Program instructions for estimate of seismic influences and object strengthening (SyDC-90)

version so-07.05.
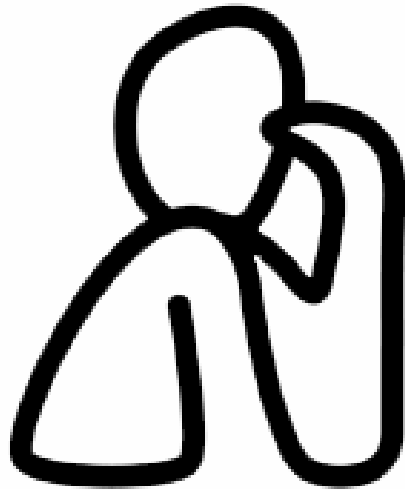
Belgrade, 2005.

Contents

Introduction

SyDc-90 is a specialized program package for estimation of object strengthening from seismic influences. This program can work in operating systems Windows 95, Windows 98, Windows ME, Windows NT 4.0, Windows 2000 and Windows XP. For using SyDc90 program, it is necessary to know the basic working techniques in Windows operating systems.

SyDc-90 is started from the desktop by left clicking the icon labeled SyDc-90 (Picture 1).
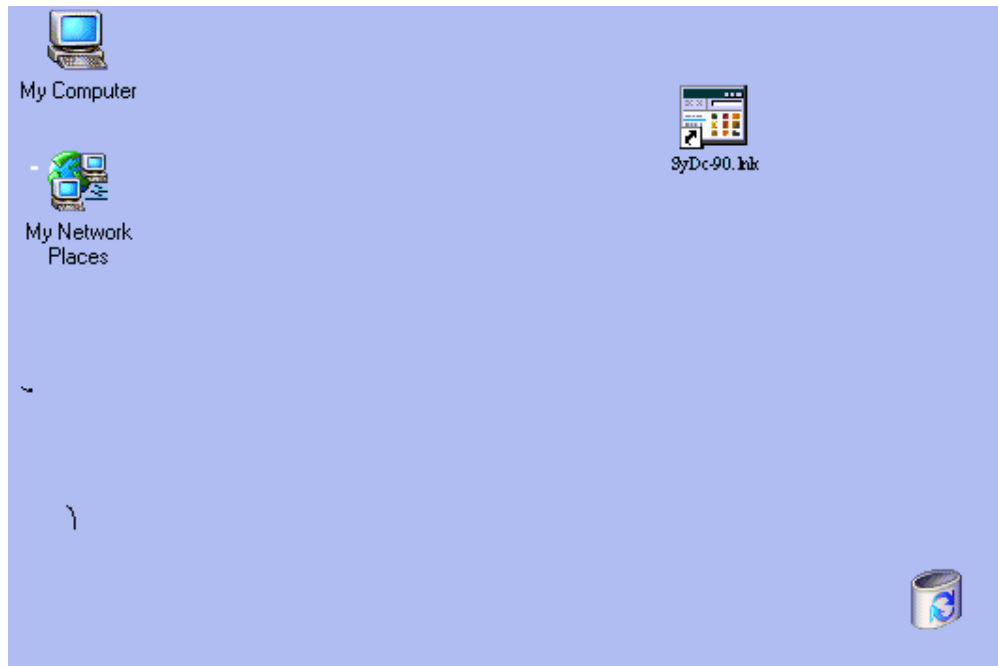
Picture 1   Desktop

