Division of Apprenticeship Standards (DAS)

Apprenticeship Program Summary Sheet

To: Adele Burnes, Chief
From: Tony Pena
CC: Program Planning and Review
Date: April 18, 2025

Program Name: IPC
Industry: Advanced Manufacturing
DAS File No.: 101362
Grant Awardee: ☒ No ☐ Yes

Actions:

- ☒ Proposed new apprentice program
- ☐ Existing apprenticeship program adding new occupations
- ☐ Existing apprenticeship program expanding area of operations
- ☐ Existing apprenticeship program changing work processes on approved occupations.

Labor Organizations Representing Any of the Apprentices:

None

Request for Approval under Labor Code 3075:

IPC is not intended to train in the building and construction trades and is not eligible to dispatch apprentices to projects with public works, prevailing wage or skilled and trained workforce requirements within the meaning of Labor Code sections 1720 and 3075 and will not train or dispatch apprentices in the building and construction trades or firefighters occupations.

Comments:

IPC International, the global trade association for the electronics manufacturing industry, is dedicated to building a skilled and sustainable workforce through innovative training and certification programs. As both the program sponsor and provider of Related Technical Instruction (RTI), IPC partners with employers nationwide to develop a highly trained workforce that meets the evolving demands of the electronics sector. The IPC Registered Apprenticeship Program for Electronics Assembler, PCB Fabricator, and PCB Design Engineer occupations is designed to address critical skills gaps and enhance the quality and consistency of manufacturing processes. By combining structured on-the-job training with industry-recognized certifications, apprentices gain practical skills that directly align with employer needs. IPC's flexible training model allows companies to seamlessly integrate apprentices into their

production environments while reducing onboarding and training time. Through IPC's apprenticeship programs, employers benefit from developing a pipeline of skilled workers who are proficient in the latest standards and practices, while apprentices gain valuable hands-on experience and career advancement opportunities. IPC seeks approval from the Department of Industrial Relations, Division of Apprenticeship Standards to continue strengthening the electronics manufacturing workforce through this vital training initiative.

IPC will oversee the apprenticeship program herein and seeks approval from the Department of Industrial Relations, Division of Apprenticeship Standards for the following:

Proposed Occupation, Wage Rate & O*Net Code:

- Electronic Assembler O*Net: 51-2022.00
  Professional Worker Wage: $23.42 per hour
  Proposed Apprentice Wage: $21.42 per hour
  Proposed No. of Apprentices: 50

- Printed Circuit Board Fabricator O*Net: 17-3023.00
  Professional Worker Wage: $23.42 per hour
  Proposed Apprentice Wage: $21.42 per hour
  Proposed No. of Apprentices: 50

- Printed Circuit Board Design Engineer O*Net: 17-3012.00
  Professional Worker Wage: $26.42 per hour
  Proposed Apprentice Wage: $21.42 per hour
  Proposed No. of Apprentices: 50

Proposed Employers:

- Circuit Assembly Corp. – 6 Autry Suite 150, Irvine, CA 92618
  - Occupation(s): Electronic Assembler, Printed Circuit Board Fabricator, Printed Circuit Board Design Engineer

DAS FILE # 101362

IPC
Program Standards

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Article I Purpose and Policy

The parties hereto declare it to be their purpose and policy to establish an organized, planned system of apprenticeship, conducted as an education-sponsored, employer-based undertaking.

These standards have, therefore, been adopted and agreed upon under the Shelley-Maloney Apprentice Labor Standards Act of 1939, as amended, to govern the employment and training of apprentices in the trade, craft, or occupation defined herein, to become effective upon their approval.

Article II Craft, Trade or Occupation, Related and Supplemental Instruction, Term of Apprenticeship, Ratio, Wage Schedule, and Work Training

Occupation	O*Net Code	Attachment
Electronic Assembler	51-2022.00	B-1
Printed Circuit Board Fabricator	17-3023.00	B-2
Printed Circuit Board Design Engineer	17-3012.00	B-3

Article III Organization

For each employer participating in this program, an “Employer Agreement” (See Attachment D) will be provided to specify the information particular to that employer as noted herein, including the option to waive or offer participation on the committee, employer committee members will be selected as outlined in the rules & regulations.

Article IV Jurisdiction

These standards shall apply to the employer and employee organizations signatory hereto; their members, to other employers who subscribe hereto or who are party to a collective bargaining agreement with an employee organization(s) signatory hereto, and to all apprentice agreements hereunder.

