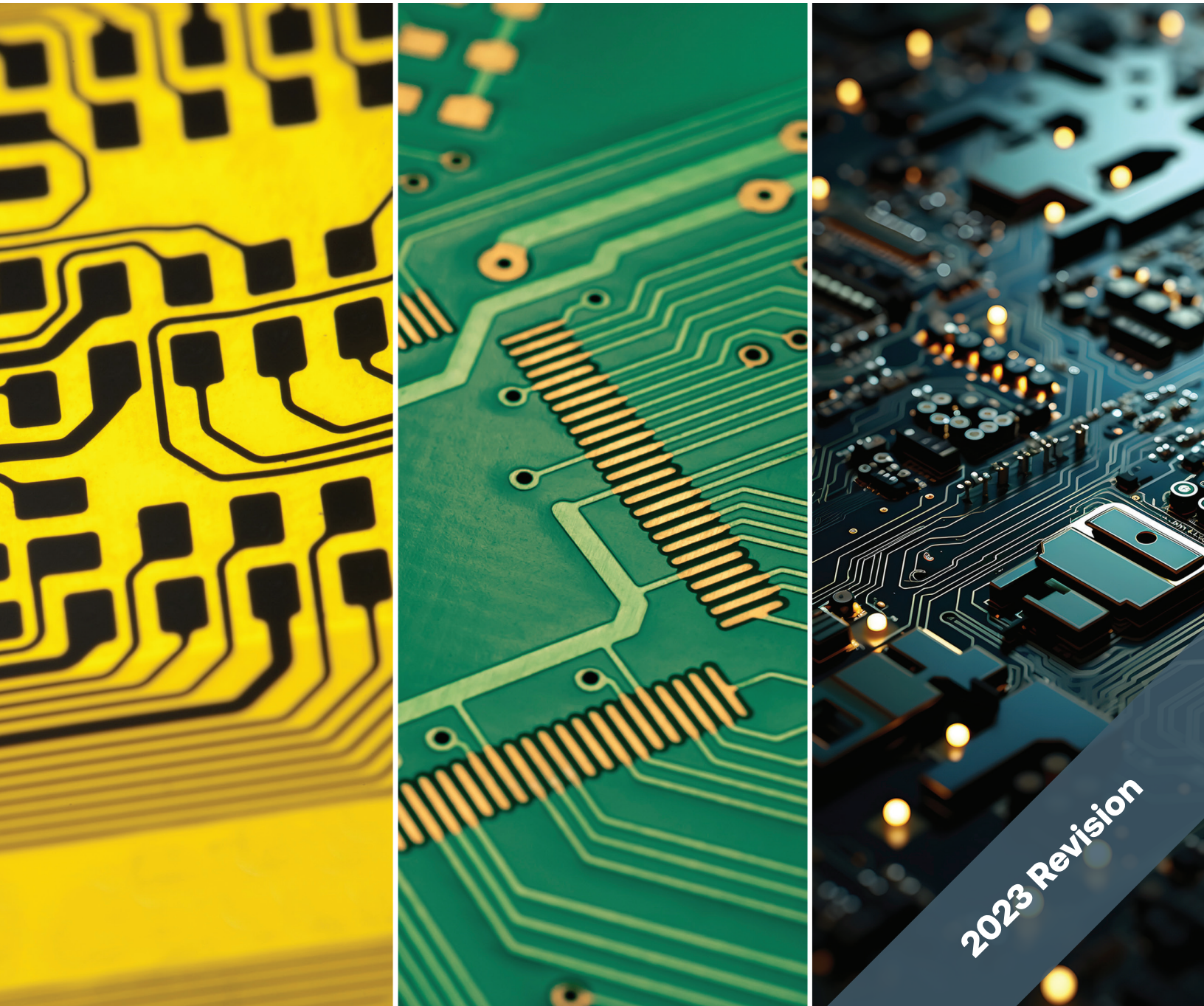
BUILD ELECTRONICS BETTER

IPC CHECKLIST

for Producing Printed Board Assemblies



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IPC Offices

IPC HQ Office

3000 Lakeside Drive, 105 N
Bannockburn, IL 60015
Tel: + 1 847-615-7100
www.ipc.org

IPC Atlanta Office

333 North Point Center East
Suite 260
Alpharetta, GA 30022
Tel: + 1 847-615-7100
www.ipc.org

IPC Washington, D.C. Office

1331 Pennsylvania Avenue, NW
Suite 625 South
Washington, D.C. 20004
Tel: + 1 202-661-8090
www.ipc.org

IPC China

IPC China HQ

Room 510
Modern Logistic Building
#448 Hongcao Rd.
Xuhui District
Shanghai, 200233. PRC
Tel: + 86 400 6219 610
www.ipc.org.cn

IPC Europe

IPC Europe HQ

IPC Electronics Europe Gmbh

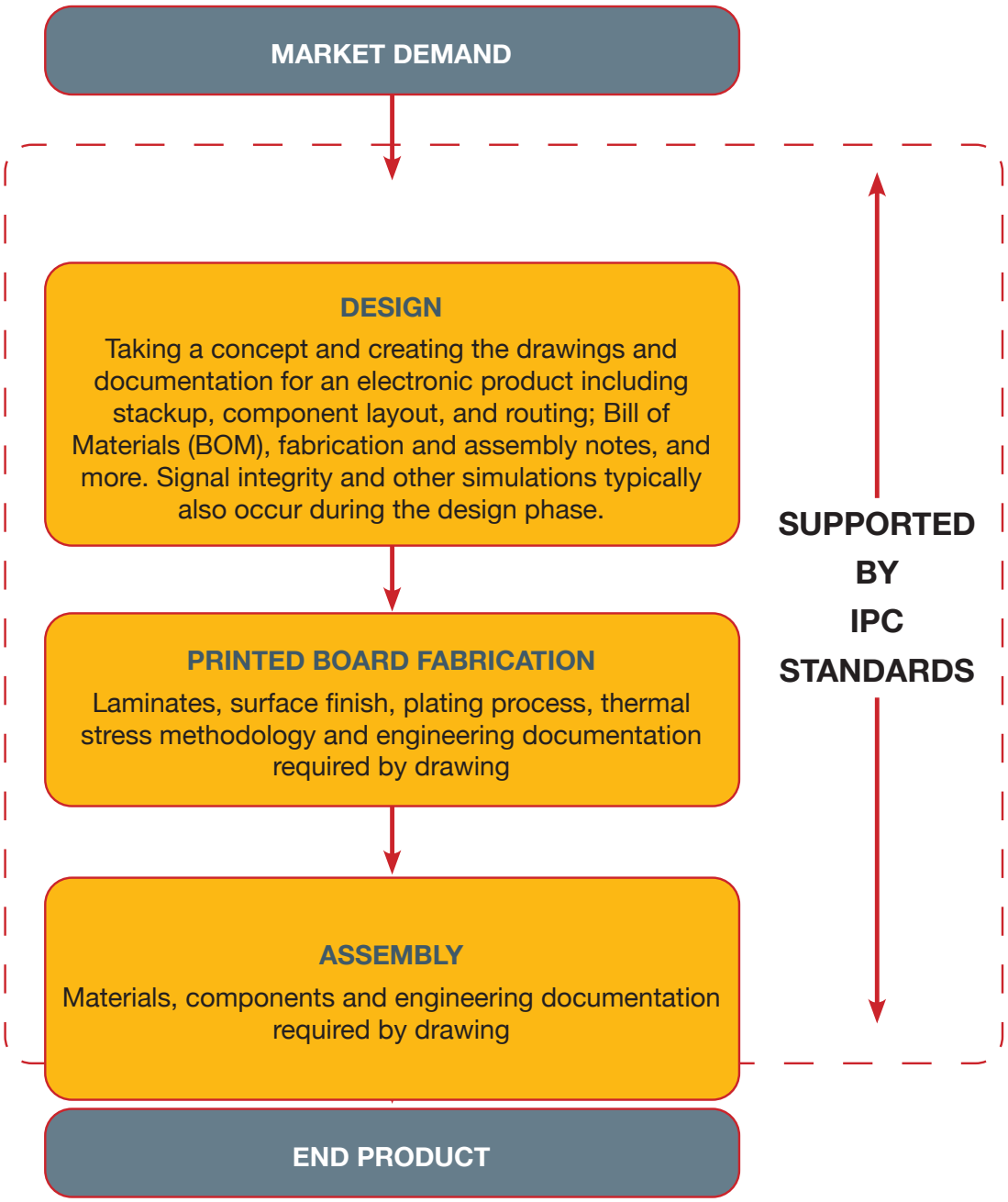
Herzogspitalstrasse 24
D-80331 Munich
Germany
Tel: + 49 151 15518587
www.ipc.org/europe

IPC India

IPC India HQ

Old No. 269, (New No. 35)
2nd floor
5th Mani, 4th Block,
Jayanagar, Bangalore, 560011
Tel: + 91 80 26532211
www.ipc.org/ipc-india

Production Cycle



Engineering Documentation Drawings, specifications, technical illustrations and other documents, prepared and released by the design activity in any form of media, that establish the design and design requirements.