On the main mask of the SyDc-90 program, there are the following options:
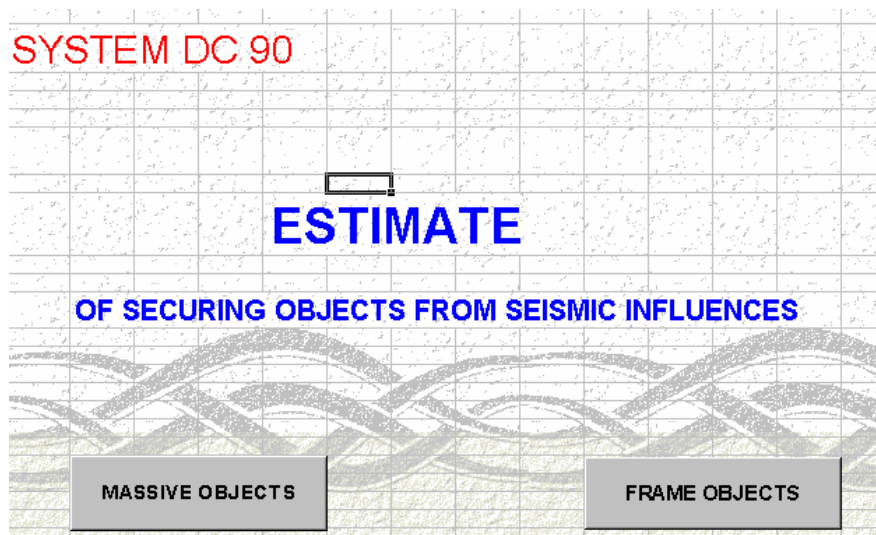
The following parameters are here:

Mass objects. This option includes protection estimation for multi-floor mass objects, Po+P+3.

Frame objects. This option includes the protection estimation of multi-story frame objects, Po+P+8.

To choose option, left click the desired button.

Object system parameters
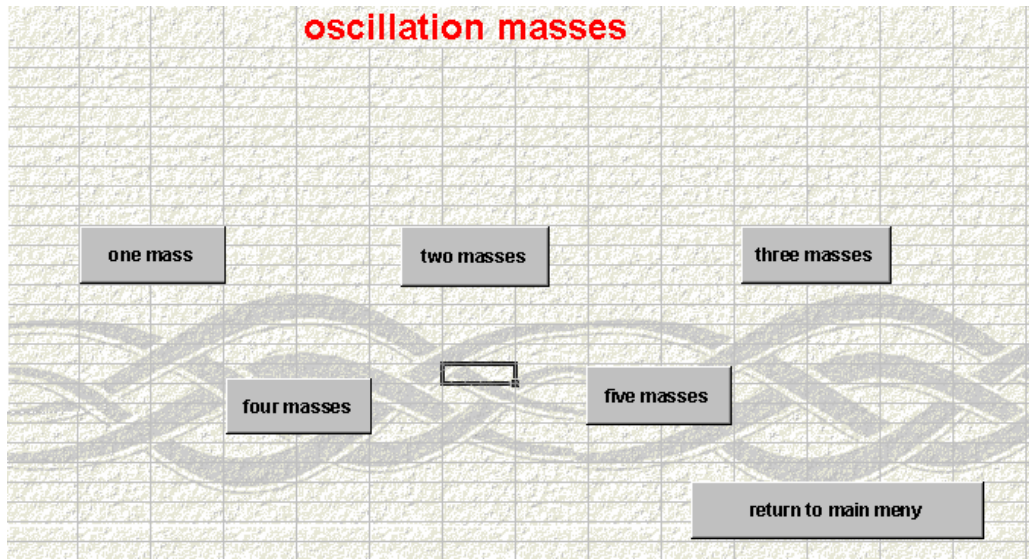
Here we have the following parameters:

- Oscillation mass – selection of the number of oscillation masses depending on the number of floors
- Return to main menu – return to the beginning of the program.

  Selection of desired options is performed by left clicking on appropriate buttons.

Parameter selection for massive objects
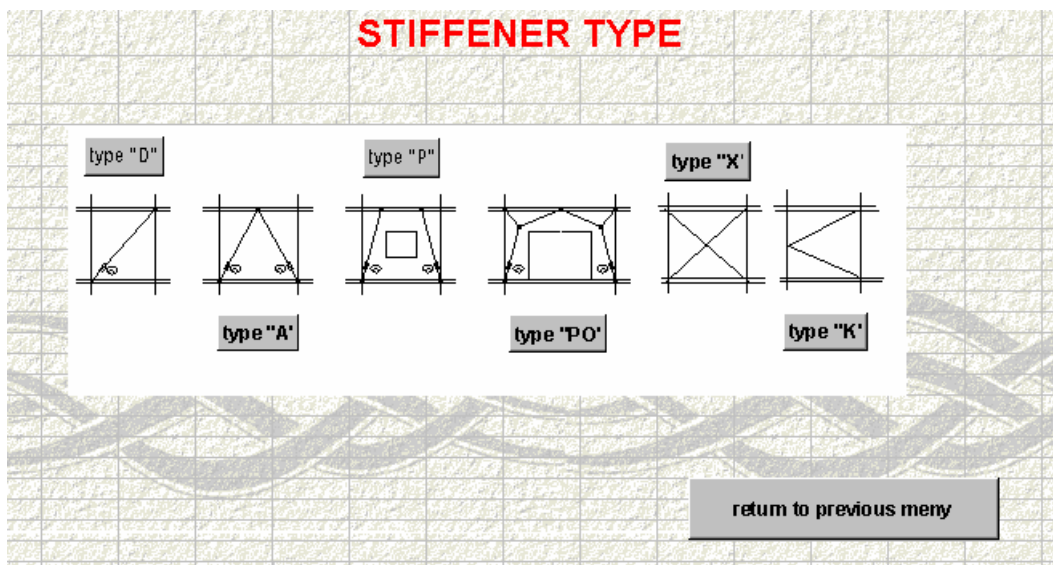
Here are the following parameters:

- Stiffener type – five types - D, A, P, Po, X or K.
- Return to previous menu - return to selecting number of oscillation masses

All options are selected by left clicking the apropriate buttons.

Selection of massive object load parameters

ONE STOREY OBJECT WITH TYPE "D" STIFFENER

| return to previous meny |

1. Load analysis

1.1. Constant load		
Roof with attic construction	1.50	Kn/m^2
Walls	16.00	Kn/m^3
Interstorey construction	2.60	Kn/m^2
1.2. Payload	1.50	Kn/m^2
1.3. Wind + snow	1.00	Kn/m^2

Here are the following parameters:

- Load analysis – this option enables input of load values depending on type of material and purpose of the object.
- Return to main menu – back to stiffener type selection.

Options are selected by left clicking on yellow fields, and typing in the desired load value.

Selection of parameters for determination of the mass center

2. Determination of mass center position by levels

2.1. Ground floor

area	36.0	m²
wall thickness	0.25	m¹
wall hight	3.00	m¹
storey hight	3.00	m¹

wall	b (m)	d (m)	h (m)	X(wall)m	Y(wall)m	G(wall)	G x X	G x Y
1	0.25	6.00	3.00	3.00	0.00	72.00	216.00	0.00
2	0.25	6.00	3.00	3.00	6.00	72.00	216.00	432.00
3	0.25	6.00	3.00	0.00	3.00	72.00	0.00	216.00
4	0.25	6.00	3.00	6.00	3.00	72.00	432.00	216.00
5	0.25		3.00			0.00	0.00	0.00
6	0.25		3.00			0.00	0.00	0.00
7	0.25		3.00			0.00	0.00	0.00
8	0.25		3.00			0.00	0.00	0.00
9	0.25		3.00			0.00	0.00	0.00
10	0.25		3.00			0.00	0.00	0.00
11	0.25		3.00			0.00	0.00	0.00
12	0.25		3.00			0.00	0.00	0.00

Here are the following parameters:

- area – possibility of input of gross area of the entire object.
- wall thickness – input of wall thickness per story.
- wall height – input of the height of the wall belonging to the oscillating mass.
- story height – input of story height.
- d (m) - length of wall which mass is being calculated.
- Xwall (m) – X coordinate of the wall mass center.
- Ywall (m) – Y coordinate of the wall mass center.

Options are selected by left clicking on yellow fields, and typing in the desired value.

NOTE!! – The zero point of the coordinate system should always be placed in the lower left of the object.

Determination of stiffness center position parameters

3. Determination of stiffness center position per level

3.1. Ground floor

X-direction

stiffening	b (m)	d (m)	I (m⁴)	y(m)	I·y
1	0.25	2.00	0.1667	0.00	0.0000
2	0.25	2.00	0.1667	6.00	1.0000
3	0.25	0.00	0.0000		0.0000
4	0.25	0.00	0.0000		0.0000

Y-direction

stiffness	b (m)	d (m)	I (m⁴)	x(m)	I·x
1	0.25	2.00	0.1667	0.00	0.0000
2	0.25	2.00	0.1667	6.00	1.0000
3	0.25	0.00	0.0000		0.0000
4	0.25	0.00	0.0000		0.0000

Parameters are as follows:

- d (m) – stiffening width.
- Xwall (m) - X coordinate of the stiffening center.
- Ywall (m) - Y coordinate of the stiffening center.