Area Covered by Standards: All CA Counties

Article V Functions

The functions of the apprenticeship committee shall be to:

1) develop an efficient program of apprenticeship through systematic on-the-job training with related and supplemental instruction and periodic evaluation of each apprentice;

2) serve in an advisory capacity with employers and employees in matters pertaining to these standards;
3) ensure the program's ability, including financial ability, and commitment to meet and carry out its responsibilities under federal and state law and regulations applicable to the apprenticeable occupation and for the welfare of the apprentice;
4) aid in the adjustment of apprenticeship disputes;
5) develop fair and impartial selection procedures and an affirmative action plan in accordance with existing laws and regulations, and apply them uniformly in the selection of applicants for apprenticeship.

Article VI Responsibilities

The responsibilities of the apprenticeship committee shall be to:

1) supervise the administration and enforcement of these standards;
2) adopt such rules and regulations as are necessary to govern the program provided that the rules and regulations do not conflict with these standards;
3) conduct orientations, workshops, or other educational sessions for employers to explain the apprenticeship program's standards and the operation of the apprenticeship program;
4) pass upon the qualification of employers and, when appropriate, to suspend or withdraw approval;
5) conduct on-going evaluation of the interest and capacity of employers to participate in the apprenticeship program and to train apprentices on the job;
6) make periodic evaluations of each apprentices on-the-job training and related and supplemental instruction;
7) ensure safe work site facilities, skilled workers as trainers at the work site, and safe equipment sufficient to train apprentices;
8) determine the qualifications of apprentice applicants and ensure fair and impartial treatment of applicants for apprenticeship selected through uniform selection procedures;
9) file a signed copy, written or electronic, of each apprentice agreement with the Division of Apprenticeship Standards, within 30 days of execution, with copies to all parties to the agreement;
10) establish and utilize a procedure to record and maintain all records of the apprentice's worksite job progress and progress in related and supplemental instruction;
11) establish and utilize a system for the periodic review and evaluation of the apprentice's progress in job performance and related instruction;
12) discipline apprentices, up to and including termination, for failure to fulfill their obligations on-the-job or in related instruction, including provisions for fair hearings;

13) annually prepare and submit a Self-Assessment Review as well as a Program Improvement Plan to the Chief of the Division of Apprenticeship Standards;
14) ensure training and supervision, both on the job and in related instruction, in first aid, safe working practices and the recognition of occupational health and safety hazards;
15) ensure training in the recognition of illegal discrimination and sexual harassment;
16) establish an adequate mechanism to be used for the rotation of the apprentice from work process to work process to assure the apprentice of complete training in the apprenticeable occupation including mobility between employers when essential to provide exposure and training in various work processes in the apprenticeable occupation;
17) establish an adequate mechanism that will be used to provide apprentices with reasonably continuous employment in the event of a lay-off or the inability of one employer to provide training in all work processes as outlined in the standards;
18) comply with meaningful representation requirements for the interests of apprentices in the management of the program where apprentices are at least equally represented on an advisory panel established by the apprenticeship committee responsible for the operation of the program;
19) adopt changes to these standards, as necessary, subject to the approval of the parties hereto and the Chief of the Division of Apprenticeship Standards.

Article VII Definition of an Apprentice

An apprentice is a person at least 16 years of age, who has met the requirements for selection under the selection procedures of participating employer, who is engaged in learning a designated craft or trade, and who has entered into a written apprentice agreement under the provisions of these standards.

Article VIII Duties of an Apprentice

Each apprentice shall satisfactorily perform all work and learning assignments both on the job and in related instruction and shall comply with the rules, regulations, and decisions of the apprenticeship committee.

Article IX Apprentice Agreement

1) Each apprentice agreement shall conform to the State law governing apprentice agreements, and shall be signed by the employer, by the program sponsor, and by the apprentice and must be approved by the apprenticeship committee.
2) Each apprentice shall be furnished a copy of or be given an opportunity to study these standards before registration. These standards shall be considered a part of the apprentice agreement as though expressly written therein.

3) If the apprentice is under 18 years of age, the agreement must be signed by the apprentice's parent or guardian. When the period of training extends beyond 18, the apprentice agreement shall likewise be binding to such a period as may be covered.

