# PCI Plant Quality Talk
# Quality Enhancement Committee

NPCA National Precast Concrete Association

PCI Precast/Prestressed Concrete Institute

## SERIES 3, ISSUE 11– POUR LINES

A pour line is a blemish that appears on a formed concrete surface as a color difference between successive concrete lifts within a pour. Pour lines may be relatively transverse or angled and are typically associated with the placement method and consistency of the concrete. Pour lines are often mistakenly identified as cold joints; the latter may have more serious structural consequences than pour lines.



Double tee exhibiting significant pour lines.

### Causes of pour lines

Pour lines are often an indication of a change in concrete properties between batches of concrete during placement, or they may show a merge line between different areas of initial concrete placement. Typical causes include the following:

- **Delays.** If there is a delay between loads of concrete, the concrete in one layer in the forms may have already settled by the time the next layer is placed. Layering may also occur if excessive time passes between starting and finishing discharge for one layer and placing of the next layer. When delays occur, the result may be a variation of color, or possibly texture, typically caused by a slight change in the water-cementitious material ratio between each pour, batch, or layer. Darker fine material may also be brought to the surface with the paste in the first layer before the subsequent layer is placed.
- **Placement methods.**
  - The first discharged concrete into a form will roll at the form face, creating a head of paste along the edges. When two of these leading edges meet, the paste on the form face may be excessive, resulting in a pour line/sand streak or minor discoloration. When distributing concrete within a panel at the form face after the initial concrete discharge, always place additional concrete on the already discharged concrete, moving the concrete mass into areas needed by dragging with a rake.
  - Vibration near the leading edge of a concrete placement can cause the appearance of pour lines. To minimize the formation of discoloration pour lines when placing concrete in the flat face of a panel such as a wall panel, cover the entire panel face with concrete before applying any vibration.
- **Variations between batches.** Pour lines may also be due to natural color variation between concrete batches, a different rate of consolidation or vibration, or a difference in the curing stage of the fresh concrete.
- **Differences in viscosity.** With self-consolidating concrete (SCC), pour lines may occur because viscosity varies between layers or batches. The relative viscosity of SCC can be monitored with regular testing with the T-50 test method (ASTM C1611/C1611M).

If a visible line is found on an exposed concrete surface, it does not necessarily indicate a cold joint. This may be just a color variation between layers or batch placement that may fade with time. A pour line of this type can be a noncritical blemish and does not indicate a significant structural defect. However, pour lines do affect the aesthetics of a component and can be a meaningful concern in architectural products.

### Avoiding pour lines

- Always keep the discharge behind the leading edge of the concrete flow as concrete moves across the panel during placement. If the discharge moves ahead of the flow, the newer discharged concrete may overcome the leading-edge paste, resulting in discoloration from trapped air and form oil that creates a pour line.
- Carefully monitor concrete consistency from batch to batch to ensure consistent concrete color and appearance. Pour lines can form when segregation and changes in concrete quality or water content occur between loads.
- After the initial load is placed, start placing subsequent loads on top of previously placed concrete, staying behind the flow edge and therefore pushing the leading edge across the form. Avoid starting at a new discharge point where two flow edges can come together.
- Avoid delays between loads. The flow edge may begin to stiffen before the next load can continue to move the edge during a pour.
- Form oil should be applied as directed by the manufacturer. If too much form oil is used during setup, the flow edge of the concrete will screed excess oil off the form face at the leading edge, resulting in a pour line or other discoloration.

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**Note:** Please complete this form and return to the Quality Control Manager. All crew members should be observant and report to their foreman anything out of the ordinary on a project. See something, say something.

| NOTES | ATTENDEE SIGNATURES |
|---|---|
| DATE<br>PRESENTER | |