Classification

IPC Product/Performance Classes

Three general product/performance classes are established to reflect progressive increases in sophistication, functional performance requirements and testing/inspection frequency. There may be an overlap of product/performance classes in complex multi-unit electronic systems.

Class 1
General Electronic Products

Includes products suitable for applications where the major requirement is function of the completed assembly.

Class 2
Dedicated Service Electronic Products

Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

Class 3
High Performance/Harsh Environment Electronic Products

Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function when required, such as life support or other critical systems.

The Use of Addendums

An addendum is written to a specific revision of a base document. Addendums are industry segment specific and are not standalone documents. They must be used with a base document.

Producibility Levels

IPC design standards, including the IPC-2220 series and the IPC-7352, provide design producibility levels of features, tolerances and measurements within the printed board manufacturing process. These are intended to reflect increases in the sophistication of tooling and processing and therefore, progressive increases in fabrication cost.

These levels are:
Level A: General Design Producibility — Preferred
Level B: Moderate Design Producibility — Standard
Level C: High Design Producibility — Reduced

The producibility levels are not to be interpreted as a design requirement but rather as a method of communicating the degree of difficulty of a feature between the design authority and manufacturing. The use of one level for a specific feature does not mean that other features must be of the same level, and selection should recognize precision, performance, pattern density, equipment and assembly/testing requirements. The specific requirement for any feature shall be as specified in the procurement documentation.

Standards Checklist

Note: The decisions made using this checklist are dependent upon the type of assembly, i.e. rigid, rigid flex, etc. and the operating environment of the completed product.

(x)	Typical Process Steps for a Printed Board Assembly	IPC Standard(s)
	Select component package	IPC-222X, IPC-7352, IPC-7093, IPC-7095
	Select surface finish on components	IPC J-STD-002
	Data transfer and electronic product documentation needs	PC-2581, IPC-2610
	CAD according to Class 1, 2 or 3	IPC-2221, IPC-2222 and IPC-2223
	CAD according to Producibility Level A, B or C	IPC-2221, IPC-2222 and IPC-2223
	Footprint/land according to Producibility Level A, B or C	IPC-7351 and IPC-7352
	Printed board internal/external thermal management	IPC-2221 and IPC-2152
	Design/CAD of QFN	IPC-7093
	Design/CAD of BGA/CSP	IPC-7095
	Design/CAD of stencils	IPC-7525
	Placement of components	IPC-222X, IPC-7352, IPC-7093, IPC-7095
	Select printed board base material	IPC-4101
	Select printed board base material Cu foil	IPC-4562
	Select printed board solder mask	IPC-SM-840
	Select printed board surface finish	IPC-4552, IPC-4553, IPC-4554, IPC-4555 or IPC-4556
	Select printed board handling and storage	IPC-1602
	Solderability of printed board	IPC J-STD-003
	Printed board process requirements at supplier	IPC-6011, IPC-6012, IPC-6013, IPC-6017 or IPC-6018
	Stencil/printing options	IPC-7526 and IPC-7527
	Printed board assembly requirements Class 1, 2 or 3	IPC J-STD-001
	Printed board assembly acceptability Class 1, 2 or 3	IPC-A-610
	Solder paste/bar/wire options	IPC J-STD-005 and IPC J-STD-006
	Flux with solder paste/bar/wire options	IPC J-STD-004
	Reflow/vapor phase/wave/selective/hand options	IPC-2221
	Select soldering environments (O_2 free, N_2 or Air)	IPC-2221, IPC-7525
	Select Pb or Pb-free process	IPC-2221, IPC-WP-012, IPC-WP-014 and IPC/PERM-2901
	Select moisture sensitive level (MSL)	IPC J-STD-033
	Select cleaning method	IPC-CH-65, IPC-5702, IPC-5703
	Conformal coating	IPC-CC-830 and IPC J-STD-001
	Printed board assembly rework, modification and repair	IPC-7711/21
	Printed board assembly requirements/acceptability for electronic enclosures	IPC-A-630
	Printed board assembly requirements/acceptability for cable	IPC/WHMA-A-620

IPC Reference Standards

IPC's robust library of standards and guidelines help electronics manufacturers build electronics better. The following documents are available from shop.ipc.org.

For a complete list, including obsolete, superseded, retired, and other documents published before 2010, please visit https://www.ipc.org/ipc-document-revision-table.

Interested in helping develop or create an IPC document? You join a committee for FREE by visiting https://www.ipc.org/join-committee-home-page and referencing the committee code below.w

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies	5-22a	J-STD-001 Task Group	Assembly Processes
J-STD-001xA/ A-610xA Automotive Addendum	*Automotive Addendum to IPC J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies and IPC-A-610 Acceptability of Electronic Assemblies*	5-22a	J-STD-001 Task Group	Assembly Processes
J-STD-001xS Space Hardware Addendum	*Space Applications Electronic Hardware Addendum for J-STD-001*	5-22as	Space and Military Electronic Assemblies Task Group	Assembly Processes
IPC-HDBK-001	Handbook and Guide to the Requirements for Soldered Electrical and Electronic Assemblies	5-22f	IPC-HDBK-001 Task Group	Assembly Processes
J-STD-020	Moisture/Reflow Sensitivity Classification of Plastic Surface Mount Devices	B-10a	Plastic Chip Carrier Cracking Task Group	Quality, Reliability, Test, & Inspection
IPC/PERM-WP-022	Mitigation of Pure Tin Risk by Tin-Lead SMT Reflow - Results of an Industry Round-Robin - Final Report	8-81f	PERM Self-Mitigation of Tin by SMT Task Group	Assembly Processes for Lead-Free and Tin-Lead
IPC-WP-023	IPC Technology Solutions White Paper on Performance-Based Printed Board OEM Acceptance: Via Chain Continuity Reflow Test: The Hidden Reliability Threat – Weak Microvia Interface	V-TSL	Technology Solutions Committee	Supply Chain & Business Issues
IPC-WP-024	Smart Textiles Reliability Following Laundering	D-70	E-Textiles Committee	E-Textiles
IPC-WP-025	A Framework for the Engineering and Design of E-Textiles	D-70	E-Textiles Committee	E-Textiles
IPC-WP-026	IPC Technology Solutions White Paper on Blockchain and the Electronics Industry: A review of the current state of the blockchain technology and its potential applications in electronics manufacturing	V-TSL	Technology Solutions Committee	Supply Chain & Business Issues
J-STD-030	Selection and Application of Board Level Underfill Materials	5-24f	Underfill Materials Task Group	Assembly Processes
J-STD-033	Handling, Packing, Shipping and Use of Moisture, Reflow, and Process Sensitive Devices	B-10a	Plastic Chip Carrier Cracking Task Group	Quality, Reliability, Test, & Inspection
J-STD-046	Customer Notification Standard for Product/Process Changes by Electronic Product Suppliers (revision of JESD46D)	2-15f	Obsolete and Discontinued Product Task Group	Supply Chain & Business Issues
J-STD-048	Notification Standard for Product Discontinuance	2-15f	Obsolete and Discontinued Product Task Group	Supply Chain & Business Issues
IPC-T-50	Terms and Definitions for Interconnecting and Packaging Electronic Circuits	2-30	Terms and Definitions Committee	PCB Fabrication and Materials

