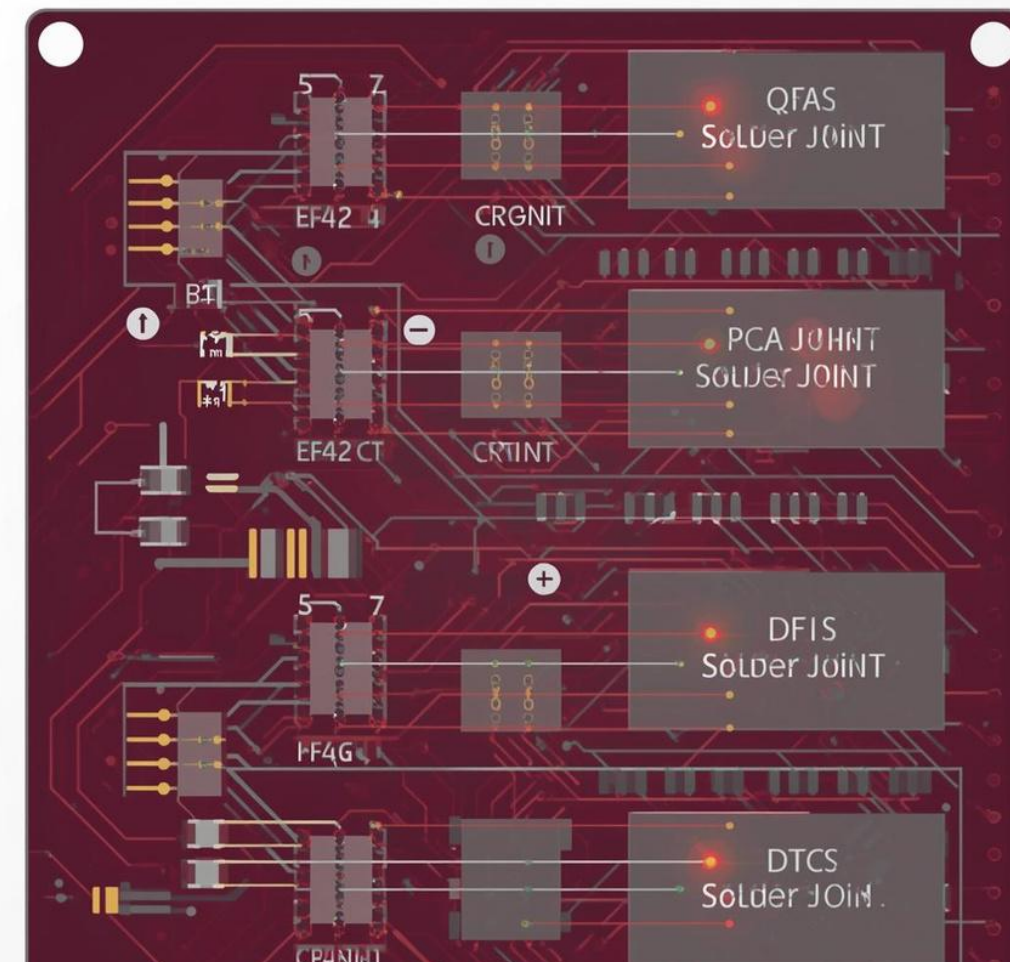
