Work Order : 12-1022-107- CENIDET

Date October 29th, 2012.

This work is issued by WinBuild Inc. to Centro Nacional de Investigación y Desarrollo Tecnológico-DGEST-SEP, Departamento de Ingeniería Mecánica- Área Sistemas Térmicos (Here refered as CENIDET), where in Dra. Gabriela del Socorro Álvarez García will be the Principal Investigator (PI) and project lead, to conduct a study of the impact of cool roofs on energy savings and thermal comfort in buildings in Mexico in accordance to the goals and deliverables listed below.

1. OBJECTIVE

Study the impact of cool roofs on energy saving and thermal comfort of buildings located in Mexico.

2. PROJECT SCOPE

a) Investigate and gather information of solar radiation to elaborate solar radiation maps of Mexico.
b) Effect of using cool roofs on the energy saving will be evaluated by using the database of climate variables and degree days of 700 cities reported by the Arq. Victor Fuentes Freixanet.
c) Estimate the area of different color of roofs in 5 typical cities of different climate zones in Mexico by using a digital process by satellite image identification in order to know the percentage of areas of roof different to cool roofs in cities of Mexico.

3. PROJECT GOALS

- To study the cool roof impact of non residential and residential building under NOM 008 and NOM 020 by simulating them in Energy Plus.
- Elaborate monthly average solar radiation, temperature, humidity maps, and maximum and minimum climatic variables maps.
- Identify the different climatic zones in Mexico.
- Elaborate monthly heating and cooling degree day maps in Mexico.
- Determine the energy savings by the use of cool roofs in Mexico.
- Estimate the percentage areas of different colors of roofs of 5 cities representative of different climates.

4. PROJECT DELIVERABLES

At the conclusion of the study, a document entitled **"Evaluation of the impact of cool roofs on energy saving and thermal comfort in buildings in Mexico"** will be issued with the following content:

a) Background
b) Maps of solar radiation (W/m^2), temperature (^oC), and humidity (%) and to identify the different climatic zones.
c) Description of the degree day methodology used and calculations.
d) Maps of monthly degree days identifying the zones of cooling degree days of 3 different buildings or houses (to be defined).
e) Graphs of energy consumption against degree days.
f) Estimate overall energy savings resulting from the deployment of cool roofs by climate zone.
g) Photographs estimating the percentage areas of roofs in 5 cities in Mexico.
h) Energy loads of cool roof impact of non residential and residential building under NOM 008 and NOM 020 in seven cities corresponding to climatic zones in Mexico. **To be handled on November 30th, 2012.**

PARTICIPANTS

Dra. Gabriela del Socorro Álvarez García
Professor/Project manager
Dr. Jesús Perfecto XamanVillaseñor
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5. PROJECT COST

The total cost of this project is **28,288.34US DLLS** (twenty eight thousand two hundred and eighty eight dollars and 34 cents).

6. PAYMENT

At the beginning, a 100 % bank deposit will be made to CENIDET.

7. PROJECT EXCECUTION TIME

The work of this project will be carried out by March 20th, 2013.

8. SIGNATURES

CENIDET-DGEST-SEP	WINBUILD, INC
Dr. Victor Hugo Olivares Peregrino Director	Bipin Shah (President) WinBuild Inc.
Dr. Gabriela del S. Alvarez Garcia Professor-Researcher- Technical Responsible	