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-T-51	Terms and Definitions for Design and Manufacture of Printed Electronics	D-64a	Printed Electronics Terms and Definitions Task Group	PCB Fabrication and Materials
IPC-CH-65	Guidelines for Cleaning of Printed Boards and Assemblies	5-31d	Cleaning Handbook Task Group	Cleaning/Coating/ Contamination
IPC-WP-113	Guidance for the Development and Implementation of a Red Plague Control Plan (RPCP)	7-31k & 7-31h	Wire Harness Design Task Group & IPC-HDBK-620 Handbook Task Group	Quality, Reliability, Test, & Inspection
IPC-WP-114	Guidance for the Development and Implementation of a White Plague Control Plan (WPCP)	7-31k & 7-31h	Wire Harness Design Task Group & IPC-HDBK-620 Handbook Task Group	Quality, Reliability, Test, & Inspection
IPC-WP-116	Guidance for the Development and Implementation of a Foreign Object Debris (FOD) Control Plan	7-31k & 7-31h	Wire Harness Design Task Group & IPC-HDBK-620 Handbook Task Group	Quality, Reliability, Test, & Inspection
IPC-FC-234	Pressure Sensitive Adhesive (PSA) Assembly Guidelines for Flexible, Rigid or Rigid-Flex Printed Boards	D-13	Flexible Circuits Base Materials Subcommittee	Assembly Processes
IPC-D-325	Documentation Requirements for Printed Boards, Assemblies and Support Drawings	2-40	Electronic Documentation Technology Committee	Design
IPC-A-600	Acceptability of Printed Boards	7-31a & D-33a	IPC-A-600 Task Group & Rigid Printed Board Performance Specifications Task Group	PCB Fabrication and Materials
IPC-A-610	Acceptability of Electronic Assemblies	7-31b	IPC-A-610 Task Group	Assembly Processes
IPC-A-610G-R	*Rail Transit Addendum to IPC-A-610G Acceptability of Electronic Assemblies*	7-31br	IPC-A-610 Addendum for High Speed Railway Task Group	Assembly Processes
IPC-A-610xC	IPC-A-610xC Telecom Addendum	7-31bc	A-610 Telecom Addendum Task Group	Assembly Processes
IPC-D-620	Design and Critical Process Requirements for Cable and Wiring Harnesses	7-31k	Wire Harness Design Task Group	Quality, Reliability, Test, & Inspection
IPC/ WHMA-A-620	Acceptability of Electronic Wire Harnesses and Cables	7-31f	IPC WHMA-A-620 Task Group	Design
IPC/ WHMA-A-620 Space Hardware Addendum	*Space Applications Electronic Hardware Addendum for IPC/WHMA-A-620. The addendum MUST be used with the same version of the standard; e.g. 620CS with 620C*	7-31fs	IPC WHMA-A-620 Space and Military Electronic Assemblies Addendum Task Group	Design
IPC/WHMA-A-620CR	*Rail Transit Addendum to IPC/WHMA-A-620C*	7-31fr	7-31FR: IPC WHMA-A-620 Addendum for High Speed Railway Task Group	Design
IPC-HDBK-620	Handbook and Guide to IPC-D-620 and IPC/WHMA-A-620	7-31h & 7-31k	IPC-HDBK-620 Handbook Task Group & Wire Harness Design Task Group	Design
IPC-A-630	Acceptability Standard for Manufacture, Inspection and Testing of Electronic Enclosures	7-31j	Electronic Box Assemblies Task Group	Assembly Processes
IPC-HDBK-630	Guidelines for Design, Manufacture, Inspection, and Testing of Electronic Enclosures	7-31j	Electronic Box Assemblies Task Group	Assembly Processes
IPC-A-640	Acceptance Requirements for Optical Fiber, Optical Cable, and Hybrid Wiring Harness Assemblies	7-31m	Fiber Optic Cable Acceptability Task Group	Quality, Reliability, Test, & Inspection

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-D-640	Design and Critical Process Requirements for Optical Fiber, Optical Cable and Hybrid Wiring Harness Assemblies	7-31m	Fiber Optic Cable Acceptability Task Group	Design
IPC-SM-817	General Requirements for Dielectric Surface Mounting Adhesives	5-21k	IPC-SM-817 SMT Adhesive Task Group	Assembly Processes
IPC-AJ-820	Assembly and Joining Handbook	7-35	Assembly and Joining Handbook Subcommittee	Assembly Processes
IPC-CC-830	Qualification and Performance of Electrical Insulating Compound for Printed Wiring Assemblies	5-33a	Conformal Coating Task Group	Cleaning/Coating/ Contamination
IPC-HDBK-830	Guidelines for Design, Selection and Application of Conformal Coatings	5-33c	Conformal Coating Handbook Task Group	Cleaning/Coating/ Contamination
IPC-SM-840	Qualification and Performance Specification of Permanent Solder Mask and Flexible Cover Materials	5-33b	Solder Mask Performance Task Group	Quality, Reliability, Test, & Inspection
IPC-1401	Corporate Social Responsibility	4-35cn	Corporate Social Responsibility and Sustainability in the Supply Chain in China	Supply Chain & Business Issues
IPC-1602	Standard for Printed Board Handling and Storage	D-35	Printed Board Storage and Handling Subcommittee	PCB Fabrication and Materials
IPC-1751	Generic Requirements for Declaration Process Management	E-31a	Generic Requirements for Declaration Process Management Task Group	Supply Chain & Business Issues
IPC-1752	Materials Declaration Management	E-31b	Materials Declaration Task Group	Supply Chain & Business Issues
IPC-1753	Laboratory Report Standard	E-31j	Lab Report Task Group	Supply Chain & Business Issues
IPC-1754	Materials and Substances Declaration for Aerospace and Defense and Other Industries	E-31k	Materials and Substances Declaration for the Aerospace, Defense, and Other Industries	Supply Chain & Business Issues
IPC-1755	Conflict Minerals Data Exchange Standard	E-31h	Conflict Minerals Data Exchange Task Group	Supply Chain & Business Issues
IPC-1756	Manufacturing Process Data Management	2-18a	Manufacturing Process Declaration Task Group	Supply Chain & Business Issues
IPC-1758	Declaration Requirements for Shipping, Pack and Packing Materials	2-18	Supplier Declaration Subcommittee	Supply Chain & Business Issues
IPC-1782	Standard for Manufacturing and Supply Chain Traceability of Electronic Products	2-19a	Critical Components Traceability Task Group	Supply Chain & Business Issues
IPC-1791	Trusted Electronic Designer, Manufacturer, and Assembler Requirements	2-19b	Trusted Supplier Task Group	Supply Chain & Business Issues
IPC-1792	Standard for Cybersecurity Management in the Manufacturing Industry Supply Chain	2-12c	Cybersecurity Protection Standard Task Group	Supply Chain & Business Issues
IPC-2221	Generic Standard on Printed Board Design	D-31b	IPC-2221 2222 Task Group	Design
IPC-2222	Sectional Design Standard for Rigid Organic Printed Boards	D-31b	IPC-2221 2222 Task Group	Design

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-2223	Sectional Design Standard for Flexible Printed Boards	D-11	Flexible Circuits Design Subcommittee	Design
IPC-2226	Sectional Design Standard for High Density Interconnect (HDI) Printed Boards	D-31b	IPC-2221 2222 Task Group	Design
IPC-2228	Sectional Design Standard for High Frequency (RF/ Microwave) Printed Boards	D-21	High Speed/High Frequency Design Subcommittee	Design
IPC-2231	DFX Guidelines	1-14	DFX Subcommittee	Design
IPC/JPCA-2291	Design Guideline for Printed Electronics	D-61	Printed Electronics Design Subcommittee	Design
IPC-2292	Design Standard for Printed Electronics on Flexible Substrates	D-61	Printed Electronics Design Subcommittee	Design
IPC-2551	International Standard for Digital Twins	2-12a	Generic Requirements for Digital Twin Task Group	Design
IPC/DAC-2552	General Electronic Components Model Based Definition (MBD) Standard	2-12b	Model Based Definition (MBD) for Digital Twins Task Group	Design
IPC-2581	Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology	2-16	Digital Product Model Exchange (DPMX) Subcommittee	Design
IPC-2591	Connected Factory Exchange (CFX)	2-17	Connected Factory Initiative Subcommittee	PCB Fabrication and Materials, Assembly Processes
IPC-2611	Generic Requirements for Electronic Product Documentation	2-40	Electronic Documentation Technology Committee	Design
IPC-2612	Sectional Requirements for Electronic Diagramming Documentation (Schematic and Logic Descriptions)	2-40	Electronic Documentation Technology Committee	Design
IPC-2612-1	Sectional Requirements for Electronic Diagramming Symbol Generation Methodology	2-40	Electronic Documentation Technology Committee	Design
IPC-2614	Sectional Requirements for Board Fabrication Documentation	2-40	Electronic Documentation Technology Committee	Design
IPC-2615	Printed Board Dimensions and Tolerances	1-10a	Dimensioning and Tolerancing Task Group	Design
IPC/PERM-2901	Pb-free Design & Assembly Implementation Guide	8-81D	Research Coordination and Technical Guidance Task Group	Assembly Processes for Lead-Free and Tin-Lead
IPC-4101	Specification for Base Materials for Rigid and Multilayer Printed Boards	3-11	Laminate Prepreg Materials Subcommittee	PCB Fabrication and Materials
IPC-4103	Specification for Base Materials for High Speed/ High Frequency Applications	D-23	High Speed High Frequency Base Materials Subcommittee	PCB Fabrication and Materials
IPC-4202	Flexible Base Dielectrics for Use in Flexible Printed Wiring	D-13	Flexible Circuits Base Materials Subcommittee	PCB Fabrication and Materials
IPC-4203	Adhesive Coated Dielectric Films for Use as Cover Sheets	D-13	Flexible Circuits Base Materials Subcommittee	PCB Fabrication and Materials

