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Skyscraper Would Be Simulated to Increase Stability and Buckling Resistance Using the Palm Tree Behavior in War Condition

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Abstract
Palm trees are located in the NW of the Persian Gulf, Iran and Iraq. Trees were infected by war weapons during the 8 years fighting. Palm proves extra resistance and super buckling against the war effects.

Palm tree can continue natural growing after war conditions where the horizontal section area exist less than 70 percentage of gross area. This fact is meaning the stability reaction which attack forces could be applied upon the tall building and safe collapsing. Elements are defining by roots (foundation), trunk (high building) and head (vibration mass).

Main exerted loads onto the tree are demonstrated using the fruit (250kg), wind, earthquake, shaken, fire and war. Trunk skin is the main cover to guard against burning events in fire attacks. Also, old fiber layers could be prevented by weapon accidents. Picture is explained the extraordinary behavior of palm skin which would be used to promise next design of tall building and manmade load effects.

Waiting time can be defined using the duration to provide vertical collapsing. It is belonged to the degree of safety and building height. Slender ratio of palm tree will consider more than 30 therefore height of skyscraper will be simulated more than 1000m.

Keywords
Palm Tree, Simulation, Slenderness, Manmade Loads, attacks

1. Introduction

Nature is the mother of invention where the human designs could not be passed through problematic conditions and unsolved terrorist attacks. Date palm tree is the unique monocotyledonous that could be extended to vertical direction with un-wooden structure. There is not radius growing to extend diameter of palm tree and middle part will transit the main nourishing into the head. Infected palms are demonstrated to recognize the unexpected behavior against weapon and war crashes.

Figures 1-2 will be proved to modify designs and stability of tall building in lateral load attacks. Also, it is presented the decreasing the section area more than 70 percentages of tree. It could be simulated to increase the resistance of skyscraper when will be crashed to collapse by undesired lateral loads and misfit main elements. Palm tree has been converted the compressive stress into tensile stresses.

Figure 1: A Symbol of Stability with Crash Section Area

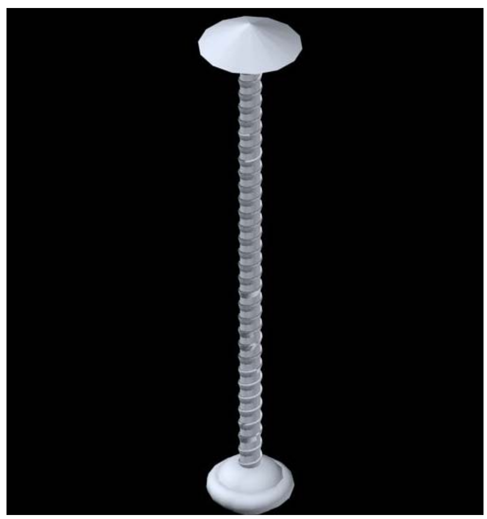

Figure 2: Palm Tree Modeling

2. Foundation of Simulated Part (Turk, 2007)

Depth of palm roots is the main part of stability in the low resistance soils that will measure less than 10 percentages of height of palm tree. Equation 1 can be explained to demonstrate the foundation index parameters in root space. The BAM city (Iran, 2004) will provide the high stability against earthquake.

$$\chi = \frac{\left(\frac{h}{d}\right)_{palm\ tree}}{\left(\frac{h}{d}\right)_{building}} \qquad (1)$$

χ_{FSP} : *foundation index*

Figure 3: Root Net of Palm Tree

Figure 4: Foundation Modeling

2.1 Foundation Vibrational Equation

Great casualties in Bam city (2004) will be studied to obtain the main item of stability (Turk, 2004) by Equation 2 and Figures 1-4. The parameter *K* will be obtained through the field test studies (Turk, 2005).

$$\chi_{FVE} = \frac{\left(M\ddot{X} + \overbrace{M \cdot \sqrt{\frac{K}{M}}}^{C\left(\frac{kg \cdot Rad}{Sec}\right)} \cdot \dot{X} + \overbrace{K}^{field\ test} \cdot \Delta X \right)_{palm\ tree}}{\left(M(kg) \cdot \underbrace{a}_{accelaration} \left({}^{m}\!/_{S^2} \right) + \sqrt{\frac{K}{M}} \left({}^{kg \cdot Rad}\!/_{Sec} \right) \cdot \underbrace{v}_{velocity} \left({}^{m}\!/_{\sec} \right) + K \cdot \underbrace{\delta x}_{vertical\ deflection} \right)_{building}} \tag{2}$$

