

# RECALL 251 ATTACHMENT A

## CHRONOLOGY OF EVENTS LEADING UP TO DEFECT DECISION

### ❖ June 2019 – July 2020

On June 5, 2019, HMA received a report of an overheated ABS module in a Hyundai Elantra vehicle located in the U.S. The ABS module was recovered and sent to HMC for analysis on July 12, 2019. HMA began monitoring market data for additional incidents.

On August 29, 2019, HMA received an overheated ABS module of a second overheated ABS module from a model year 2013 Hyundai Accent vehicle located in the U.S. The ABS module was sent to HMC for analysis on October 2, 2019.

HMA received HMC's parts analysis findings involving the ABS modules from the Elantra and Accent incident vehicles on November 19, 2019, and January 17, 2020, respectively. Both modules were damaged beyond an ability to determine a heat source and possible root cause. HMA continued monitoring market data for additional incidents. No new reports were received from January 2020 through June 2020.

On July 30, 2020, HMA's NASO received information regarding a new legal matter involving a model year 2015 Hyundai Elantra vehicle in the U.S. The ABS module was recovered and sent to HMC for analysis.

### ❖ August 2020 – November 2021

With three (3) confirmed incidents over a period of twelve months, NASO opened a formal case investigation (beginning with Elantra vehicles) on August 7, 2020, and initiated full recovery of ABS modules with thermal damage from all vehicles equipped with similar ABS modules in the U.S. market.

On December 4, 2020, NASO received information regarding a new legal matter involving 2013 Elantra vehicle. The ABS module was recovered and sent to HMC for analysis.

On February 8, 2021, NASO received HMC's findings regarding the July 2020 incident ABS module. According to HMC, evidence of an internal brake fluid leak was found, and additional testing was necessary to confirm possible leak sources in the ABS module componentry.

On April 13, 2021, NASO received a new report involving model year 2013 Hyundai Accent vehicle in Hawaii. Shortly after, on April 26, 2021, NASO received information regarding a new legal matter involving a model year 2013 Hyundai Santa Fe Sport vehicle in the U.S. Both ABS modules involved were recovered for analysis by HMC.

On June 17, 2021, NASO received HMC's findings regarding the ABS module recovered from the Hyundai Accent incident vehicle from December 2020 and the Hyundai Elantra incident vehicle from July 2020. According to HMC, evidence of an internal brake fluid leak was found in one of the ABS modules; however, a source or probable cause could not be determined in both modules.

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On September 9, 2021, NASO shipped three (3) ABS modules received as general warranty part returns to support ongoing parts analysis by HMC.

On September 23, 2021, NASO received information regarding a new legal matter involving a model year 2015 Hyundai Elantra. The ABS module was recovered for analysis by HMC.

On October 22, 2021, NASO received information regarding a new legal matter involving a model year 2013 Hyundai Santa Fe vehicle in the U.S. Shortly after, on October 27, 2021, NASO received information regarding a new legal matter involving an additional model year 2013 Hyundai Elantra vehicle in the U.S. As an alternate means of investigating potential root causes, NASO arranged for recovery of the full incident vehicle for in-depth evaluation by Exponent, a third-party engineering analysis firm.

### ❖ December 2021 – September 2022

On December 2, 2021, Exponent presented its findings to HMA. According to Exponent, the overheat condition was potentially triggered by an internal brake fluid leak from the ABS module hydraulic circuit. Additional incident and exemplar parts were requested for further confirmation.

From January to September 2022, NASO continued recovering incident and exemplar ABS modules for ongoing analysis by HMC and Exponent. On May 19, 2022, Exponent provided an update indicating new findings regarding an ABS module received from a 2014 Hyundai Elantra incident vehicle. Exponent confirmed the presence of brake fluid on both sides of the O-rings for the ABS module motor shaft. Exponent also noted that the incident O-rings exhibited less hardness compared to the ones found in exemplar parts. Part recovery efforts continued for additional samples to be analyzed by Exponent from June to September 2022.

In August 2022, Exponent performed a review of two exemplar Elantra vehicles intended to confirm possible signs of slow-developing internal leaks in the ABS modules. Exponent reported its findings to NASO on September 16, 2022, confirming the presence of brake fluid on the ABS module controller PCB, possibly through the motor shaft O-ring as previously observed. Exponent requested additional exemplar part samples for further confirmation.

### ❖ October 2022 – December 2022

From October to December 2022, HMA continued providing incident and exemplar ABS modules for Exponent analysis. On December 2, 2022, Exponent presented their findings regarding ABS modules recovered from two (2) recent incident vehicles. According to Exponent, brake fluid contamination was present on the PCBs of both ABS modules. Additionally, both O-rings were found contaminated with surface debris with one O-ring also displaying signs of deformation as a result. Exponent later confirmed that the motor shaft seals may be gradually losing hardness in a subsequent update provided on December 21, 2022. Exponent requested additional test samples for further testing.

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### ❖ January 2023 – September 2023

From January to September 2023, HMA continued providing incident and exemplar ABS modules for Exponent analysis. During this period, Exponent focused testing on the motor shaft O-ring material durability. In an update provided on May 9, 2023, Exponent reported that foreign contaminants were present in residual brake fluid found inside certain analyzed ABS modules. In an update provided on July 7, 2023, Exponent found the O-rings used in the subject ABS modules consisted of varying rubber material formulations determined through thermogravimetric (“TGA”) analysis. In an update provided on September 6, 2023, Exponent confirmed that certain material formulations used in the O-ring rubber could lose hardness over time. Additionally, the material could be affected by foreign contaminants in the brake fluid, potentially impacting sealing performance. Based on this information, HMC conducted a review of supplier manufacturing records and confirmed a material formulation change to one with increased hardness implemented by the supplier in September 2014 and February 2015 at the Korea and U.S. plants, respectively.

Based on these findings, HMA’s NASO convened its North America Safety Decision Authority on September 15, 2023 and decided to conduct a safety recall of affected vehicles in the U.S. market.

- ❖ There are no crashes, injuries, or fatalities attributable to this condition. To date, twenty-one (21) related vehicle fires and twenty-two (22) thermal incidents (i.e. smoking, burning, melting, etc) have occurred in the U.S. based on reports received from June 15, 2017 through June 1, 2023.