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Our Ref : CI/FCI19000288/D

05 January 2019

**M/s First Capital Insurance Limited**

36 Robinson Road  
#16-01 City House  
Singapore 068877  
(Motor Claims Department)

**TECHNICAL INVESTIGATION REPORT OF FIRE INCIDENT INVOLVING THE INSURED VEHICLE SHC 8497L ON 23 DECEMBER 2018**

1. I refer to your request dated 27 December 2018.
2. My analysis, comments and opinions with respect to the cause of fire to the insured vehicle SHC 8497L (herein referred to as "**Insured Vehicle**") are set out below.

**Inspection of the Insured Vehicle**

3. The Insured Vehicle was physically inspected on 28 December 2018 at the premises of M/s ComfortDelgro Engineering Pte Ltd, 59 Loyang Drive Singapore 508969.
4. A static inspection was carried out to the Insured Vehicle where the following general information was first recorded: -

|                          |                         |
|--------------------------|-------------------------|
| Vehicle Registration No. | : SHC 8497L             |
| Make / Model             | : Hyundai I40 1.7 CRDI  |
| Chassis No               | : KMHLB41UMGU080993     |
| Year of Registration     | : 2015 (December)       |
| Mileage                  | : N.A (wiring affected) |

5. The Insured Vehicle was noted to have sustained fire damage that was confined to its engine compartment. Most of the parts and components within the engine compartment were burnt and/or melted. This had included various rubber hoses, wiper panel, battery, air intake duct, bonnet insulator, brake fluid reservoir, cooling fan, radiator, intake manifold and alternator amongst others. Exteriorly, only the front bonnet and front windscreen were affected.
6. Apart from the normal standard additional equipment(s) which can be found on a motor taxi, there was no modification(s) and/or additional electronic and/or electrical component(s) fitted on the Insured Vehicle. See photo 1 – 4 below.



**Photo 1** shows a general view of the front right body of the Insured Vehicle at the time of my inspection. The fire damage was confined to the engine compartment of the Insured Vehicle. Exteriorly, only the front bonnet and front windscreen were affected by the incident. The interior compartment and the rear portion of the Insured Vehicle were unaffected.



**Photo 2** shows a general view of the front left body of the Insured Vehicle at the time of my inspection. The fire damage was confined to the engine compartment of the Insured Vehicle. Exteriorly, only the front bonnet and front windscreen were affected by the incident. The mileage of the Insured Vehicle could not be recorded due to its wirings being affected by the fire.



**Photo 3** shows a general view of the Insured Vehicle's engine compartment at the time of my inspection. Most of the parts and components within the engine compartment were burnt and/or melted. This had included various rubber hoses, wiper panel, battery, air intake duct, bonnet insulator, brake fluid reservoir, cooling fan, radiator, intake manifold and alternator amongst others.



**Photo 4** shows the interior compartment of the Insured Vehicle, which was unaffected by the incident. Apart from the normal standard additional equipment(s), there appears to be no modification(s) and/or additional electronic and/or electrical component(s) fitted on the Insured Vehicle.