Article X Termination and Transfer of Agreements

1) During the probationary period, an apprentice agreement shall be terminated by the apprenticeship committee at the request in writing of either party. After such probationary period, an apprentice agreement may be terminated by the Administrator by mutual agreement of all the parties thereto or cancelled by the Administrator for good and sufficient reason.
2) If an employer is unable to fulfill his/her obligations to train under any apprentice agreement or in the event of a layoff, the apprenticeship committee may, with the approval of the Administrator, transfer such agreement to any other employer if the apprentice consents, and such other employer agrees to assume the obligation of said apprentice agreement.

Article XI Lay-off

1) If for any reason a lay-off of an apprentice occurs, the apprentice agreement shall remain in effect unless cancelled by the Administrator. However, credit for related instruction shall be given when the apprentice continues such instruction during the lay-off.
2) There shall be no liability on the part of the employer, the program, or the committee for an injury sustained by an apprentice engaged in schoolwork at a time when the apprentice is unemployed.

Article XII Controversies

All controversies or differences concerning apprentice agreements that cannot be adjusted locally by the apprenticeship committee or otherwise shall be submitted to the Administrator for determination.

Article XIII Certificate of Completion

1) In addition to previous on-the-job training and related school instruction, which is of an approved nature, the Apprentice shall have completed not less than an additional six (6) months as an apprentice under the laws of the State of California and demonstrated mastery of the skills and knowledge of the prescribed program.

2) In recognition of unusual ability and progress, the apprenticeship committee may decrease the term of apprenticeship for an individual apprentice not more than twelve and one-half percent (12½%).
3) Upon evidence of satisfactory completion of apprenticeship, and upon the recommendation of the apprenticeship committee, each apprentice will be issued a Certificate of Completion by the authority of the Chief of the Division of Apprenticeship Standards and the Interagency Advisory Committee on Apprenticeship.

Article XIV Equal Opportunity in Apprenticeship

The recruitment, selection, employment and training of apprentices during their apprenticeship shall be without discrimination because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation or veteran or military status.

IPC will ensure selection procedures meet objective standards and maintain a fair and equitable selection process for all applicants.

Article XV Written Applications

Explore IPC Apprenticeships at https://www.electronics.org/apprenticeships for an overview of programs, benefits, eligibility requirements, and application steps, plus the most up-to-date list of available apprenticeship occupations.

Article XVI Records

All records will be maintained, in written or electronic form, for five (5) years and kept at:

IPC
3000 Lakeside Drive, Suite 105 N,
Bannockburn, IL 60015

Article XVII Annual Compliance

IPC will submit an annual compliance report to the Division of Apprenticeship Standards as requested by the Division.

IPC agrees to accept electronic signatures for these Division of Apprenticeship Standards and all related Division of Apprenticeship Standards documents.

The foregoing standards are hereby agreed to and adopted by IPC on December 15, 2025 (Committee approval date).

Employer Organization

IPC

3000 Lakeside Drive, Suite 105 N, Bannockburn, IL 60015

_____ _____

Coreen Blaylock, Director Workforce Partnerships Date

The foregoing apprenticeship standards, being in conformity with the applicable California Labor Code, California Code of Regulations and Federal Regulations, are hereby approved

_____.

(DAS approval date)

_____ _____

Adele Burnes, Chief Date

Division of Apprenticeship Standards

DAS FILE # 101362

Attachment B-1
Training Schedule and Working Conditions

IPC

Occupation

Occupation: Electronic Assembler
O*Net Code: 51-2022.00

Article I Term of Apprenticeship and Probation

The standard term of apprenticeship shall be a competency-based approach, with approximately 2,000 on-the-job training (OJT) hours, 175 related and supplemental instruction (RSI) hours, and completed within approximately 12 months.

The period of probation shall be reasonable in relation to the full apprenticeship term, with full credit given for such period toward completion of the apprenticeship, and in no event shall exceed the shorter of 25 percent of the length of the program or one year. The period of probation shall be three (3) months.

Article II Wage Schedule

Professional Worker Wage:

$ 23.42 per hour effective 12/1/2025.

Apprentice Wage and Advancement Schedule:

In no case shall an Apprentice receive a starting wage that is less than the applicable federal, state, or local entity (city or county) minimum wage, whichever is higher for the county or city where the apprentice is working. The applicable minimum wage law shall establish the effective date of the minimum wage.