Options are selected by left clicking on yellow fields, and typing in the desired value.

NOTE!! – The zero point of the coordinate system should always be placed in the lower left of the object.

Selection of parameters for determination of seismic force

4.2. Total seismic force

JUS (EC)	IRAN	ALGERES	VALUE
coefficient of object category - K1	design base acceleration - A	zone acceleration coefficient - A	1.00
coefficient of dynamism - K2	building response factor obtained from the design response spectrum - B	average dynamic strenghtening factor - D	1.00
ductility and damping coefficient - K3	building importance factor	construction stiffness factor -B	2.00
seismic coefficient - K4	building behaviour factor - 1/R	quality factor - Q	0.05

The parameters here are as follows:

- Value – possibility to input coefficients from JUS, EU, IRAN, ALGIERS standards.

Options are selected by left clicking on yellow fields, and typing in the desired value.

Determination of parameters for seismic force distribution

Distribution of seismic force on a wall with bowsprit and absorber and on the existing wall
(ref Appendix 1: estimate of brick wall stiffness and walls with bowsprit and absorber)

x - direction

	length (m)
walls	12.00

	number	width	(B+60)/2
	1	2.00	1.30
stiffeners	2	2.00	1.30
	3	0.00	0.30
	4	0.00	0.30

Y - direction

	length (m)
walls	12.00

	number	width	(B+60)/2
	1	2.00	1.30
stifeners	2	2.00	1.30
	3	0.00	0.30
	4	0.00	0.30

Here we have the following parameters:

- length (m) – total length of walls that are under seismic influences.
- width (m) – stiffening width.

Options are selected by left clicking on yellow fields, and typing in the desired value.

Selection of dimensioning parameters

5. Dimensioning of stiffeners

5.1. Weight dimensioning

Vmax=	25.41	KN
pot A=	1.059	cm^2

for determined vertical RA 400/500   1   φ   19

A =	2.83	cm^2
stvσ =	8.967	KN/cm^2

5.2. Bowsprit dimensioning

Dmax=	30.540	KN
pot A=	1.909	cm^2

for determined diagonal pipe φ 48.3 x 3.2 (Č0361)
and aditional framework RA 400/500   0   φ   19

A =	4.82	cm^2
stvσ =	6.336	KN/cm^2

Here we have the following parameters:

- reinforcement for stiffener vertical – input of necessary number of reinforcement bars in order not to exceed the vertical stress
- additional diagonal reinforcements – input of the number of additional reinforcement bars for the diagonal strengthening

Options are selected by left clicking on yellow fields, and typing in the desired value.

Selection of stiffener parameters for frame objects

Here are the following parameters:

- stiffener type – choosing between following types: D, A, P, PO, X or K
- return to main menu – return to the selection of number of oscillating masses.

Options are selected by left clicking on desired button.

Selection of massive object load parameters

ONE STOREY OBJECT WITH TYPE "D" STIFFENER

return to previous meny

1. Load analysis

1.1. Constant load		
Roof with attic construction	1.50	Kn/m^2
Walls	16.00	Kn/m^3
Interstorey construction	2.60	Kn/m^2
1.2. Payload	1.50	Kn/m^2
1.3. Wind + snow	1.00	Kn/m^2

The parameters here are as follows:

- Load analysis – this option enables input of load values depending on type of material and purpose of the object.
- Return to main menu – back to stiffener type selection.

Options are selected by left clicking on yellow fields, and typing in the desired load value.

Selection of parameters for determination of the mass center

2. Determination of mass center position by levels

2.1. Ground floor

area	36.0	m²
wall thickness	0.25	m¹
wall hight	3.00	m¹
storey hight	3.00	m¹

wall	b (m)	d (m)	h (m)	X(wall)m	Y(wall)m	G(wall)	G x X	G x Y
1	0.25	6.00	3.00	3.00	0.00	72.00	216.00	0.00
2	0.25	6.00	3.00	3.00	6.00	72.00	216.00	432.00
3	0.25	6.00	3.00	0.00	3.00	72.00	0.00	216.00
4	0.25	6.00	3.00	6.00	3.00	72.00	432.00	216.00
5	0.25		3.00			0.00	0.00	0.00
6	0.25		3.00			0.00	0.00	0.00
7	0.25		3.00			0.00	0.00	0.00
8	0.25		3.00			0.00	0.00	0.00
9	0.25		3.00			0.00	0.00	0.00
10	0.25		3.00			0.00	0.00	0.00
11	0.25		3.00			0.00	0.00	0.00
12	0.25		3.00			0.00	0.00	0.00

