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<b>Date:</b>	2016/12/15
<b>Subject:</b>	<b>Structural Analyses of Brackenfell Carport Structures</b>

Structural analyses were conducted on the carports at Eskom Offices in Brackenfell, Western Cape, to determine if the structures will be able to support solar panels. It is intended for the panels to be mounted flat on top of the carport roofs.

The structures were checked for the following conditions:

- Weight of solar panels and support structures: 20kg/m<sup>2</sup>
- Panels will be fixed to the carport purlins
- Panels will be fixed flat on the carport roofs at an angle of 3 degrees

### **Analyses of carport structures**

2D STAAD.Pro models were analysed to assess the 3 different types of carport moment frames (Frames A, B and C - Refer to drawings D-WC-7307 sheets 10-13). The Purlins were checked for the additional solar panel and support structure loads. Only the downward wind pressure loads on the roof structure were considered as this would result in the most critical case (the self weight of the panels would counter the wind uplift forces). Live loads for inaccessible roofs were used for the analyses.

The following standards were used to check the carport structures:

- SANS 10162-1
- SANS 10160-1
- SANS 10160-2
- SANS 10160-3
- Southern African Steel Construction Handbook (Red Book)

### **Results and recommendations:**

- Moment frames were found to have sufficient strength to support the additional 20kg/m<sup>2</sup>.
- Purlins for frames A and C (spaced at 1m and 1.1m) were found to have sufficient strength to support the additional 20kg/m<sup>2</sup>.
- **Wider spaced purlins (1,37m) for frame B fail due to the additional weight and will have to be strengthened to be able to support solar panels.**

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### Kindly note the following:

If the total weight increases above  $20\text{kg/m}^2$  or if the angle at which the panels are mounted changes (i.e. not flat against the roofs), the structures will have to be re-checked for new loads and wind conditions. At the moment loads have only been added as area loads due to the uncertainty of how the panels are going to be fixed to the structure. It is therefore recommended that a detailed verification of the above analysis is conducted once more information becomes available.

Yours sincerely,

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