To advance from one period to the next, the apprentice shall have met the following requirements:

1st period	0 Competencies	$ 21.42 /hour
2nd period	100% Competencies	$ 23.42 /hour

Apprentices may receive worker benefits at the discretion of the employer.

Hours of Work and Working Conditions and Overtime Provision:

Eight (8) hours of labor constitutes a day's work. Employment beyond eight (8) hours in any workday or more than six (6) days in any workweek requires the employee to be compensated for the overtime at not less than one and one-half times the employee's regular rate of pay for all hours worked in excess of eight (8) hours, up to and including 12 hours in any workday, and for the first eight (8) hours worked on the seventh (7) consecutive day of work in a workweek; and double the employee's regular rate of pay for all hours worked in excess of 12 hours in any workday and for all hours worked in excess of eight (8) on the seventh (7) consecutive day of work in a workweek. If employers utilize an alternative workweek schedule in accordance with the California Industrial Welfare Commission Orders, the overtime will be determined and paid in accordance with the applicable alternative workweek provisions.

The workday and workweek and all other conditions of employment for apprentices shall conform to all applicable laws and regulations and shall not be greater than for those of a professional worker.

Overtime shall not be allowed if it will interfere with or impair the training or be detrimental to the health and safety of the apprentice.

ARTICLE III Work-Training

1) The employer shall see that all apprentices are under the supervision of a qualified professional worker or instructor and shall provide the necessary diversified experience and training in order to develop the apprentice into a proficiently skilled worker, as outlined herein.
2) Each apprentice shall be trained in the use of new equipment, materials, and processes as they come into use in the occupation.
3) The major categories in which apprentices will be trained (although not necessarily in the order listed) are as follows:

Competency Check List
Demonstrates Fundamentals: Apprentice can perform the task with some coaching.
Proficient in Task: Apprentice performs task properly and consistently.
Completion Date: Date apprentice completes final demonstration of competency.
Detailed Work Activities: Initial and date each task when Competency Check List has been completed.

1. **Operate Machinery and Tooling**
   a. Operate various machinery and modify settings as needed to meet design specifications.
   b. Position and align subassemblies in jigs or fixtures, using measuring instruments and following blueprint lines and/or index points.
   c. Align, fit, assemble, connect, or install system components, using jigs, fixtures, measuring instruments, hand tools, or power tools.

2. **Review and assemble according to blueprints or other instructions to determine operational methods or sequences.**
   a. Read blueprints, illustrations, or specifications to determine layouts, sequences of operations, or identities or relationships of parts to assemble hardware.

3. **Soldering**
   a. Place and solder resistors, diodes, capacitors, transistors, wires, and integrated circuits onto printed circuit boards needed for assembly or installation, using shop machinery or equipment according to standards and/or specifications.

4. **Inspect installed components or assemblies**
   a. Inspect or test installed units, parts, systems, or assemblies for fit, alignment, performance, defects, or compliance with standards, using measuring instruments or test equipment.
   b. Perform quality checks to identify faulty components to rework and replace them as required.

5. **Rework or Repair parts or assemblies**
   a. Adjust, repair, rework, or replace parts or assemblies to ensure proper operation in compliance with standards.

6. **Maintain a clean and safe work environment**
   a. Move equipment, material, and tools within the immediate production area to maintain a clean and safe work environment.

7. **Assemble electrical or electronic equipment**
   a. Align, fit, assemble, connect, or install system components, using jigs, fixtures, measuring instruments, hand tools, or power tools.
   b. Fabricate and assemble prototypes, production, or integrated-technology hardware for new, existing, or emerging technologies related to assemblies, sub-assemblies, cables, harnesses, printed circuit boards, or similar electronic components as required.

8. **Operate mechanical components in production equipment**
   a. Install, align, fit, assemble, connect, or install system components, using jigs, fixtures, measuring instruments, hand tools, or power tools to meet design specifications.

9. **Mark products, workpieces, or equipment with identifying information**
   a. Mark identifying information on tubing or production assemblies, using etching devices, labels, rubber stamps, or other approved methods.

10. **Measure dimensions of completed products or workpieces to verify conformance to specifications**
    b. Verify dimensions of assemblies or components, using measuring instruments.

