Troubleshooting Guide for Identifying Likely Causes for Low Compressive Strengths

**Mixing:**

- **Ambient Temperature:**
  - Low temperatures result in slower strength gain.

- **Material Temperature:**
  - Low temperatures result in slower strength gain.

- **Water Temperature:**
  - Low temperatures result in slower strength gain.

- **Water Source:**
  - Only potable (drinkable) water should be used.

- **Water Quantity per Bag:**
  - Higher water contents can result in lower strength, higher shrinkage, increased air and segregation.

- **Type of Mixer:**
  - Mixing with a drill can result in increased air.

- **Length of Mixing Period:**
  - Mixing for too short can lead to incomplete mixing. Mixing for too long can result in increased air.

**Sample Fabrication and Storage**

- **Type of cube molds used:**
  - Only calibrated, brass, waxed 2” (50mm) cube molds should be used. Never use plastic inserts.

- **How were samples cured?**
  - Cementitious grouts must be moist cured.

- **Where were samples stored?**
  - Samples should be stored out of direct sunlight and moved to a testing lab after 24 hrs.

- **Temperature during storage:**
  - Samples should be stored at 21°C (72°F) if trying to verify manufacturer’s data.

- **Samples vibrated?**
  - Vibration can result in segregation. Fluid grouts should be puddled. Otherwise, follow C-109.

- **Molds stacked/clamped?**
  - Expansion must be restrained. Otherwise, “bulged” cubes can exhibit low strengths.

- **Samples moist cured?**
  - Cementitious grouts must be moist cured. Epoxy grouts are air cured.

- **Curing temperature?**
  - Samples should be stored at 21°C (72°F) if trying to verify manufacturer’s data.
**Sample Testing**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were samples/cubes weighed?</td>
<td></td>
<td>Weighing cubes verifies unit weight and can indicate excess air/porosity or added water than can result in low strength.</td>
</tr>
<tr>
<td>What were dimensions of cubes?</td>
<td></td>
<td>Cube molds that are out of tolerance can result in variable, often low, strengths</td>
</tr>
<tr>
<td>Were cubes faces square?</td>
<td></td>
<td>Cube molds that are out of tolerance can result in variable, often low, strengths</td>
</tr>
<tr>
<td>What was the test (crosshead) speed?</td>
<td></td>
<td>Variable test speeds can result in variable results</td>
</tr>
<tr>
<td>Were apple-core breaks achieved?</td>
<td></td>
<td>Visual indication that samples were fabricated and tested correctly.</td>
</tr>
</tbody>
</table>