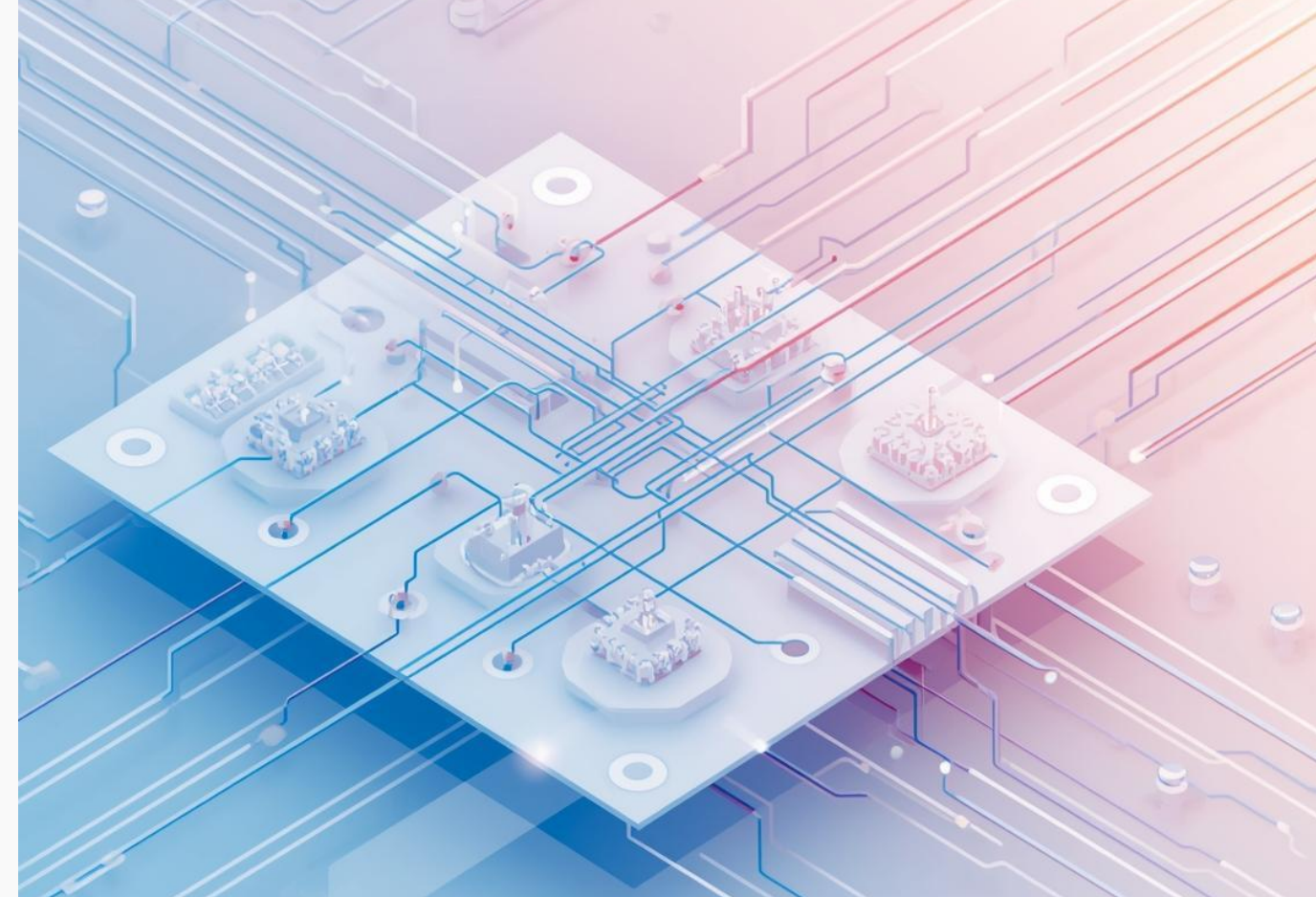