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-4412	Specification for Finished Fabric Woven form "E" Glass for Printed Boards	3-12d	Woven Glass Reinforcement Task Group	PCB Fabrication and Materials
IPC-4552	Specification for Electroless Nickel/Immersion Gold (ENIG) Plating for Printed Circuit Boards	4-14	Plating Processes Subcommittee	PCB Fabrication and Materials
IPC-4554	Specification for Immersion Tin Plating for Printed Circuit Boards	4-14	Plating Processes Subcommittee	PCB Fabrication and Materials
IPC-4555	Performance Specification for High Temperature Organic Solderability Preservatives (OSP) for Printed Boards	4-14e	Final Finishes for Printed Boards - OSP Task Group	PCB Fabrication and Materials
IPC-4556	Specification for Electroless Nickel/Electroless Palladium/Immersion Gold (ENEPIG) Plating for Printed Circuit Boards	4-14	Plating Processes Subcommittee	PCB Fabrication and Materials
IPC-4562	Metal Foil for Printed Wiring Applications	3-12a	Metallic Foil Task Group	PCB Fabrication and Materials
IPC/JPCA-4591	Requirements for Printed Electronics Functional Conductive Materials	D-63	Printed Electronics Functional Materials Subcommittee	PCB Fabrication and Materials
IPC-4592	Requirements for Printed Electronics Functional Dielectric Materials	D-63a	Printed Electronics Functional Dielectric Materials Task Group	PCB Fabrication and Materials
IPC-HDBK-4691	Handbook on Adhesive Bonding in Electronic Assembly Operations	5-11c	Electronic Assembly Adhesives Task Group	PCB Fabrication and Materials
IPC-4821	Specification for Embedded Passive Device Capacitor Materials for Rigid and Multilayer Printed Boards	D-52	Embedded Component Materials Subcommittee	PCB Fabrication and Materials
IPC-4921	Requirements for Printed Electronics Base Materials	D-62	Printed Electronics Base Materials Substrates Subcommittee	PCB Fabrication and Materials
IPC-5262	Design, Critical Process and Acceptance Requirements for Polymeric Applications	5-24g	Polymerics Standard Task Group	PCB Fabrication and Materials
IPC-5703	Cleanliness Guidelines for Printed Board Fabricators	5-32c	Bare Board Cleanliness Assessment Task Group	Cleaning/Coating/ Contamination
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards	D-33a	Rigid Printed Board Performance Specifications Task Group	PCB Fabrication and Materials
IPC-6012xA	*Automotive Applications Addendum to IPC-6012 Qualification and Performance Specification for Rigid Printed Boards*	D-33aa	IPC-6012 Automotive Addendum Task Group	PCB Fabrication and Materials
IPC-6012xS	*Space and Military Applications Addendum to IPC-6012 Qualification and Performance Specification for Rigid Printed Boards*	D-33as	IPC-6012 Aerospace Addendum Task Group	PCB Fabrication and Materials
IPC-6012xM	*Medical Applications Addendum to IPC-6012 Qualification and Performance Specification for Rigid Printed Boards*	D-33am	IPC-6012 Medical Addendum Task Group	PCB Fabrication and Materials
IPC-6013	Qualification and Performance Specification for Flexible Printed Boards	D-12	Flexible Circuits Specifications Subcommittee	PCB Fabrication and Materials

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-6013xM	*Medical Applications Addendum to IPC-6013 Qualification and Performance Specification for Flexible/Rigid-Flexible Printed Electronics. The addendum MUST be used with the same revision of the standard.*	D-33am	IPC-6012 Medical Addendum Task Group	PCB Fabrication and Materials
IPC-6017	Qualification and Performance Specification for Printed Boards Containing Embedded Passive Devices	D-53	Embedded Devices Performance Subcommittee	PCB Fabrication and Materials
IPC-6018	Qualification and Performance Specification for High Frequency (Microwave) Printed Boards	D-22	High Speed High Frequency Board Performance Sub-committee	PCB Fabrication and Materials
IPC-6018xS	*Space and Military Avionics Applications Addendum to IPC-6018, Qualification and Performance Specification for High Frequency (Microwave) Printed Boards. The addendum MUST be used with the same revision of the standard.*	D-22	High Speed High Frequency Board Performance Sub-committee	PCB Fabrication and Materials
IPC/JPCA-6901	Application Categories for Printed Electronics	D-64a	Printed Electronics Terms and Definitions Task Group	PCB Fabrication and Materials
IPC-6902	Qualification and Performance Specification for Printed Electronics on Flexible Substrates	D-64	Printed Electronics Final Assembly Subcommittee	Assembly Processes
IPC-6903	Terms and Definitions for the Design and Manufacture of Printed Electronics (Additive Circuitry)	D-64a	Printed Electronics Terms and Definitions Task Group	PCB Fabrication and Materials
IPC-7091	Design and Assembly Process Implementation of 3D Components	B-11a	3-D Electronic Packages Subcommittee	Design, Assembly Processes
IPC-7092	Design and Assembly Process Implementation for Embedded Components	D-55	Embedded Devices Process Implementation Subcommittee	Quality, Reliability, Test, & Inspection
IPC-7093	Design and Assembly Process Implementation for Bottom Termination SMT Components	5-21h	Bottom Termination Components (BTC) Task Group	Design, Assembly Processes
IPC-7094	Design and Assembly Process Implementation for Flip Chip and Die Size Components	5-21g	Flip Chip Mounting Task Group	Design, Assembly Processes
IPC-7095	Design and Assembly Process Implementation for BGAs	5-21f	Ball Grid Array Task Group	Design, Assembly Processes
IPC-7352	Generic Guideline for Land Pattern Design	1-14	DFX Standards Subcommittee	Design
IPC-7525	Guidelines for Stencil Design	5-21e	Solder Stencil Task Group	PCB Fabrication and Materials
IPC-7526	Stencil and Misprinted Board Cleaning Handbook	5-31g	Flip Chip Mounting Task Group	Design, Assembly Processes
IPC-7527	Requirements for Solder Paste Printing	5-21jnd	Solder Paste Printing Task Group	PCB Fabrication and Materials
IPC-7530	Guidelines for Temperature Profiling for Mass Soldering Processes (Wave and Reflow)	5-22h	Thermal Profiling Guide Task Group	PCB Fabrication and Materials
IPC-7535	Solder Dross Reduction in Wave Soldering Process	5-22jcn	Solder Dross Reduction Chemical Task Group - China	Assembly Processes