Apprenticeship Competencies – Behavioral

In addition to mastering all the essential technical competencies, an apprentice must consistently demonstrate at an acceptable level the following behavioral competencies in order to complete the apprenticeship. Behavioral competencies embrace the core values and beliefs of a business organization's culture. They apply across all positions and all occupations of that organization and must be demonstrated as an apprenticeship and as a fully competent worker.

- Maintains an acceptable attendance record
- Reports to work on time
- Completes assigned tasks on time
- Follows safety rules
- Demonstrates respect for co-workers and supervisors
- Maintains a positive attitude
- Cooperate with and assist co-workers
- Follows instructions/directions
- Works under supervision
- Accepts constructive feedback and criticism
- Adheres to work policies/rules/regulations
- Take care of equipment and workplace
- Keeps work area neat and clean
- Meets supervisor's work standards
- Demonstrates trust, honesty, and integrity

ARTICLE IV Related Instruction

Apprentices shall satisfactorily complete prescribed courses of related and supplemental instruction, which will not be less than 175 hours per year. Related and supplemental instruction will be provided by IPC and sanctioned by El Camino College.

Time spent in related and supplemental instruction may not be compensated.

Courses	Hours
Apprenticeship Employer Onboarding	16
ESD Control for Electronics Manufacturing	1
Safety for Electronics Manufacturing	1
Foreign Object Debris/Damage	1
Electronics Assembly for Operators	40
IPC Soldering Fundamentals I	20
IPC J-STD-001 for Operators	8
IPC J-STD-001 Certification (Certified IPC Specialist)	40
IPC A 610 for Operators	8
IPC A 610 Certification (Certified IPC Specialist)	40
Total	**175**

Course Topic Descriptions

Category: Apprenticeship Employer Onboarding

Knowledge Topics: This course introduces participants to the employer site tools, workflows, practices, and procedures in an electronics manufacturing environment. In the absence of an employer-provided anti-harassment training component of the onboarding process, Anti-Harassment Training, provided by the Office of Apprenticeship, will be used.

Estimated Hours: 16 hours

Category: Electro Static Discharge (ESD) Control for Electronics Manufacturing

Knowledge Topics: Introduce participants to the causes of ESD and the steps you can take to mitigate its effects when handling, storing or transporting ESD-sensitive components in a manufacturing facility. These preventive measures and their application are based on American Nation Standards Institute (ANSI)/ESD.

Estimated Hours: 1 hour

Category: Safety for Electronics Manufacturing

Knowledge Topics: This course introduces participants to the most common safety practices and workplace hazards in electronics manufacturing. After completing this course, participants will be able to employ the key tools, materials, and processes designed to keep you and your coworkers safe within a manufacturing facility.

Estimated Hours: 1 hour

Category: Foreign Object Debris

Knowledge Topics: In this course, participants learn to identify the causes of foreign object debris and how to use the tools, materials, and processes designed to control its damaging effects. The best practices outlined in this course are based on industry consensus standards such as IPCs Guidance for the Development and Implementation of a Foreign Object Debris Control Plan and the Foreign Object Debris/Damage Prevention Guidance Document.

Estimated Hours: 1 hour

Category: Electronics Assembly for Operators

Knowledge Topics: This course introduces the key concepts, tools, materials, and processes that operators need to know to do their best work. Participants can complete the core set of modules to receive their certificate of qualification, then select among nine voluntary modules for process-specific training. After completing this course, participants will be able to employ the correct procedures for fabricating Printed Circuit Boards (PCBs) within an electronics manufacturing facility.

Estimated Hours: 40 hours

Category: IPC Soldering Fundamentals I

Knowledge Topics: This practical, hands-on course introduces participants to the basic concepts, tools, materials, processes, and skills required to hand solder through-hole and surface mount chip components according to industry standards. After completing this course, you will be able to safely solder through-hole and surface mount chip components according to industry standards.

Estimated Hours: 20 hours

Category: IPC J-STD-001 for Operators

Knowledge Topics: This course provides a practical introduction to the terms, concepts, and acceptability requirements of the IPC J-STD-001 standard as they apply to the role of the operator. After completing this course, you will be able to effectively navigate, locate, and apply the criteria specified in the IPC J-STD-001 standard in your role as an electronics assembly line operator, technician, or supervisor.