ICTC Value Add Services Overview

# Dye & Pull Testing

Revealing Hidden Weaknesses  
in Solder Joints



# Why Dye & Pull Testing

Dye & Pull Testing is a destructive analysis method used to reveal hidden cracks and weak interfaces in solder joints—especially under area-array packages like BGAs, CSPs, and LGAs. By pulling the component after dye penetration, microscopic cracks and lifted pads become visible, providing objective evidence of where solder joints may be vulnerable.

## Hidden Weaknesses

Dye & Pull testing reveals micro-cracks and weak solder interfaces that may not be visible through external inspection. It supports early identification of latent solder joint weakness before it contributes to field issues.

## Complements X-ray

Dye & Pull works alongside X-Ray and CSAM by revealing crack paths and interfacial separation that may not be fully evident in non-destructive imaging. Together, these methods provide a more complete understanding of solder joint condition.

## Cost-Effective Diagnosis

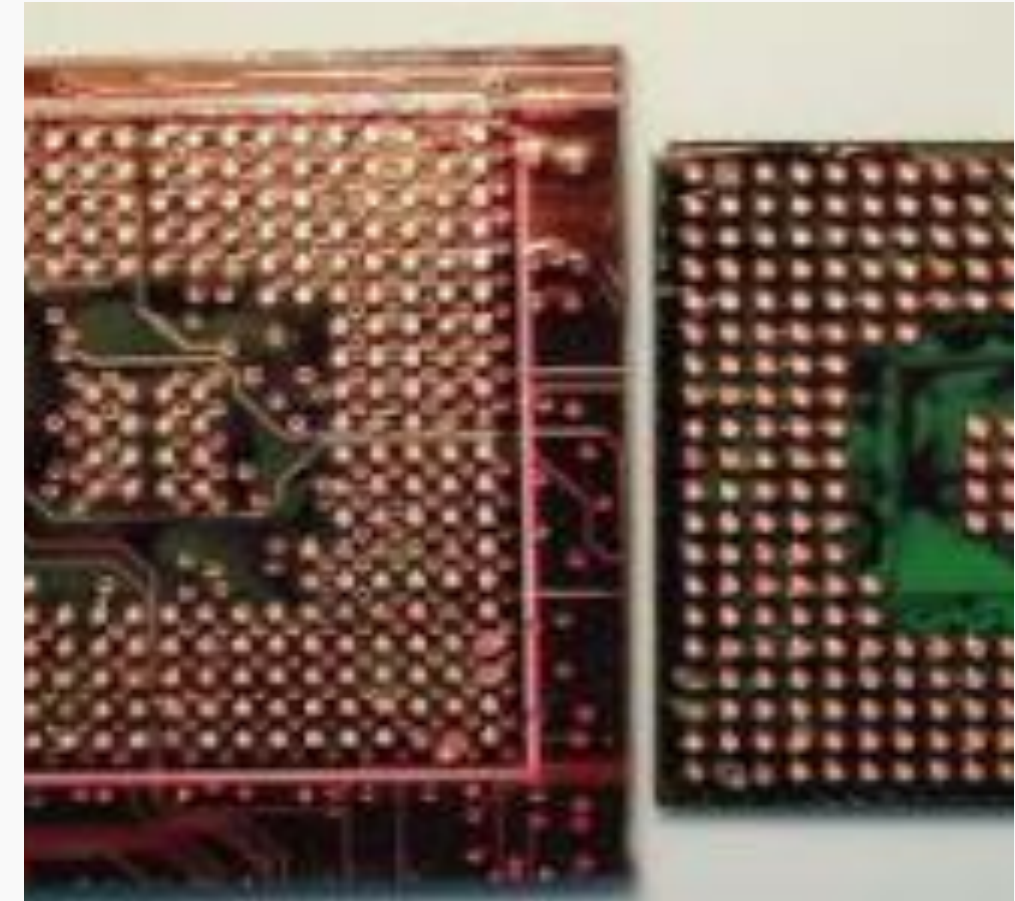
By targeting the highest-risk components or suspected failure areas, Dye & Pull provides objective evidence quickly—helping teams focus troubleshooting and corrective actions without unnecessary rework or blanket destructive analysis.

## Process Validation

Use Dye & Pull to de-risk NPI, line transfers, material/process changes, and qualification builds by documenting solder joint cracking indications and comparing results across builds or conditions (per the agreed test plan).

Results are documented with images and observations to support engineering review and decision-making.

Revealing Hidden Weaknesses in Solder Joints



# Key Benefits



## Early Detection

Dye & Pull testing can support early identification of micro-cracks and pad craters, providing objective evidence to help evaluate solder joint integrity before issues affect product performance.