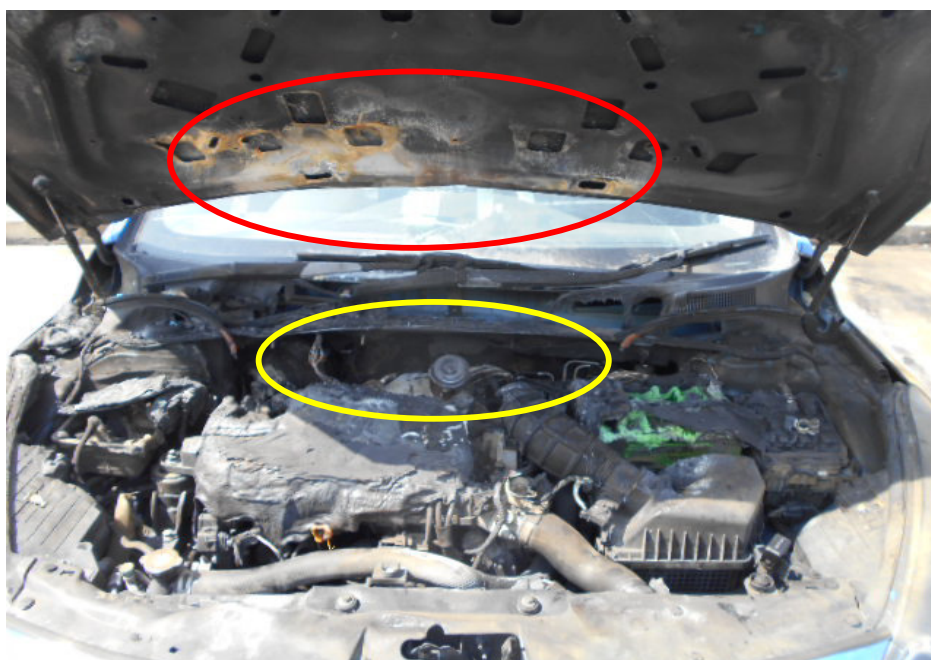


### **Technical Analysis**

7. For this particular case, the fire can be established to have originated within the engine compartment of the Insured Vehicle, given the single area of fire damage that the Insured Vehicle had sustained (interior compartment and rear portion unaffected). The burn mark found at a single area at the top side of its front bonnet further indicates that the fire had originated somewhere around the rear centre of the engine compartment.
8. Following the characteristic of heat rising upwards, high heat intensity burn marks (whitish burn marks) were correspondingly found on the underside of the Insured Vehicle's front bonnet, directly below the area where the burn mark was formed on the top side of the front bonnet. These whitish burn marks are a result of exposure to prolong heat intensity. Rust would normally start to develop around these areas soon after a fire as prolonged exposure to high heat intensity usually causes steel/metal material body parts to be exposed to natural environmental condition. See photo 5 & 6 below.



**Photo 5** shows the burn mark (circled) that was formed at a single area on the top side of the Insured Vehicle's front bonnet. Apart from this burn mark, there was no other mark(s) of burnt nature found on the exterior body of the Insured Vehicle. Given this single burn mark on the exterior body and the physical evidence that only the parts and components within the engine compartment were burnt and/or melted, the fire can then be established to have originated within the engine compartment of the Insured Vehicle, somewhere around the rear centre of the engine compartment.



**Photo 6** shows the whitish burn mark (red circle) that was found on the underside of the Insured Vehicle's front bonnet, directly under the area where the single burn mark was formed on the top side of the front bonnet. Such whitish burn marks are a result of exposure to prolong heat intensity. The fire to the Insured Vehicle can then be established to have originated around the rear centre of the engine compartment (yellow circle).

9. My examination of the rear centre area of the engine compartment, during my inspection of the Insured Vehicle, revealed greenish residue on several stretches of original factory fitted wirings. The presence of greenish residue indicates internal heating of copper wires, a sign of an electrical short circuit occurring. The greenish residue is normally left behind from oxidation as a result of chemical reaction involving the copper wires. This physical evidence would then appear to suggest that the cause of fire to the Insured Vehicle was due to electrical in nature. See photo 7 & 8 below.
10. To further explain briefly, heat from engine operation could cause the rubber insulation of the wires and/or wiring harness within the engine compartment to lose its flexibility and become hardened after a prolong period of time. The hardened rubber insulation may then become brittle and break off bits by bits, exposing live wires that may come into contact with each other and/or the metal body of the vehicle, creating sparks that could ignite a fire. Unlike countries with different seasons, the hot local climate increases the heat within the engine compartment of locally used vehicles, and this could accelerate the hardening of rubber insulations, and any other rubber material parts within the engine compartment.

11. For the Insured Vehicle, the factory fitted turbocharger and exhaust manifold/pipe were also fitted at the rear centre of its engine compartment. These parts tend to become hot during engine operation. Heat dissipation from these parts would naturally rise upwards and this could also affect the rubber wire insulators within the vicinity of the rear centre of engine compartment. In fact, the turbocharger housing of the Insured Vehicle, which is made of cast iron, was noted to be of bright red colour at the time of my inspection. This is an indication that the turbocharger was overheated (unable to cool down sufficiently). The heat dissipated from the turbocharger affected the rubber wire insulators and/or melted other combustible materials in the vicinity, ultimately leading to the fire.