M : *mass of vibration*

K : *axial sitffness*

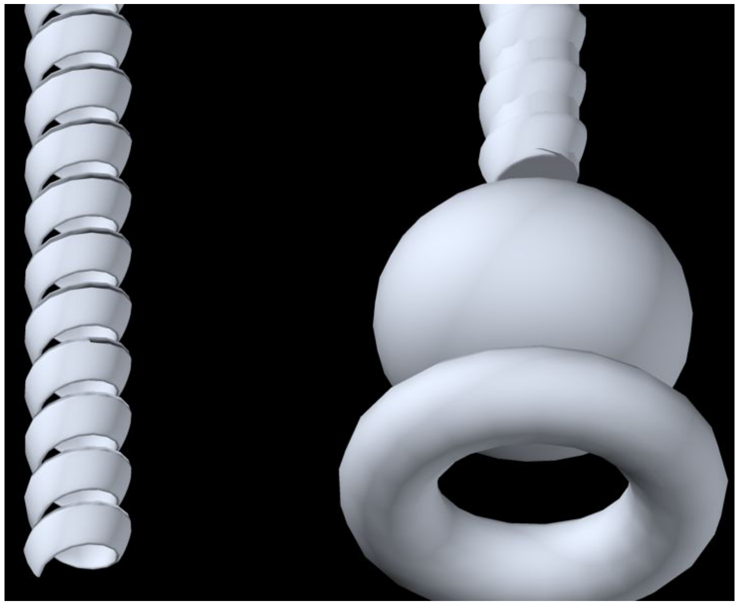

Figure 5: Spiral and Trunk Modeling

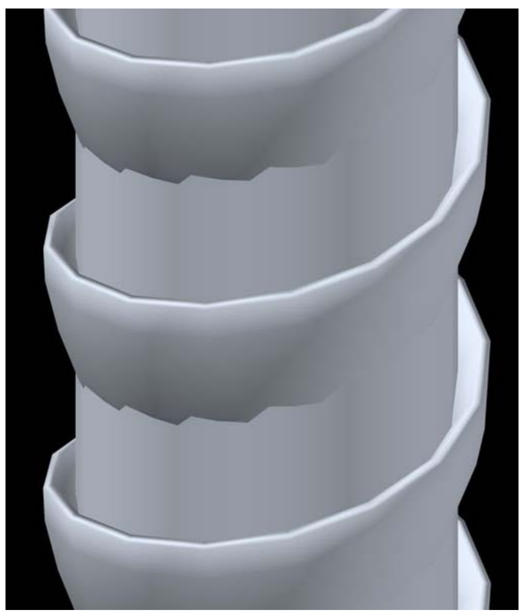

Figure 6: Trunk Simulated

3. Trunk and Simulated Part

M_C is the collapse bending moment that will produce through summation of all Mi at tree elliptical plan.

$$M_{Collapse} = \sum_{i=1}^{n} \underbrace{\left(\int_{\varphi_{i1}}^{\varphi_{i2}} t_i \cdot r_i \cdot d\varphi \right)}_{\oint dA_i} \cdot \left(\underbrace{\underbrace{r_i \cdot COS(\beta_i)}_{horizontal\ Arm\ (80^\circ - 82^\circ)} \cdot \underbrace{\left| COS(\theta_i) \right|}_{palm\ spiral\ (0^\circ - 360^\circ)}}_{Bending\ Arm} \right) \underbrace{\sigma_i}_{stress} \quad (3)$$

Figure 7: Misfit Member More Than 70 Percentages and Growing

4. Conclusion

Based on natural behavior of the date palm tree it could be concluded to design new generation of high rise building with extraordinary height. Research and study will continue upon the tin fibers inside the palm body which would be increased the buckling and reaction resistance. Structure would be constructed to rise into the sky through the simulation processing and intelligence materials. Date palm tree will be required more researches and studies to obtain the exact behaviors. Infected palm trees explain the resistance against lateral loads, buckling and fire accident. Also, it could be converted the compressive buckling forces into ultimate tensile stresses.

5. References

Bowels, Joseph E., (1968). "*Foundation Analysis & Design*", 3rd edition, Mc Graw Hill, New York, USA.

Hsai-yang, F., (2001). "*Foundation Engineering Handbook*", 2nd edition, chapter 12, Chapman ISBN: 0-412-98891-7, CBS publisher ISBN: 81-239-0545-9

Puller, M. J., (2003). "*Deep excavations*", Tomas Telford, 2rd edition, ISBN:07277 3150 5

Turk, A. and Rezania, A.R. (2004). "Gelatin concrete, design and behaviour to modify steel sheet piles foundation, based on composite phenomena". *Proceedings of 32nd Annual Conference: C S CE*, GC#219, Saskatoon, Saskatchewan, Canada

Ulrich, S., (2004). "*Geotechnical Engineering Handbook*". Ernest & Sohn, A Wiley Company, Germany, Volume 3, Elements & Structures, ISBN 3-433-01451-5.

Turk, A., (2005). "Ship lock economical design and dragging using river capacity index and Gelatin concrete". *Proceedings of Third International Structural Engineering & Construction Conference,* Tokoyama collage of technology, Shunan, Japan, ISBN: 0 415 39037 0, Volume 2, pp. 649-655

Turk, A. and Ghanavatizadeh, S., (2006). "Micro-pile Root Net Theory to modify Earthquake and liquefaction properties of soils based on biologic concepts, laboratory and field tests". *Presented at 10th biannual EARTH&SPACE Conference,* ASCE/AEROSPACE division, USA.

Turk, A. and Ghanavatizadeh, S., (2007). "High rise intelligence building through natural date palm tree simulation". *Structures Congress,* ASCE, USA.