AC Engineering

Home Done Solution

WIND STUDY 15|03|2017

AC Engineering S.p.A.
Via Toniolo 39/A – 61032 Fano (PU) – Italy - P.I.: 02368570418 – REA: PS 175929
T: +39 0721 855778 – info@homedone.it – www.homedone.com

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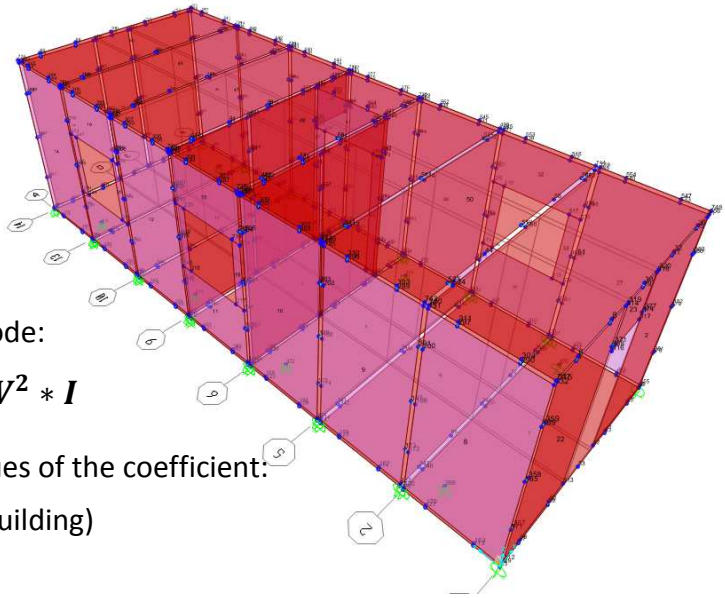
Living Unit 27mq – BOX



Loads applied:

Dead load – structural, G1

Live load – floor, Q1= 2kN/m^2 = 42,8psf

Live load – roof, Q2=0,5kN/m^2 = 10,4psf

Wind load – according to Florida building code:

$$q = 0,00255 * k_z * k_{zt} * k_d * V^2 * I$$

Florida Building Code indicated general values of the coefficient:

I=1 for type 2 of construction (Residential Building)

K_{zt} =1 – topografic factor

K_z = 0,9 – velocity pressure exposure coefficient

K_d = 0,85 – wind directionally factor for buildings

Three different velocity of wind are analyzed:

- ***V_1= 150 mph***
- ***V_2= 200 mph***
- ***V_3= 250 mph***
- ***V_4= 300 mph***

Considering these values, the wind load is:

- *q_1= 43,89 psf*
- *q_2= 78,03 psf*
- *q_3= 121,92 psf*
- *q_4= 175,57 psf*

In conclusion, the design wind pressure is calculated by the following equation:

$$p = q_n * (Gc_{pf} - Gc_{pi})$$

Where:

Gc_{pf} : external pressure coefficient from Figure 6-10 of ASCE7 code.

Gc_{pi} = ± 0,18 internal pressure coefficient

The combination factored loads used is:

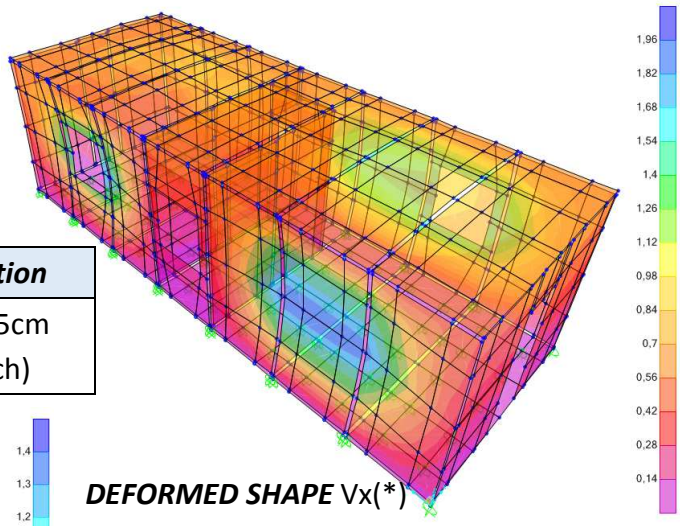
$$1,2D + 1,6W + L + 0,5\,L_r$$

(*) The deformed shape obtained in output is amplified by 20-30 times to facilitate the identification of critical points, but the real deformation values can be read from the chromatic scale, measured in cm.