## Reliability

This method provides evidence to support evaluation of print and reflow process performance and solder joint consistency—especially in critical applications.

## Risk Mitigation

By identifying potential weaknesses early, this process can help reduce escapes and returns that may otherwise contribute to field failures and warranty claims.

## Clarity

Results can be documented with mapped indications and images, helping teams make informed decisions regarding process improvements and quality assurance.

# Key Benefits

## **Reveals Hidden Solder Joint Weakness**

Identifies cracks, pad separation, and weak interfaces that may not be visible through external inspection.

## **Supports Process Evaluation**

Provides evidence to support evaluation of print, placement, and reflow process performance on high-density assemblies.

## **Helps Reduce Escapes**

Helps reduce escapes and returns by identifying potential weaknesses earlier in the product lifecycle.

## **Clear, Documented Results**

Photo-documented observations and mapped indications make findings easier to communicate and act on.

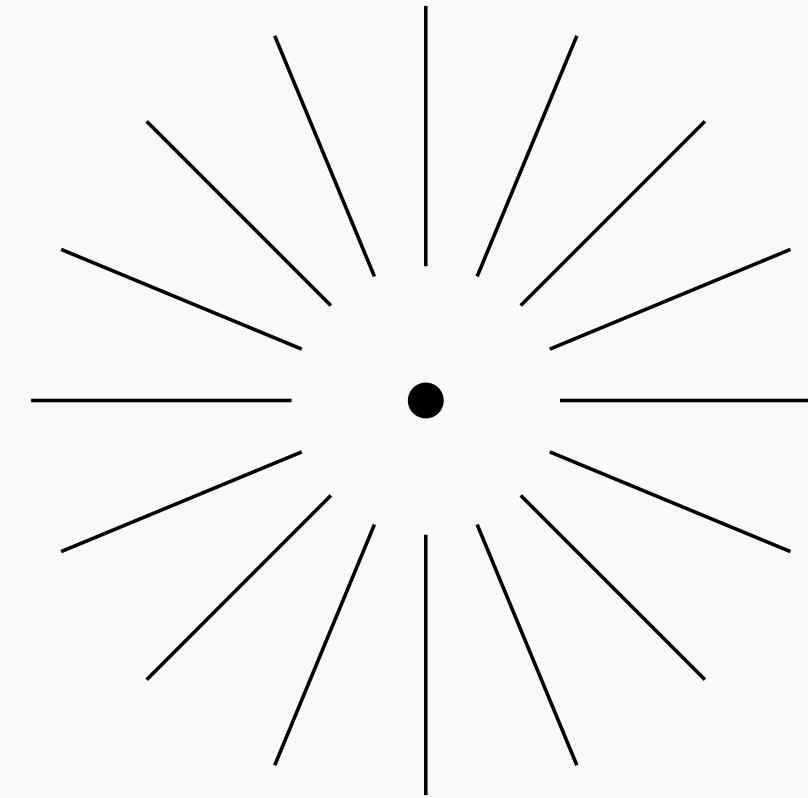
## **Design & Material Insights**

Supports comparisons across solder alloys, finishes, process profiles, or design features contributing to cracking risk.

## **Targeted Next-Step Recommendations**

Actionable recommendations can be provided to support troubleshooting, corrective actions, or follow-on analysis.

# What You Receive



## Report

You will receive a concise report outlining documented findings, supported by photos and mapped indications to facilitate engineering review and decision-making.

## Traceability

Each report includes a traveler to support traceability of relevant process parameters and key steps performed during the Dye & Pull procedure.