IPC Reference Standards

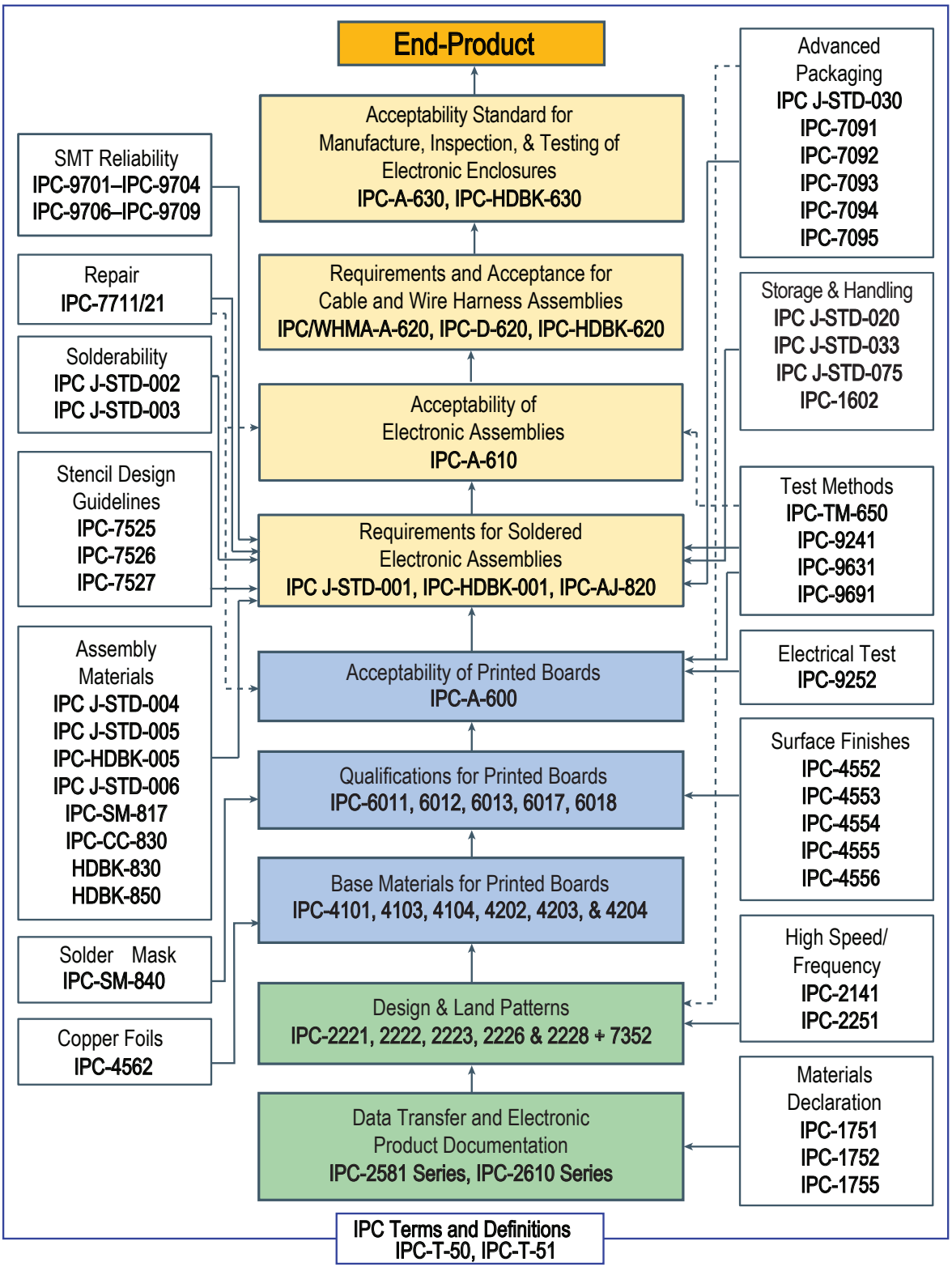
DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-7621	Guideline for Design, Material Selection and General Application of Encapsulation of Electronic Circuit Assembly by Low Pressure Molding with Thermoplastics	5-33g	Low Pressure Molding Task Group	Assembly Processes
IPC-7711/21	Rework, Modification and Repair of Electronic Assemblies	7-34	Repairability Subcommittee	PCB Fabrication and Materials
IPC-7801	Reflow Oven Process Control Standard	5-45	Reflow Oven Process Control Subcommittee	PCB Fabrication and Materials
IPC-8701	Final Acceptance Criteria Standard for PV Modules-Final Module Assembly	E-15	Visual Acceptance Criteria for Solar Panel-Final Module Assembly Subcommittee	Assembly Processes
IPC-8921	Requirements for Woven and Knitted Electronic Textiles (E-Textiles) Integrated with Conductive Fibers, Conductive Yarns and/or Wires	D-72	E-Textiles Materials Subcommittee	E-Textiles
IPC-8952	Design Standard for Printed Electronics on Coated or Treated Textiles and E-Textiles	D-73a	E-Textiles Printed Electronics Design Standard Task Group	E-Textiles
IPC-8971	Requirements for Electrical Testing of Printed Electronics on E-Textiles	D-74a	Printed Electronics E-Textiles Electrical Test Task Group	E-Textiles
IPC-9111	Troubleshooting for Printed Board Assembly Processes	7-23	Assembly Process Effects Handbook Subcommittee	Assembly Processes
IPC-9121	Troubleshooting for Printed Board Fabrication Processes	7-24	Printed Board Fabrication and Assembly Process Effects Subcommittee	PCB Fabrication and Materials, Assembly Processes
IPC-9202	Material and Process Characterization/Qualification Test Protocol for Assessing Electrochemical Performance	5-32b	SIR and Electrochemical Migration Task Group	Cleaning/Coating/ Contamination
IPC-9203	Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle	5-32b	SIR and Electrochemical Migration Task Group	Cleaning/Coating/ Contamination
IPC-9241	Guidelines for Microsection Preparation	7-12	Microsection Subcommittee	Quality, Reliability, Test, & Inspection
IPC-9252	Requirements for Electrical Testing of Unpopulated Printed Boards	7-32c	Electrical Continuity Testing Task Group	Quality, Reliability, Test, & Inspection
IPC-9262	Specification for Characterization and Verification of Assembly Level Automatic Optical Inspection Equipment	7-32cn	Automatic Optical Inspection Characterization and Verification Subcommittee`	Quality, Reliability, Test, & Inspection
IPC/ JEDEC-9301	Numerical Analysis Guidelines for Microelectronics Packaging Design and Reliability	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC-9505	Guideline Methodology for Assessing Component and Cleaning Materials Compatibility	5-31j	Cleaning Compatibility Task Group	Cleaning/Coating/ Contamination
IPC-9631	User Guide for IPC-TM-650, Method 2.6.27, Thermal Stress, Convection Reflow Assembly Simulation	D-32	Thermal Stress Test Methodology Subcommittee	Quality, Reliability, Test, & Inspection
IPC-9641	High Temperature Printed Board Flatness Guideline	6-11	Printed Board Coplanarity Subcommittee	Quality, Reliability, Test, & Inspection

IPC Reference Standards

DOCUMENT NUMBER	DOCUMENT TITLE	COMMITTEE CODE	COMMITTEE TITLE	MEETING FOCUS AREA
IPC-9691	User Guide for the IPC-TM-650, Method 2.6.25, Conductive Anodic Filament (CAF) Resistance Test (Electrochemical Migration Testing)	5-32e	Conductive Anodic Filament (CAF) Task Group	PCB Fabrication and Materials
IPC-9701	Qualification and Performance Test Methods for Surface Mount Solder Attachments	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC/ JEDEC-9702	Monotonic Bend Characterization of Board-Level Interconnects	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC/ JEDEC-9704	Printed Circuit Assembly Strain Gage Test Guideline	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC/ JEDEC-9706	Mechanical Shock In-situ Electrical Metrology Test Guidelines for FCBGA SMT Component Solder Crack and Pad Crater/Trace Crack Detection	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC/ JEDEC-9707	Spherical Bend Test Method for Characterization of Board Level Interconnects	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC-9708	Test Methods for Characterization of Printed Board Assembly Pad Cratering	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC-9709	Test Guidelines for Acoustic Emission Measurement during Mechanical Test	6-10d	SMT Attachment Reliability Test Methods Task Group	Assembly Processes
IPC-9797	Press-fit Standard for Automotive Requirements and other High-Reliability Applications	5-21m	Cold Joining Press-fit Task Group	Assembly Processes
IPC-HDBK-9798	Handbook for Press-fit Standard for Automotive Requirements and Other High-Reliability Applications	5-21n	Cold Joining Press-fit Handbook Task Group	Assembly Processes
IPC-9850	Surface Mount Equipment Performance Characterization	5-41	SMT Component Placement Equipment Subcommittee	Assembly Processes
IPC-HERMES-9852	The Global Standard for Machine-to-Machine Communication in SMT Assembly	Hermes Initiative	The Hermes Standard Initiative	PCB Fabrication and Materials, Assembly Processes
IPC-TM-650	Test Methods Manual	Various	Various	Quality, Reliability, Test, & Inspection
IPC-QRG-PTH	Through-Hole Solder Joint Evaluation Desk Reference Manual		IPC Education	Quality, Reliability, Test, & Inspection
IPC-QRG-SMT	Surface Mount Solder Joint Evaluation Desk Reference Manual		IPC Education	Quality, Reliability, Test, & Inspection
IPC-DRM-WHA	Wire Preparation & Crimping		IPC Education	Quality, Reliability, Test, & Inspection
IPC-DRM-18	Component Identification Desk Reference Manual		IPC Education	Quality, Reliability, Test, & Inspection

Italicized document titles refer to industry-specific document addendums that must be used with the same revision of their respective document. For more information on IPC's library, please contact **answers@ipc.org**.

