							
1000,00	9,77	29,38	17,496	1,92	5,89	0,006	0,003	0,002	0,072	142684,	23,
97,	14411,	157215,	0,032	0,070							
1600,00	9,97	29,96	17,494	1,92	5,87	0,004	0,002	0,000	0,058	144986,	4,
0,	9846,	154835,	0,021	0,056							
3200,00	10,25	30,80	17,492	1,92	5,88	0,005	0,002	0,000	0,064	148351,	13,
0,	11937,	160301,	0,019	0,064							
D = 20,00											
25,00	8,09	24,97	14,549	1,92	5,89	0,018	0,008	0,002	0,188	124902,	29,
36,	35745,	160711,	0,037	0,188							
50,00	8,43	25,89	15,546	1,92	5,90	0,011	0,006	0,002	0,159	128790,	21,
26,	29361,	158197,	0,025	0,159							
100,00	8,76	26,79	15,543	1,92	5,87	0,010	0,003	0,001	0,124	132537,	7,
27,	24155,	156725,	0,019	0,124							
200,00	9,08	27,65	16,540	1,92	5,86	0,003	0,003	0,001	0,108	136177,	14,
3,	22552,	158746,	0,016	0,108							
400,00	9,38	28,50	16,538	1,92	5,85	0,005	0,002	0,001	0,092	139732,	8,
59,	18529,	158327,	0,007	0,092							
1000,00	9,77	29,59	17,534	1,92	5,88	0,003	0,000	0,000	0,100	144325,	0,
0,	17139,	161464,	0,004	0,100							
1600,00	9,97	30,15	17,533	1,92	5,85	0,001	0,001	0,000	0,086	146643,	0,
0,	16603,	163247,	0,000	0,086							
3200,00	10,25	30,95	17,530	1,92	5,88	0,003	0,002	0,001	0,081	150021,	13,
5,	16455,	166494,	0,002	0,081							
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,84	0,010	0,008	0,004	0,180	127059,	50,
107,	37513,	164729,	0,002	0,180							
50,00	8,43	26,32	15,584	1,92	5,87	0,002	0,002	0,000	0,164	131092,	4,
0,	30553,	161650,	0,000	0,164							
100,00	8,76	27,20	16,581	1,92	5,86	0,003	0,000	0,000	0,138	134965,	0,
0,	27764,	162729,	0,000	0,138							
200,00	9,08	28,05	16,579	1,92	5,87	0,004	0,001	0,000	0,124	138715,	1,
0,	23291,	162007,	0,001	0,124							
400,00	9,38	28,87	17,576	1,92	5,84	0,002	0,000	0,000	0,112	142365,	0,
0,	23562,	165927,	0,001	0,112							
1000,00	9,77	29,93	17,573	1,92	5,89	0,001	0,001	0,001	0,108	147063,	1,
7,	17491,	164562,	0,000	0,108							
1600,00	9,97	30,47	17,571	1,92	5,86	0,001	0,000	0,000	0,097	149425,	0,
0,	18770,	168195,	0,000	0,097							
3200,00	10,25	31,24	18,568	1,92	5,84	0,000	0,000	0,000	0,077	152859,	0,
0,	13831,	166690,	0,000	0,077							