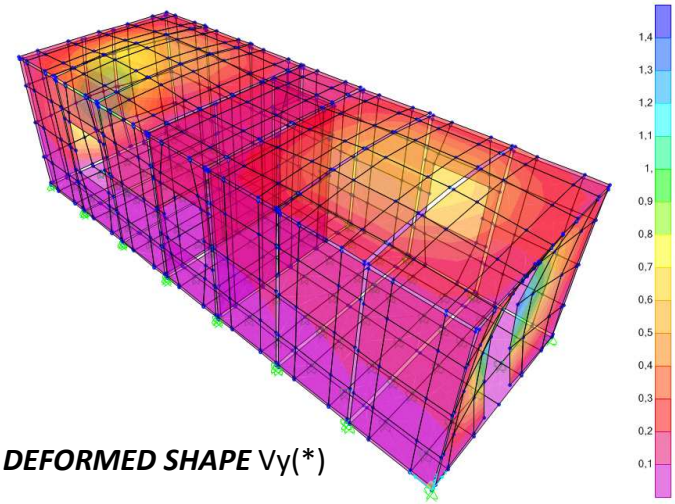
I. Case – V_1

Wall 2,60m x 1,20m – thickness 10 cm
Floor/Roof 3,20m x 1,20m – thickness 18 cm

Vx	*Vy*	*Combination*
U_{max} = 1,96cm (0,77 inch)	U_{max} = 1,3cm (0,51 inch)	U_{max}= 3,95cm (1,56 inch)



DEFORMED SHAPE Vx(*)

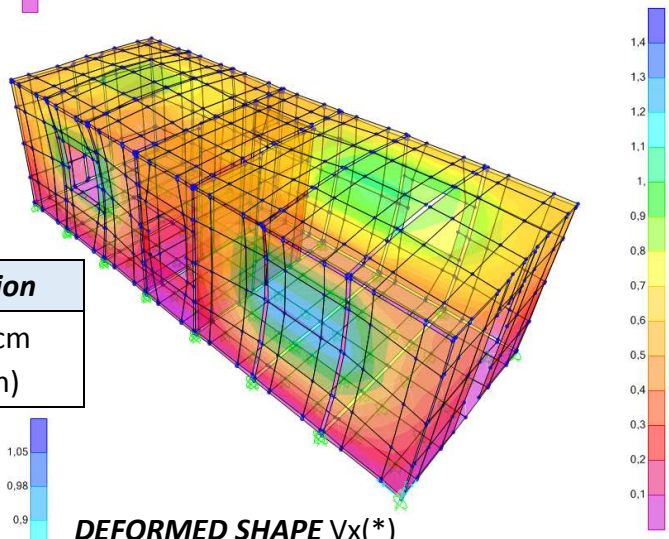


DEFORMED SHAPE Vy(*)

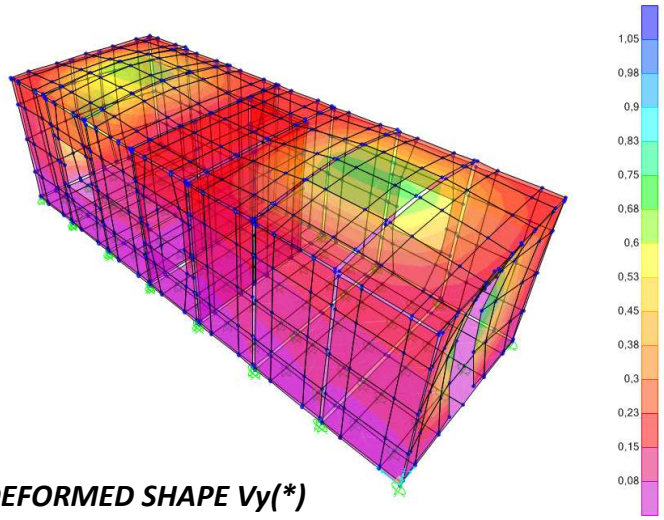
II. Case – V_1

Wall 2,60m x 1,20m – thickness 14 cm
Floor/Roof 3,20m x 1,20m – thickness 18 cm

Vx	*Vy*	*Combination*
U_{max} = 1,3cm (0,51 inch)	U_{max} = 0,98cm (0,39 inch)	U_{max}= 2,2cm (0,87 inch)