Estimated Hours: 8 hours

Category: IPC J-STD-001 Certification (Certified IPC Specialist)

Knowledge Topics: Topics Covered in the IPC J-STD-001 Endorsement Program

- General requirements, such as safety, tools and electrostatic discharge (ESD)
- Wire and terminal assembly requirements, demonstrations and laboratory
- Through-hole technology requirements, demonstrations and laboratory
- Surface mount technology requirements, demonstrations and laboratory
- General soldered connection acceptance requirements (including Lead Free)
- Machine and reflow soldering process requirements
- Test methods and related standards

Estimated Hours: 40 hours

Category: IPC A 610 for Operators

Knowledge Topics: After completing this course, you will be able to effectively navigate, locate, and apply the criteria specified in the IPC-A-610 standard in your role as an electronics assembly line operator, technician, or supervisor.

Estimated Hours: 8 hours

Category: IPC A 610 Certification (Certified IPC Specialist)

Knowledge Topics:

- Establishing and maintaining integrity of the certification program
- Purpose and application of IPC-A-610
- Hardware installation
- Soldering criteria, including lead free connections
- Soldered requirements for connecting to terminals
- Soldered connection requirements for plated-through holes
- Surface mounting criteria for chip components, leadless and leaded chip carriers
- Swaged hardware and heatsink requirements of mechanical assemblies
- Component mounting criteria for Dual Inline Packages (DIPS), socket pins and card edge connectors
- Jumper wire assembly requirements
- Solder fillet dimensional criteria for all major Surface Mount Technology (SMT) component groups

- Soldering, such as tombstoning, dewetting, voiding and others
- Criteria for component damage, laminate conditions, cleaning and coating

Estimated Hours: 40 hours

ARTICLE V Ratio

The ratio of apprentices to professional workers shall be:

1) Ratio #1: Each professional worker may supervise one (1) apprentice(s)

DAS FILE # 101362

Attachment B-2
Training Schedule and Working Conditions

IPC

Occupation

Occupation: Printed Circuit Board Fabricator
O*Net Code: 17-3023.00

Article I Term of Apprenticeship and Probation

The standard term of apprenticeship shall be a competency-based approach, with approximately 2,000 on-the-job training (OJT) hours, 155 related and supplemental instruction (RSI) hours, and completed within approximately 12 months.

The period of probation shall be reasonable in relation to the full apprenticeship term, with full credit given for such period toward completion of the apprenticeship, and in no event shall exceed the shorter of 25 percent of the length of the program or one year. The period of probation shall be three (3) months.

Article II Wage Schedule

Professional Worker Wage:

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Apprentice Wage and Advancement Schedule:

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To advance from one period to the next, the apprentice shall have met the following requirements:

1st period	0 Competencies	$ 21.42 /hour
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Apprentices may receive worker benefits at the discretion of the employer.

Hours of Work and Working Conditions and Overtime Provision:

Eight (8) hours of labor constitutes a day's work. Employment beyond eight (8) hours in any workday or more than six (6) days in any workweek requires the employee to be compensated for the overtime at not less than one and one-half times the employee's regular rate of pay for all hours worked in excess of eight (8) hours, up to and including 12 hours in any workday, and for the first eight (8) hours worked on the seventh (7) consecutive day of work in a workweek; and double the employee's regular rate of pay for all hours worked in excess of 12 hours in any workday and for all hours worked in excess of eight (8) on the seventh (7) consecutive day of work in a workweek. If employers utilize an alternative workweek schedule in accordance with the California Industrial Welfare Commission Orders, the overtime will be determined and paid in accordance with the applicable alternative workweek provisions.

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ARTICLE III Work-Training

1) The employer shall see that all apprentices are under the supervision of a qualified professional worker or instructor and shall provide the necessary diversified experience and training in order to develop the apprentice into a proficiently skilled worker, as outlined herein.
2) Each apprentice shall be trained in the use of new equipment, materials, and processes as they come into use in the occupation.
3) The major categories in which apprentices will be trained (although not necessarily in the order listed) are as follows:

Competency Check List
Demonstrates Fundamentals: Apprentice can perform the task with some coaching.
Proficient in Task: Apprentice performs task properly and consistently.
Completion Date: Date apprentice completes final demonstration of competency.
Detailed Work Activities: Initial and date each task when Competency Check List has been completed.

1. **Operate Machinery and Tooling**
   a. Operate various machinery and modify settings as needed to meet design specifications.
   b. Position and align subassemblies in jigs or fixtures, using measuring instruments and following blueprint lines and/or index points.
   c. Align, fit, assemble, connect, or install system components, using jigs, fixtures, measuring instruments, hand tools, or power tools.

