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To Whom It May Concern

Subject: *Salt Scaling in Hampton Roads*

Titan America has inspected and evaluated numerous sub-divisions this spring of 2015 in the greater Hampton Roads region for surface deterioration of exterior concrete flatwork due to the weather events that plagued our region and the Southeastern portions of the United States. The purpose of our visible inspections was to help determine the cause of the deterioration visible in the concretes top surface seen more prevalent, but not exclusive, in the more recently placed and newer concrete flatwork, since the severe weather events of 2015. The severe weather pattern of 2015 was not typical for the southeastern region of the United States; there were approximately 65 freezing and thawing climate changes in the Hampton Roads region alone in 2015, unlike the northeast region which tends to go into a more frozen state with less freeze thaw events.

Listed below are the results from our visual inspections performed in multiple sub-divisions to date:

1) *The surface deterioration observed was in the form of Scaling;, Scaling is the localized flaking away of the hardened concrete near the surface. The depth of scaling is usually about 1/8th inches in depth, but can be seen in depths greater than 1/8th inches during severe weather conditions;*

2) *The surface may look like one that has delaminated, but scaling of Exterior Concrete Flatwork is caused by freezing and thawing of the concrete, particularly when deicer salts are used during saturation of the concrete;*

3) *Deicer salts were aggressively used by all Southeastern regions DOT's and City Municipalities during the severe weather events of 2015 especially in the Hampton Roads region. These aggressive deicer salts are a known factor in surface scaling of concrete, however it is the best and fastest procedure in clearing hazardous roadways as quickly as possible for the public's safety;*

4) *The aggressive Deicer salt compounds, included combinations of Calcium, Sodium, and Magnesium Chloride in Dry and Liquid solutions, Which are very Hygroscopic in nature (Moisture Absorbing);*

5) *The salt compounds melt the snow and ice on our roadways, then become snow packed beneath our vehicles, which melts and drips onto the exterior concrete flatwork as an hygroscopic salt brine solution;*

6) *The salt brine solution then becomes puddled or absorbed into the top surface of the exterior concrete flatwork causing continued refreezing to reoccur as long as the salt brine solution is present;*

7) *As Osmotic pressure is increased in the concretes pores from the salt brine solution, over saturation continues to repeat itself each freezing night leading to Hydraulic pressure once above the saturation point of 91.7% resulting in loss of surface concrete;*

8) *The resulting loss of surface concrete is referred to as scaling.*

9) *A majority of the scaling has occurred in patterns visible around the drip locations of the vehicles from snowpack which had become packed beneath the vehicles. There were other locations also visible of salt scaling distress, which was contributed to either homeowner applications, such as ice melt products available in the market or applied by others during the severe weather event of 2015.*

Based on our visual inspections, the exterior concrete flatwork exhibited surface scaling, but was not due to improper concrete designs as manufactured, workmanship, or methods of placement. The deterioration was due to the over saturation and continued freezing & thawing in conjunction with aggressive deicer usage for highway safety that caused the surface deterioration to be so rampant. If the concrete was below saturation during the freezing conditions and the contributing aggressive salt brine solutions were not available to compound the reoccurrence of freezing, then there would be no visible scaling. The application of deicer salts by VDOT and the Hampton Roads City Municipalities and others is very aggressive and is applied for our safety.

Should you have any questions concerning this report, please contact this office at your earliest convenience.

Very truly yours,

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