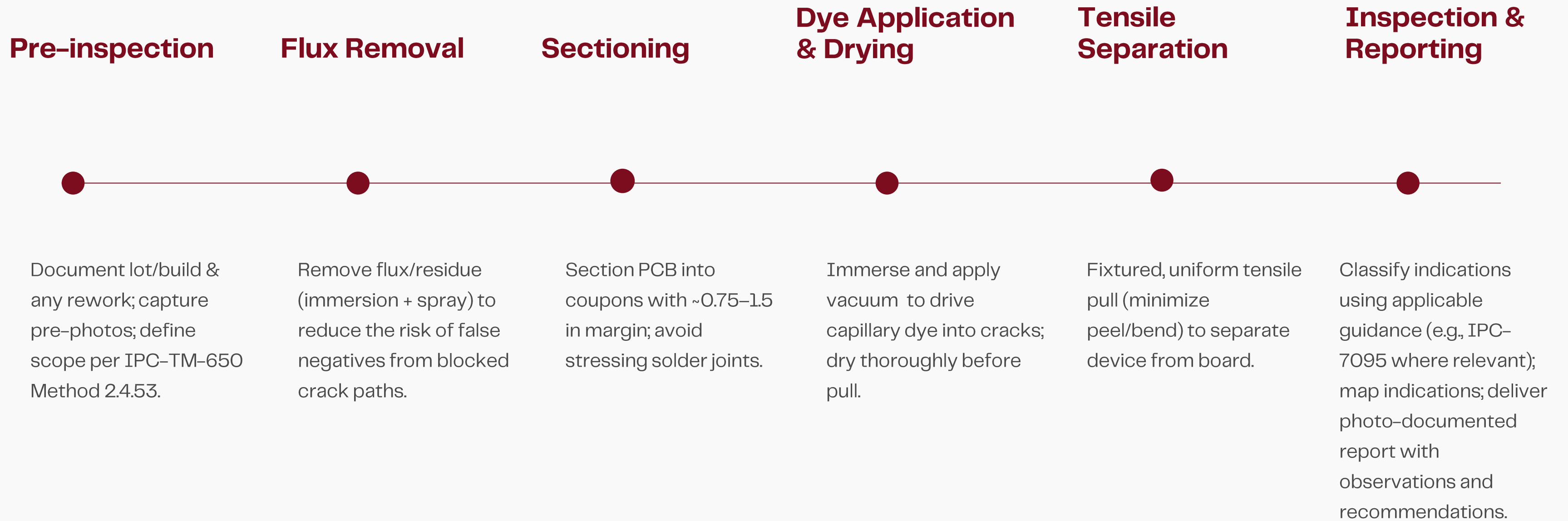
## Recommendations

Our assessment can include actionable recommendations to support process and design improvements, aligned to the project objectives and customer requirements.

Results are observational and reported against the agreed test plan and customer-defined acceptance criteria.

Revealing Hidden Weaknesses in Solder Joints

# Process Overview



# Standards & Compliance

## **IPC-TM-650**

Our Dye & Pull Testing can be performed in alignment with IPC-TM-650 Method 2.4.53 when specified by the drawing, purchase order, or customer-approved test plan.

## **IPC-7095**

Result interpretation may be supported by IPC-7095 guidance for area-array package assembly and failure modes when applicable to the device type and objective.

## **Observational Method**

Our method is observational. Acceptance criteria and reporting format are established with the customer based on the agreed test plan and project requirements.

# Typical Applications

## Aerospace

Supports failure analysis and qualification efforts for mission-critical electronics by documenting solder joint cracking indications and interfaces.

## Medical

Supports evaluation of solder joint cracking risk in high-reliability electronics where latent defects must be understood early.

## Automotive


Provides evidence to support process optimization and troubleshooting for electronics used in harsh or high-cycle environments.

## Telecom/Data Centers


Supports reliability investigations and process validation for high-density assemblies used in communications hardware.

# Ready to Discuss Your Dye & Pull Test Requirements?

For ITAR-controlled or other sensitive design data, please contact us for secure upload instructions.



Please use the contact details to tell us about your project and how you'd like to proceed. We'll respond with recommended next steps.

- 
- Email: [MHunter@ictcusa.com](mailto:MHunter@ictcusa.com)
  - Phone: (352) 238-3784