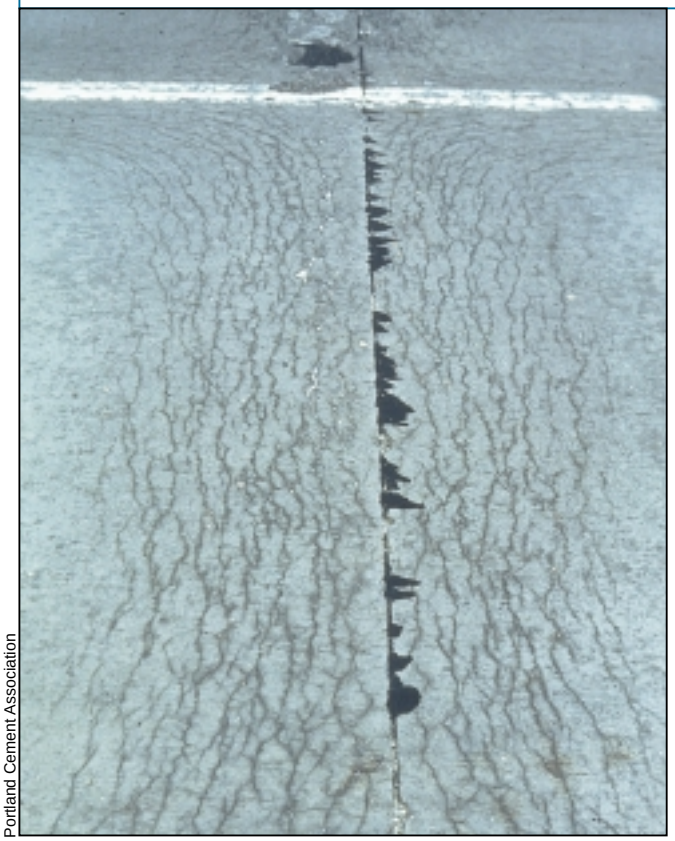
Problem D-cracking

A series of cracks roughly parallel to joints, edges, or transverse and longitudinal cracks. They are typically found in pavements or other flatwork. D-cracks curve around intersections of joints or other forms of cracking.



Portland Cement Association

Causes

D-cracking is caused by freezing and thawing of concrete. However, unlike typical freeze-thaw damage, D-cracking results from moisture expansion within the aggregate particles rather than within the paste.

D-cracking starts when the aggregate particles become saturated. In most cases, the saturation begins at the bottom of a slab or pavement and works upward.

Significant damage may occur in the interior of the concrete before cracks are seen on the surface. In other cases, moisture entering the concrete through a crack or joint may also be involved, making surface cracks appear earlier.

Aggregates susceptible to D-cracking typically have the following characteristics:

- They are usually of sedimentary origin.
- They have a large volume of very fine pores. Though aggregate absorption plays a role, the pore-size distribution of the aggregate seems to be the most important factor. Absorption alone doesn't distinguish good from bad aggregate.
- The aggregate maximum size is large.

Prevention

Several steps can be taken to prevent D-cracking:

1. Don't use aggregates known to be susceptible to this form of damage. Past experience with a particular aggregate source is the best indicator of future performance.

2. Test aggregates if a record of past performance isn't available. Because attempts to develop a specific test to identify aggregates susceptible to D-cracking have not been completely successful (some aggregates known to provide good performance may be rejected), use the standard test for freezing and thawing, ASTM C 666.

3. Provide drainage under the concrete. If the aggregate isn't saturated, it can't cause problems. But don't forget that providing under-slab drainage won't prevent water from entering the concrete through cracks and open joints.

4. Select a smaller maximum size if an aggregate is found to be susceptible. Unfortunately, there is no one-size-fits-all solution, so it may help to blend in nonsusceptible aggregates. Testing will be required to determine the appropriate maximum size for each aggregate and the blend ratio.

References

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