Here we have the following parameters:

- area – possibility of input of gross area of the entire object.
- wall thickness – input of wall thickness per story.
- wall height – input of the height of the wall belonging to the oscillating mass.
- story height – input of story height.
- d (m) - length of wall which mass is being calculated.
- Xwall (m) – X coordinate of the wall mass center.
- Ywall (m) – Y coordinate of the wall mass center.

Options are selected by left clicking on yellow fields, and typing in the desired load value.

NOTE!! – The zero point of the coordinate system should always be placed in the lower left of the object.

3. Determination of stiffness center position per level

3.1. Ground floor

X-direction

stiffening	b (m)	h (m)	b₁(m)	h₁(m)	e(m)	I (m⁴)	y(m)	I·y
1	0.25	0.25			1.00	0.0313	0.00	0.0000
2	0.25	0.25			1.25	0.0488	6.00	0.2930
3	2.00	2.00	1.80	1.80		0.4585	3.00	1.3756
4	2.50	2.00	2.10	2.10		1.6345	3.00	4.9036

Y-direction

stiffening	b (m)	d (m)	b₁(m)	h₁(m)	e(m)	I (m⁴)	x(m)	I·x
1	0.30	0.30			1.00	0.0450	0.00	0.0000
2	0.30	0.30			1.25	0.0703	6.00	0.4219
3	3.00	3.00	2.00	2.00		5.4167	3.00	16.2500
4	4.00	4.00	3.00	3.00		14.5833	3.00	43.7500

Here we have the following parameters:

- b (m). width of the reinforced concrete stiffening pillar (1)
  (external width of the reinforced concrete stiffening core) (2).
- h (m). height of the reinforced concrete stiffening pillar (1)
  (external height of the reinforced concrete stiffening core) (2).
- b_1 (m). internal width of the reinforced concrete stiffening core (2).
- h_1 (m). internal height of the reinforced concrete stiffening core (2).
- e_1 (m). distance between the pillar and the stiffening center (1).
- Xwall (m). X coordinate of the stiffening center.
- Ywall (m). Y coordinate of the stiffening center.

Options are selected by left clicking on yellow fields, and typing in the desired value.

NOTE!! – The zero point of the coordinate system should always be placed in the lower left of the object.

Selection of parameters for determination of seismic force

4.2. Total seismic force

JUS (EC)	IRAN	ALGERES	VALUE
coefficient of object category - K1	design base acceleration - A	zone acceleration coefficient - A	1.00
coefficient of dynamism - K2	building response factor obtained from the design response spectrum - B	average dynamic strenghtening factor - D	1.00
ductility and damping coefficient - K3	building importance factor	construction stiffness factor -B	2.00
seismic coefficient - K4	building behaviour factor - 1/R	quality factor - Q	0.05

Here we have the following parameters:

- value - this option enables input of coefficients belonging to JUS, EU, IRAN and ALGIERS standards.

Options are selected by left clicking on yellow fields, and typing in the desired value.

Selection of dimensioning parameters

5. Dimensioning of stiffeners

5.1. Weight dimensioning

$V_{max}=$	25.41	KN				
pot A=	1.059	cm^2				
for determined vertical RA 400/500			1	ϕ	19	
A =	2.83	cm^2				
stvσ =	8.967	KN/cm^2				

5.2. Bowsprit dimensioning

$D_{max}=$	30.540	KN				
pot A=	1.909	cm^2				
for determined diagonal pipe ϕ 48.3 x 3.2 (Č0361)						
and aditional framework RA 400/500			0	ϕ	19	
A =	4.82	cm^2				
stvσ =	6.336	KN/cm^2				

Here we have the following parameters:

- reinforcement for stiffener vertical – input of necessary number of reinforcement bars in order not to exceed the vertical stress
- additional diagonal reinforcements – input of the number of additional reinforcement bars for the diagonal strengthening

Options are selected by left clicking on yellow fields, and typing in the desired value