IPC Standards — Everything You Need from Start to Finish



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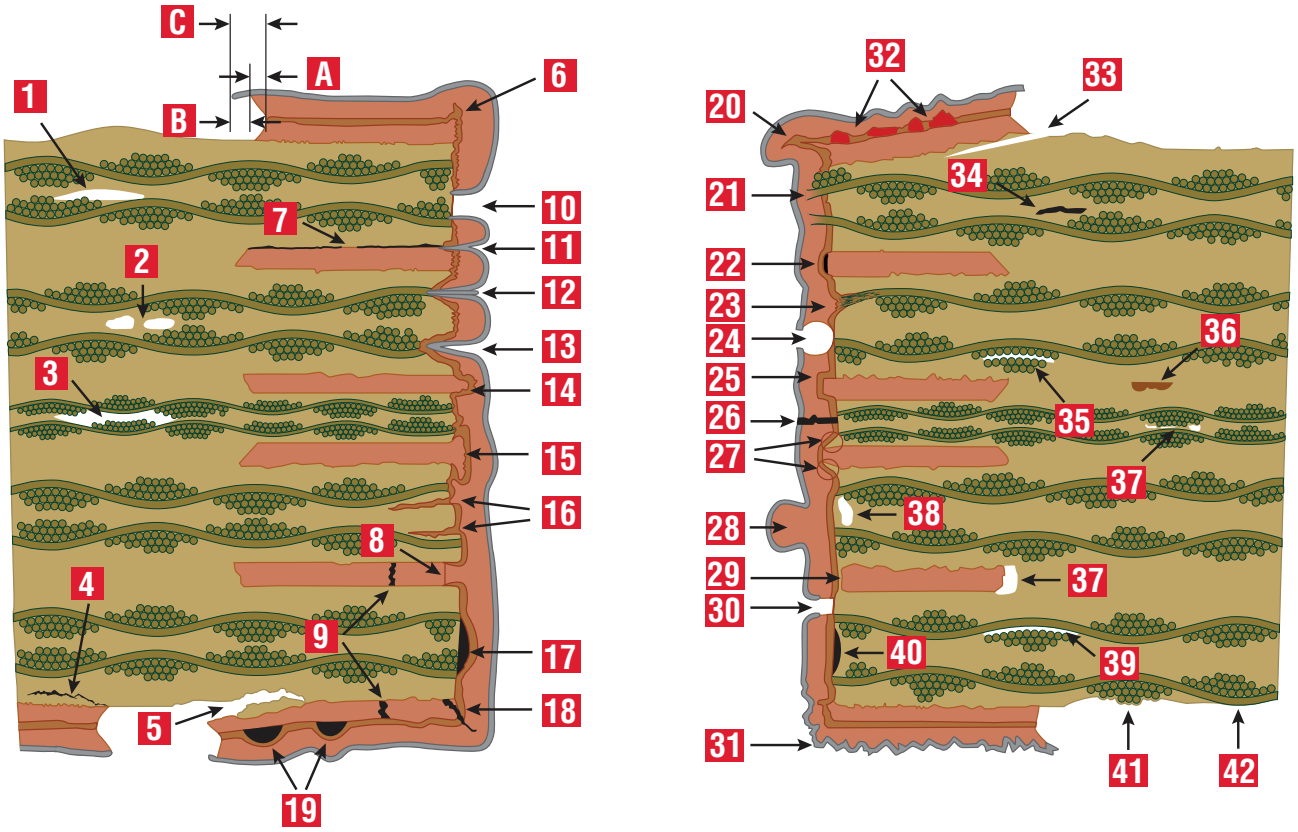
June 2023

Phenomena in Cross Section of Plated Through Holes

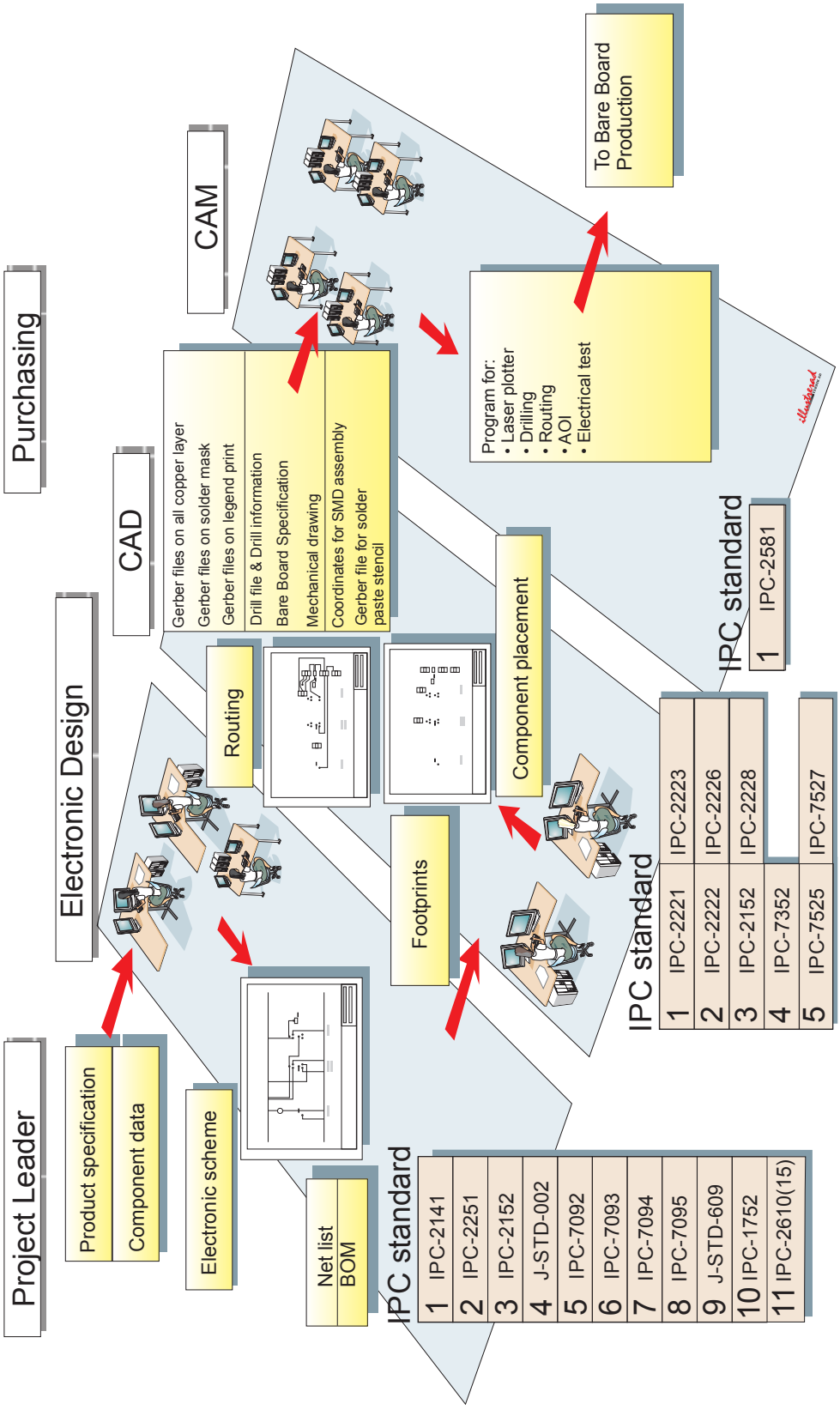


A Undercut
B Outgrowth
C Overhang

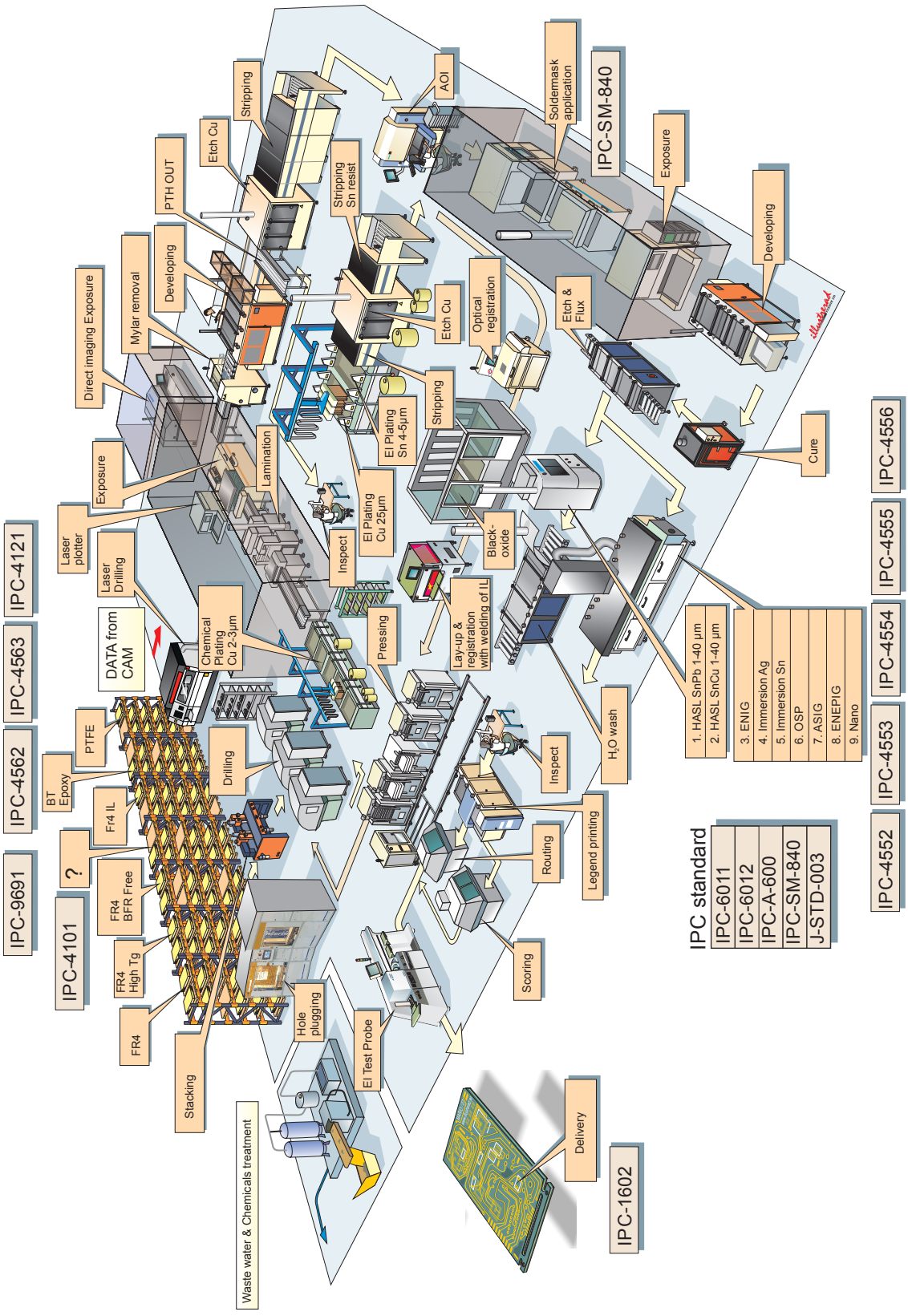
1 (Resin) Blistering
2 Laminate Void
3 (Resin) Delamination
4 Pad Cratering
5 Lifted Land Crack
6 Burr
7 Bond Enhancement removed — “Pink Ring”
8 Negative Etchback
9 Foil Crack
10 Hole Plating Void
11 Wedge Void
12 Glass Fiber Void
13 Glass Bundle Void
14 Severe Etchback
15 Nail Heading
16 Drill Wall Tear/Wicking
17 Hole Wall Pull Away
18 Corner Crack
19 (Copper) Blistering