DEFORMED SHAPE Vx(*)

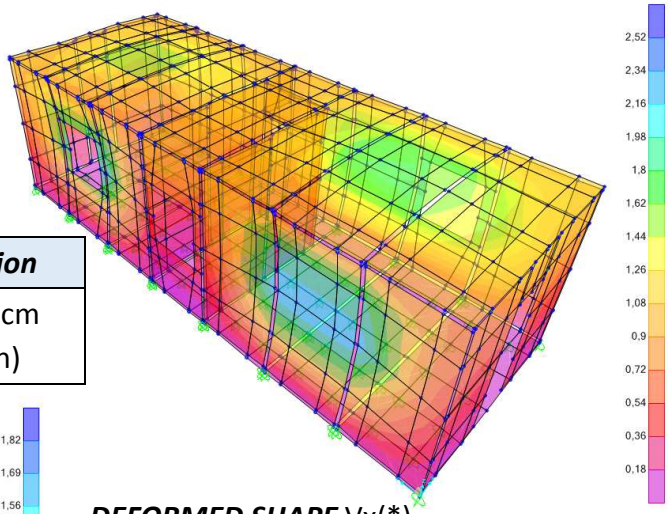


DEFORMED SHAPE Vy(*)

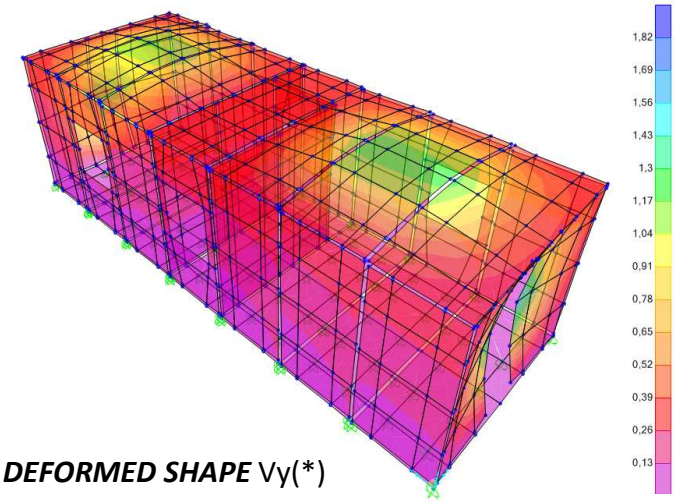
III. Case – V_2

Wall 2,60m x 1,20m – thickness 14 cm
Floor/Roof 3,20m x 1,20m – thickness 18 cm

Vx	*Vy*	*Combination*
U_{max} = 2,34cm (0,92 inch)	U_{max} = 1,56cm (0,61 inch)	U_{max}= 3,85cm (1,52 inch)



DEFORMED SHAPE Vx(*)

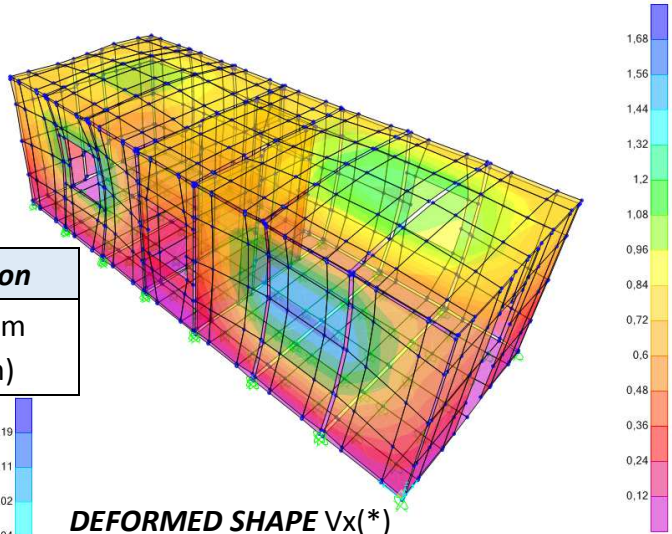


DEFORMED SHAPE Vy(*)