Date , , , , , : 20,11,2013 Time , , , , , : 13:47

Sand bound

ERUBLE 40,000000000000

ESAND 35,000000000000

RLS repair: blocks behind

EUU	TDES	HSD	B	bbbz	sigma	EH1	EH2	PFS	PFR	PFU	PPF	CIN	ERR
EFF	CTOT	PPF3	PPF5	ICASE B,1									
H, HM, TF, TR, BF, BR, HC, HW	25,00	17,00	2,00	2,00	10,00	12,00	5,26	0,00					
D = 15,00													
25,00	8,09	24,22	14,453	1,92	5,87	0,084	0,055	0,024	0,363	123666,	230,		
1252,	66927,	192074,	0,363	0,000									
50,00	8,43	25,25	14,450	1,92	5,89	0,059	0,040	0,026	0,344	127388,	240,		
1620,	58233,	187481,	0,344	0,000									
100,00	8,76	26,25	15,447	1,92	5,86	0,044	0,030	0,010	0,246	131019,	167,		
820,	40462,	172468,	0,246	0,000									
200,00	9,08	27,23	15,444	1,92	5,87	0,051	0,030	0,014	0,239	134588,	145,		
641,	39441,	174815,	0,239	0,002									
400,00	9,38	28,20	16,442	1,92	5,86	0,043	0,029	0,014	0,192	138112,	147,		
971,	29625,	168855,	0,192	0,010									
1000,00	9,77	29,47	16,438	1,92	5,82	0,019	0,011	0,004	0,146	142726,	38,		
405,	22160,	165329,	0,146	0,004									
1600,00	9,97	30,11	17,437	1,92	5,86	0,018	0,009	0,003	0,109	145079,	34,		
171,	17951,	163235,	0,109	0,010									
3200,00	10,25	31,19	17,432	1,92	5,85	0,022	0,012	0,004	0,098	149001,	62,		
277,	15255,	164595,	0,095	0,011									
D = 16,00													
25,00	8,09	24,30	14,472	1,92	5,89	0,067	0,038	0,020	0,296	123364,	226,		
1644,	51890,	177124,	0,295	0,017									
50,00	8,43	25,30	14,469	1,92	5,91	0,060	0,041	0,017	0,257	127089,	208,		
699,	45913,	173909,	0,255	0,031									
100,00	8,76	26,26	15,466	1,92	5,83	0,030	0,023	0,011	0,185	130713,	97,		
284,	30404,	161498,	0,185	0,028									
200,00	9,08	27,21	15,464	1,92	5,86	0,027	0,021	0,012	0,148	134265,	107,		
693,	24392,	159458,	0,147	0,031									
400,00	9,38	28,14	16,461	1,92	5,91	0,025	0,016	0,007	0,129	137765,	70,		
412,	18477,	156723,	0,127	0,031									
1000,00	9,77	29,36	16,458	1,92	5,88	0,012	0,010	0,002	0,098	142331,	44,		
149,	13998,	156522,	0,096	0,030									
1600,00	9,97	29,98	17,456	1,92	5,81	0,021	0,011	0,004	0,085	144655,	27,		
65,	11486,	156233,	0,082	0,024									
3200,00	10,25	30,89	17,453	1,92	5,84	0,015	0,010	0,002	0,058	148065,	26,		
50,	8732,	156873,	0,057	0,019									
D = 18,00													
25,00	8,09	24,58	14,510	1,92	5,85	0,029	0,018	0,008	0,156	123629,	95,		
447,	27122,	151292,	0,126	0,136									
50,00	8,43	25,53	15,507	1,92	5,90	0,030	0,013	0,005	0,119	127410,	88,		
451,	19604,	147552,	0,092	0,113									
100,00	8,76	26,46	15,505	1,92	5,86	0,020	0,014	0,004	0,100	131070,	78,		
441,	17589,	149178,	0,077	0,096									
200,00	9,08	27,35	16,502	1,92	5,88	0,013	0,009	0,002	0,090	134639,	50,		
168,	14633,	149490,	0,059	0,085									
400,00	9,38	28,23	16,499	1,92	5,91	0,012	0,007	0,001	0,067	138140,	27,		
101,	11476,	149744,	0,035	0,062									
1000,00	9,77	29,38	17,496	1,92	5,89	0,006	0,003	0,002	0,072	142684,	23,		
97,	14411,	157215,	0,032	0,070									
1600,00	9,97	29,96	17,494	1,92	5,87	0,004	0,002	0,000	0,058	144986,	4,		
0,	9846,	154835,	0,021	0,056									
3200,00	10,25	30,80	17,492	1,92	5,88	0,005	0,002	0,000	0,064	148351,	13,		
0,	11937,	160301,	0,019	0,064									
D = 20,00													
25,00	8,09	24,97	14,549	1,92	5,89	0,018	0,008	0,002	0,188	124902,	29,		
36,	35745,	160711,	0,037	0,188									
50,00	8,43	25,89	15,546	1,92	5,90	0,011	0,006	0,002	0,159	128790,	21,		
26,	29361,	158197,	0,025	0,159									

100,00	8,76	26,79	15,543	1,92	5,87	0,010	0,003	0,001	0,124	132537,	7,
27,24155,	156725,	0,019	0,124								
200,00	9,08	27,65	16,540	1,92	5,86	0,003	0,003	0,001	0,108	136177,	14,
3,22552,	158746,	0,016	0,108								
400,00	9,38	28,50	16,538	1,92	5,85	0,005	0,002	0,001	0,092	139732,	8,
59,18529,	158327,	0,007	0,092								
1000,00	9,77	29,59	17,534	1,92	5,88	0,003	0,000	0,000	0,100	144325,	0,
0,17139,	161464,	0,004	0,100								
1600,00	9,97	30,15	17,533	1,92	5,85	0,001	0,001	0,000	0,086	146643,	0,
0,16603,	163247,	0,000	0,086								
3200,00	10,25	30,95	17,530	1,92	5,88	0,003	0,002	0,001	0,081	150021,	13,
5,16455,	166494,	0,002	0,081								
D = 22,00											
25,00	8,09	25,41	15,587	1,92	5,84	0,010	0,008	0,004	0,180	127059,	50,
107,37513,	164729,	0,002	0,180								
50,00	8,43	26,32	15,584	1,92	5,87	0,002	0,002	0,000	0,164	131092,	4,
0,30553,	161650,	0,000	0,164								
100,00	8,76	27,20	16,581	1,92	5,86	0,003	0,000	0,000	0,138	134965,	0,
0,27764,	162729,	0,000	0,138								
200,00	9,08	28,05	16,579	1,92	5,87	0,004	0,001	0,000	0,124	138715,	1,
0,23291,	162007,	0,001	0,124								
400,00	9,38	28,87	17,576	1,92	5,84	0,002	0,000	0,000	0,112	142365,	0,
0,23562,	165927,	0,001	0,112								
1000,00	9,77	29,93	17,573	1,92	5,89	0,001	0,001	0,001	0,108	147063,	1,
7,17491,	164562,	0,000	0,108								
1600,00	9,97	30,47	17,571	1,92	5,86	0,001	0,000	0,000	0,097	149425,	0,
0,18770,	168195,	0,000	0,097								
3200,00	10,25	31,24	18,568	1,92	5,84	0,000	0,000	0,000	0,077	152859,	0,
0,13831,	166690,	0,000	0,077								