**Photo 7** shows a closer view of the rear centre area of the Insured Vehicle's engine compartment, which was where the fire had originated. The wirings (red arrow) were found with greenish residue. These are original factory fitted wirings. The presence of such greenish residue suggests occurrence of an electrical short circuit. This physical evidence would then appear to suggest that the cause of fire to the Insured Vehicle was due to electrical in nature. The turbocharger housing (yellow arrow) of the Insured Vehicle, which is made of cast iron, was noted to be of bright red colour at the time of my inspection. This is an indication that the turbocharger was overheated (unable to cool down sufficiently). The heat dissipated from overheated the turbocharger affected the rubber wire insulators and/or melted other combustible materials in the vicinity, ultimately leading to the fire.





**Photo 8** shows a closer view of the original factory fitted wirings with greenish residue (red arrow) and bright red colour of the turbocharger housing (yellow arrow). The presence of greenish residue suggests occurrence of an electrical short circuit while the bright red colour of the turbocharger housing indicates that the turbocharger had overheated (unable to cool down sufficiently).

### **Investigations & Gathered Information**

12. From the Singapore Accident Statement, which was made by one Lim Siang Choon, I note that the fire to the Insured Vehicle had started at a time when he had just alighted a passenger at Thomson Medical Centre. He was alerted by an incoming passenger that the front bonnet of the Insured Vehicle was smoky. Upon alighting, he opened the front bonnet and together with the help of the staff at Thomson Medical Centre, he was able to put out the fire. I also note from the Singapore Accident Statement that, there was no issue with the Insured Vehicle prior to the incident.
13. During the course of my investigations, I was able to obtain the maintenance and servicing history of the Insured Vehicle for the period 04 June 2018 to 23 December 2018. Upon review of the job details for this period, I note that the Insured Vehicle was last serviced on 20 November 2018 at the mileage of 296,306km. The oil filter and engine oil were replaced during this servicing. Checks on multiple aspect of the Insured Vehicle was also carried out. This included tyres, beltings, undercarriage, lightings, fan motor and wirings amongst others. The last work carried out to the Insured Vehicle was on 20 December 2018, when the battery was replaced.

14. In general, my review of the maintenance aspect of the Insured Vehicle revealed that it was regularly maintained at an interval of about once every month. There was also no major and/or recurring mechanical and/or electrical issue(s) to the Insured Vehicle for the period between June 2018 and the time of incident on 23 December 2018.
15. My checks with both local and international bodies and associations revealed that at the time of writing this report, there was no manufacturer recall of similar make and model vehicle as the Insured Vehicle. See search result below obtained from LTA.

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#### Enquiry on Vehicle Recall - Vehicle Specific

\* ONLY INFORMATION ON VEHICLE RECALLS SUBMITTED FROM 9 APRIL 2007 IS AVAILABLE

| Vehicle Owner Particulars    |                                    |
|------------------------------|------------------------------------|
| Owner ID Type:               | Company                            |
| Owner ID:                    | 3821R                              |
| Vehicle Details              |                                    |
| Vehicle Registration number: | SHC8497L ←                         |
| Make:                        | HYUNDAI                            |
| Vehicle Model:               | I40 1.7 CRDI F/L AT ABS AIRBAG 4DR |
| Engine No.:                  | D4FDFU566345                       |
| Chassis No.:                 | KMHLB41UMGU080993                  |
| Recall Details               |                                    |
| No Recall Detail records ←   |                                    |

**Screenshot** shows the LTA search result regarding manufacturer recall involving the Insured Vehicle. Results gathered from my search revealed that the Insured Vehicle was not involved in any manufacturer recall campaign.

### **Conclusion**

16. Having investigated and technically analysed the damages of burnt nature to the Insured Vehicle, I am of the view that the cause of fire to the Insured Vehicle was of electrical in nature. For this particular case, the fire had originated along the wirings inside the engine compartment, at the rear centre of the engine compartment. The wirings were original factory fitted wirings.
17. I did not find any evidence which had suggested that the cause of fire to the Insured Vehicle was due to poor maintenance and/or recurring electrical problem.



18. There were no modification(s) or additional electronic and/or electrical component(s) fitted on the Insured Vehicle at the time of my inspection of the Insured Vehicle other than the standard additional equipment(s) which can be found on a motor taxi.
19. My investigations also revealed that at the time of writing this report, there is no manufacturer recall of similar make and model vehicle as the Insured Vehicle.

**Ang Bryan Tani**

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