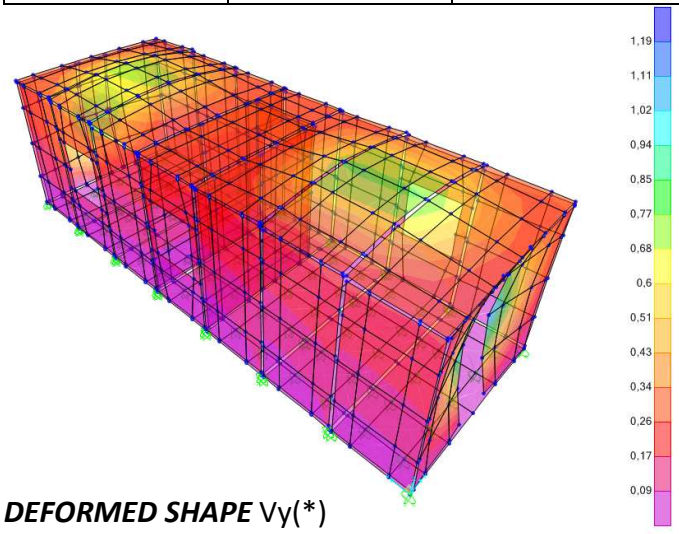
IV. Case – V_2

Wall 2,60m x 1,20m – thickness 16 cm
Floor/Roof 3,20m x 1,20m – th= 18 cm – four grid

Vx	*Vy*	*Combination*
U_{max} = 1,56cm (0,61 inch)	U_{max} = 1,11cm (0,44 inch)	U_{max}= 2,5cm (0,98 inch)



DEFORMED SHAPE Vx(*)

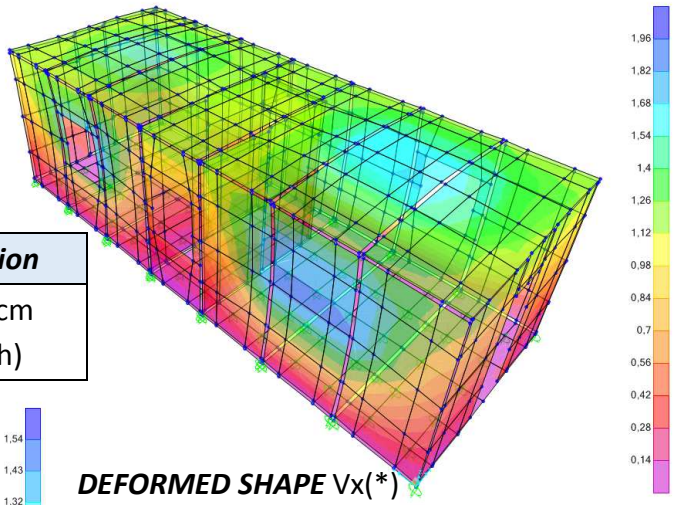


DEFORMED SHAPE Vy(*)

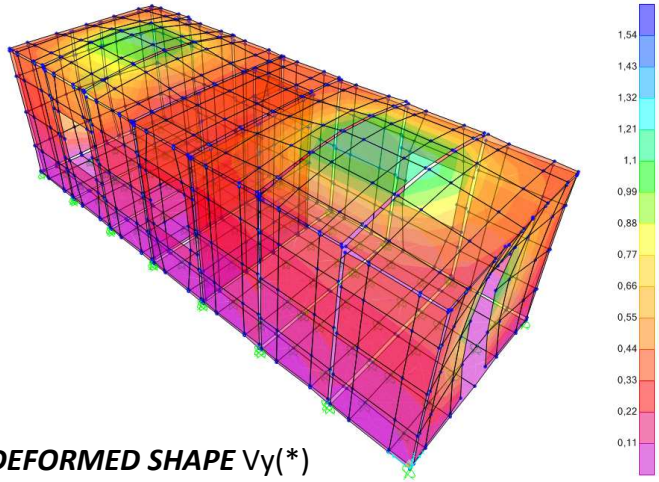
V. Case – V_3

Wall 2,60m x 1,20m – thickness 18 cm
Floor/Roof 3,20m x 1,20m – th= 20 cm – four grid