20 Burr Pushed Into Hole
21 Glass Fiber Protrusion
22 Innerlayer (Post) Separation
23 Wicking
24 Over Plating Resist Void
25 (Positive) Etchback
26 Barrel Crack
27 Shadowing
28 Nodule
29 Resin Smear
30 Copper & Over Plate Void
31 Burned Plating
32 Copper Foil Contamination
33 Lifted Land
34 Resin Crack Delamination
35 Crazing
36 Foreign Inclusion
37 Prepreg Void
38 Copper Clad Laminate Void
39 Measling
40 Resin Recession
41 Glass-Weave Texture
42 Glass-Weave Exposure

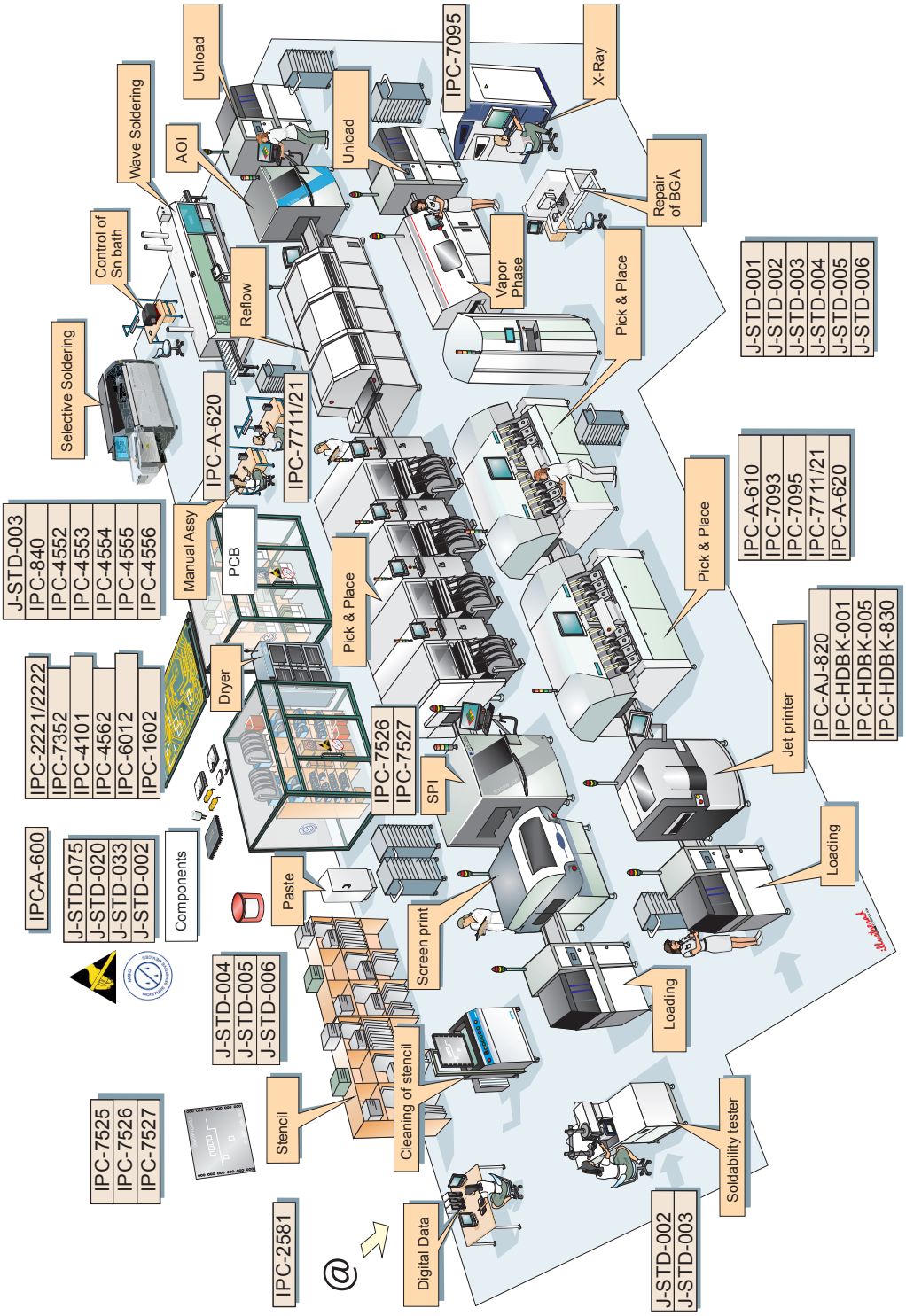
CAD Text Standards — Design