Vx	Vy	Combination
U_{max} = 1,82cm (0,72 inch)	U_{max} = 1,21cm (0,48 inch)	U_{max}= 3,5cm (1,38 inch)



DEFORMED SHAPE Vx(*)

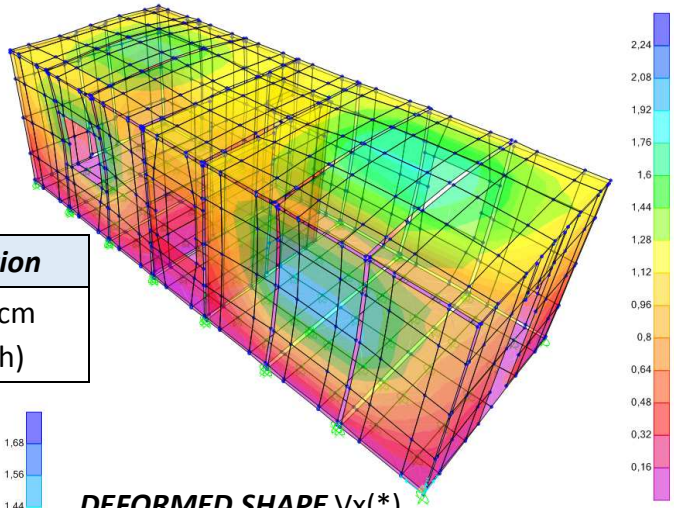


DEFORMED SHAPE Vy(*)

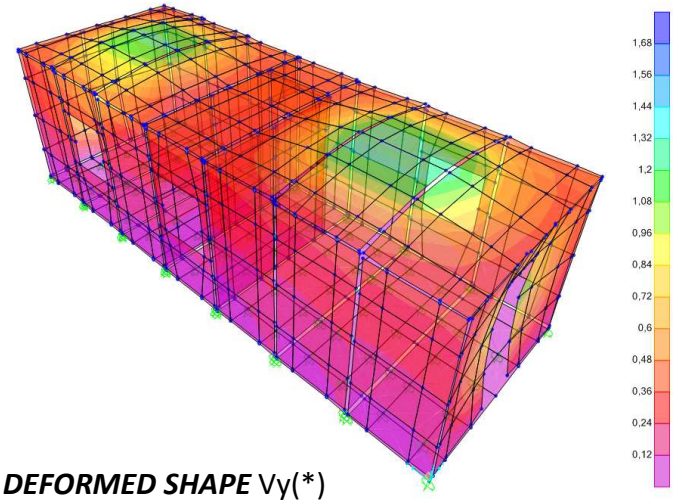
VI. Case – V_4

Wall 2,60m x 1,20m – th= 18 cm – four grid
Floor/Roof 3,20m x 1,20m – th= 20 cm – four grid

Vx	Vy	Combination
U_{max} = 1,92cm (0,76 inch)	U_{max} = 1,32cm (0,52 inch)	U_{max}= 4,1cm (1,61 inch)



DEFORMED SHAPE Vx(*)



DEFORMED SHAPE Vy(*)

CONCLUSION

This study wants to demonstrate that with Home Done panels is possible to achieve the necessary results in terms of deformation and resistance, changing the thickness or the armors of the panels themselves.

The results obtained are:

- V_1= 150mph -> Wall 14cm (5,51 inch) – Floor/Roof 18cm (7,09 inch)
- V_2= 200mph -> Wall 16cm (6,3 inch) – Floor/Roof 18cm four grid (7,09 inch)
- V_3= 250mph -> Wall 18cm (7,09 inch) – Floor/Roof 20cm four grid (7,87 inch)
- V_4= 300mph -> Wall 18cm four grid (7,09 inch) – Floor/Roof 20cm four grid (7,87 inch)

The Home done system is a simple regular shape, best characteristics in determining the performance of buildings in cyclones, which avoid concentration of pressure in the structure. Most houses are rectangular and the best layout is when the length is not more than three times the width. In addition, the foundations, the walls, and the roof structure are all firmly fixed together.