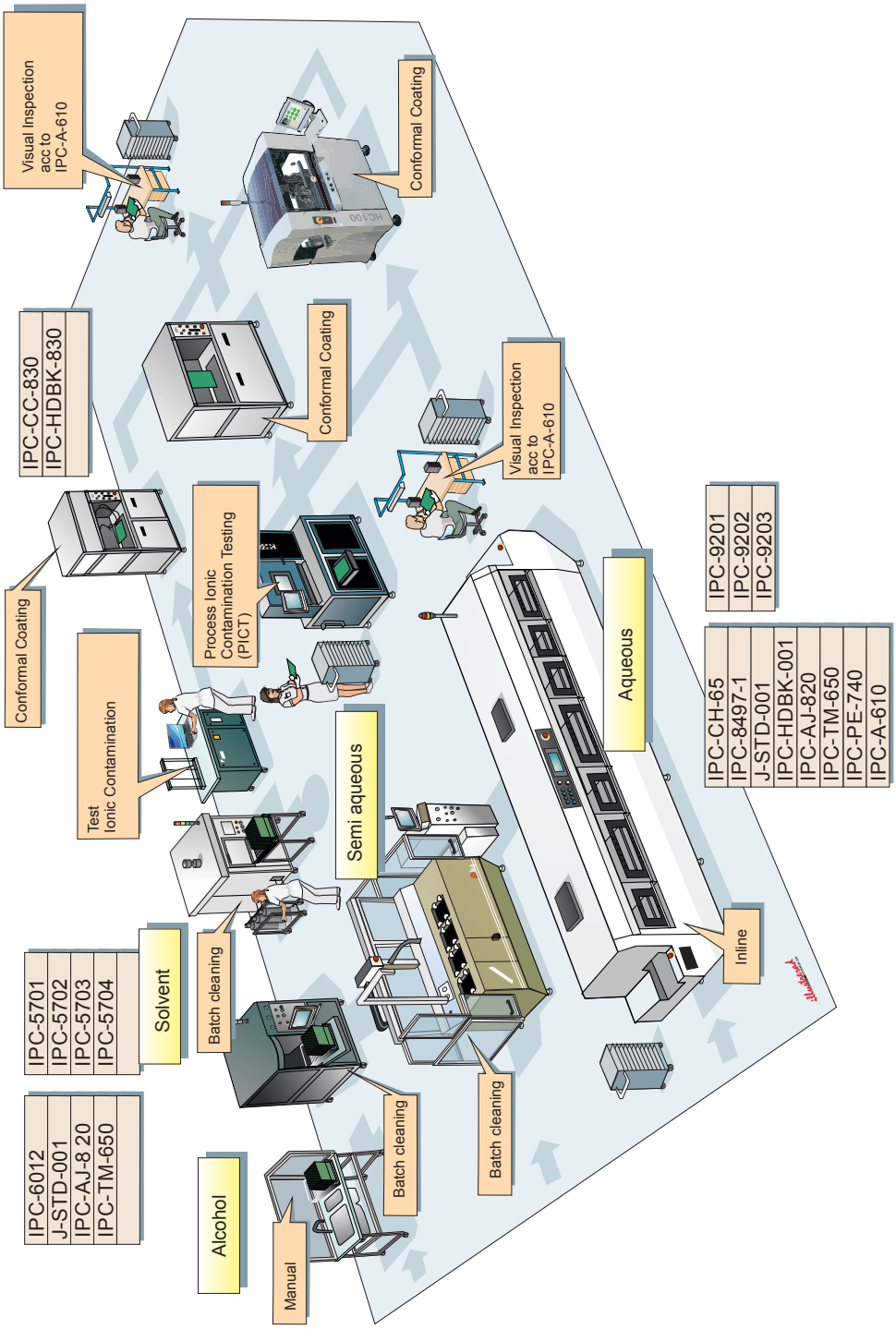
PCB with IPC Standards



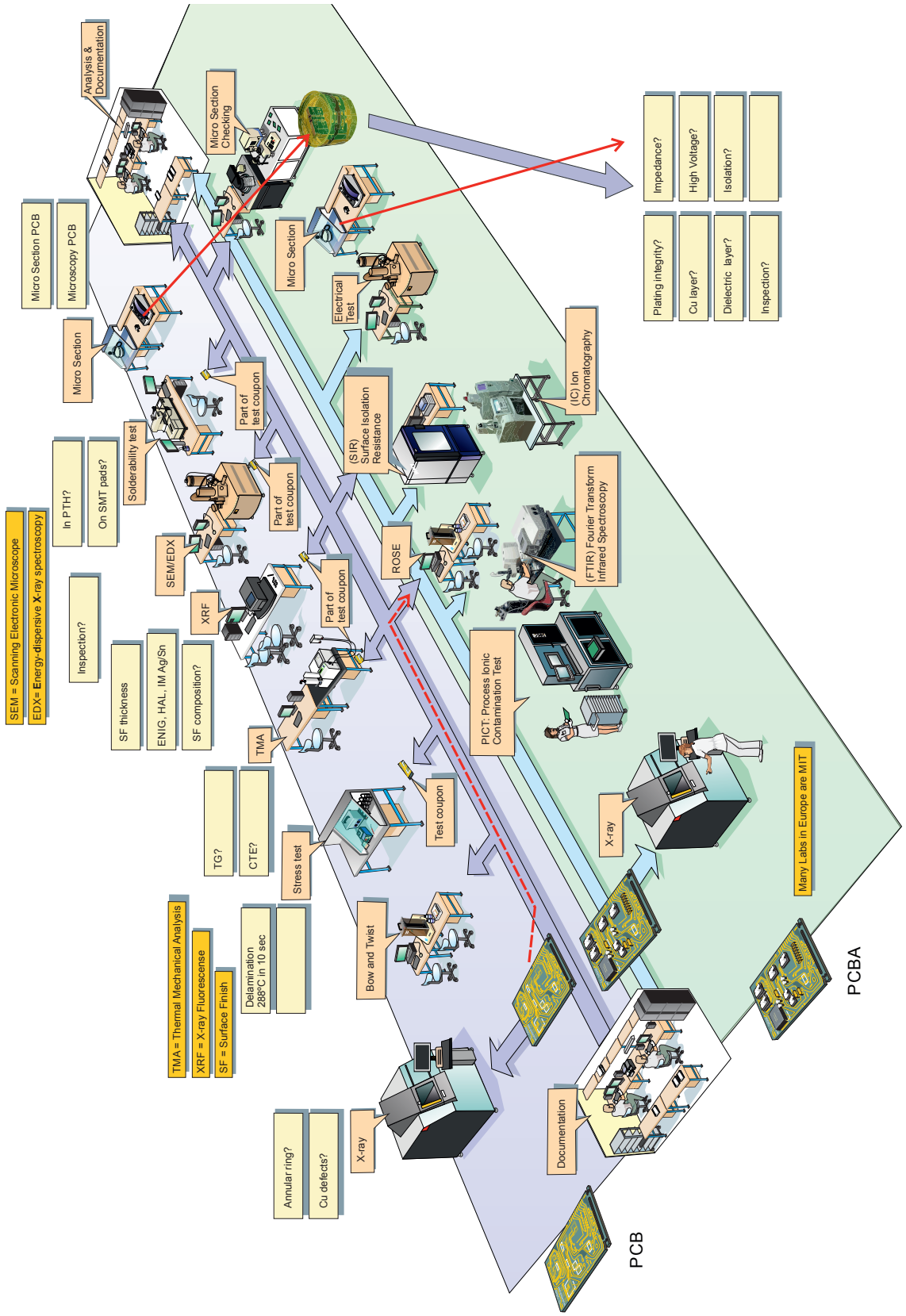
PCBA with IPC Standards —Soldering and Assembly



Cleaning and Coating with IPC Standards



Lab — Board/Assembly Quality Check



Notes

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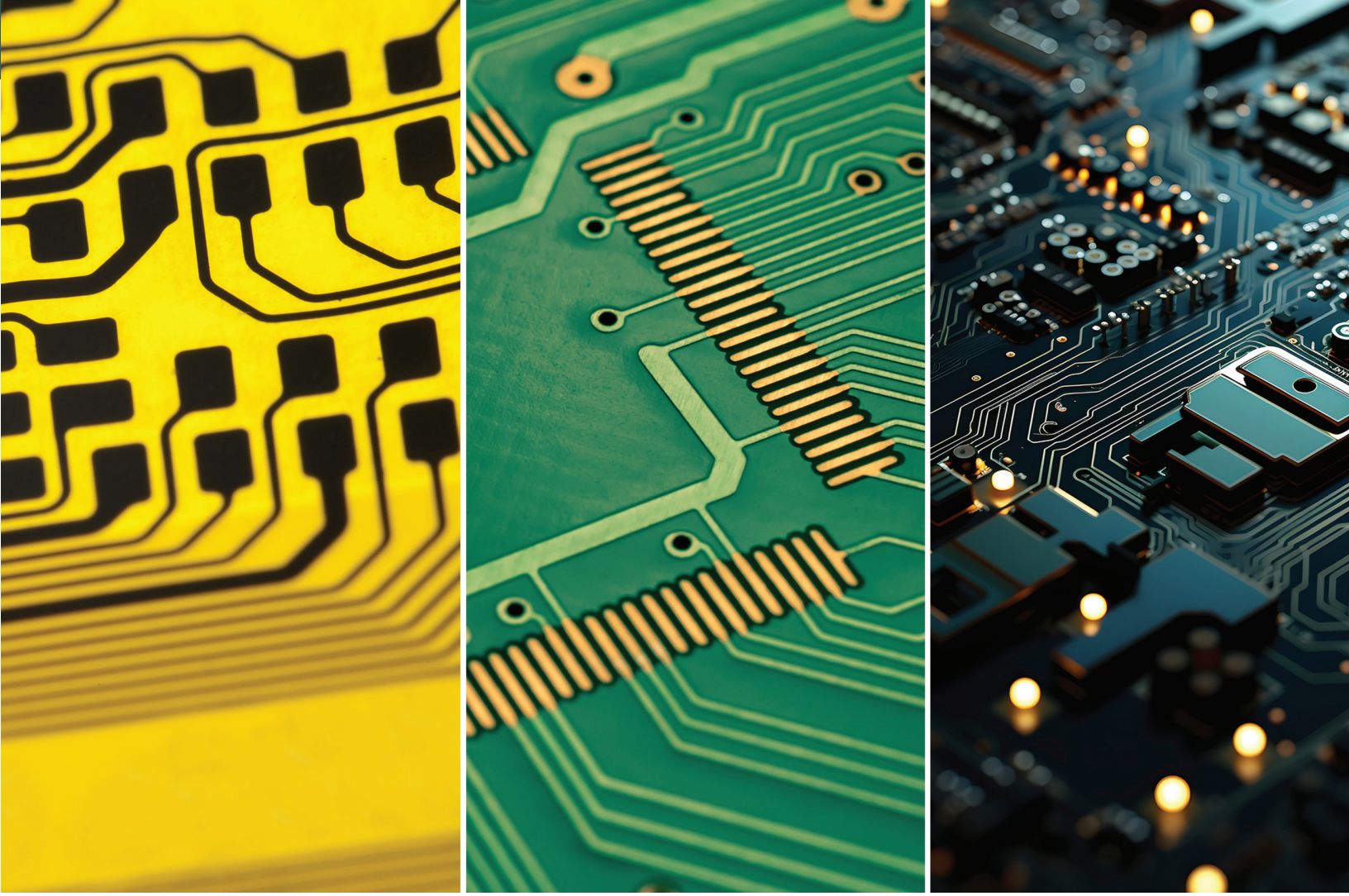

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3000 Lakeside Drive, Suite 105 N
Bannockburn, IL 60015

847-615-7100 **tel**
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