2. **Review and assemble according to blueprints or other instructions to determine operational methods or sequences**
   a. Read blueprints, illustrations, or specifications to determine layouts, sequences of operations, or identities or relationships of parts to assemble hardware.

3. **Screening**
   a. Identification of serialization requirements and artwork to include screen imaging, mixing ink identifiers, set up of tooling/machinery, and clean up of tooling and work areas.

4. **Plating**
   a. Mix epoxies, resins, polymers, plating, or other material using proper ratios as defined by drawing specifications or data sheets to manually perform or operate machines requiring standard setup, constant monitoring, and periodic adjustment in speed, temperatures and/or chemical levels. Apply mixed material using correct application procedure defined by drawing specification and/or data sheet by operating repetitive plating and wet process machinery to plate circuits on to planes through a deposition process.

5. **Solder Masking**
   a. Check films to be used according to work specifications. Image screens for solder mask. Push solder mask and hand registration of artwork on panels to photo image or automatic solder mask application/processing. Follow applicable pre-clean and clean-up of all tools used. Use of eye loop and inspection of panels. Operate solder mask developer and oven to accomplish final bake time and temperature. Move panels to designated location for continued processing.

6. **Maintain a clean and safe work environment**
   a. Move equipment, material and tools within the immediate production area to maintain a clean and safe work environment.

7. **Lamination**
   a. Check material availability in accordance with work specifications. Check stack up to verify that core layers match. Review prior runs for any changes that may have been made. Clean plates and separators for lay-up room. Knowledge of the process to oxide layers as needed. Lay-up layers and

book panels for lamination with correct identification according to tool number. Books will be loaded into the press to the right recipe and unloaded/breakdown books as required.

8. **Measure dimensions of completed products or workpieces to verify conformance to specifications**
   a. Check completed products for conformance to specifications and for defects by measuring with rulers or micrometers, by checking them visually, with measurement eye loop and/or other methods as required.

9. **Inspect production equipment**
   a. Inspect, clean, and assemble hardware and machinery before beginning work.
   b. Check all dies, templates, and cutout patterns to be used in the manufacturing process to ensure that they conform to dimensional data, photographs, blueprints, samples, or customer specifications.

10. **Select and Fabricate**
    a. Select precut substrate materials as required by specifications for assembly. Knowledge of route setup programs, edit Computer Numerical Control (CNC), counter sinks, counter bore, score setup, programs and/or bevel set up with ability to troubleshoot in process occurrences.

Apprenticeship Competencies – Behavioral

In addition to mastering all the essential technical competencies, an apprentice must consistently demonstrate at an acceptable level the following behavioral competencies in order to complete the apprenticeship. Behavioral competencies embrace the core values and beliefs of a business organization's culture. They apply across all positions and all occupations of that organization and must be demonstrated as an apprenticeship and as a fully competent worker.

- Maintains an acceptable attendance record
- Reports to work on time
- Completes assigned tasks on time
- Follows safety rules
- Demonstrates respect for co-workers and supervisors
- Maintains a positive attitude
- Cooperate with and assists co-workers
- Follows instructions/directions
- Works under supervision
- Accepts constructive feedback and criticism
- Adheres to work policies/rules/regulations
- Take care of equipment and workplace
- Keeps work area neat and clean
- Meets supervisor's work standards
- Demonstrates trust, honesty, and integrity

ARTICLE IV Related Instruction

Apprentices shall satisfactorily complete prescribed courses of related and supplemental instruction, which will not be less than 155 hours per year. Related and supplemental instruction will be provided by IPC and sanctioned by El Camino College.

Time spent in related and supplemental instruction may not be compensated.

Courses	Hours
Apprenticeship Employer Onboarding Employer Onboarding	16
ESD Control for Electronics Manufacturing	1
Safety for Electronics Manufacturing	1
Foreign Object Debris/Damage	1
Printed Circuit Board Fabrication for Operators	40
IPC 6012 for Operators	8
IPC 6012 Certification Endorsement (Certified IPC Specialist)	40
IPC A 600 for Operators	8
IPC A 600 Certification (Certified IPC Specialist)	40
Total	**155**

Course Topic Descriptions

Category: Apprenticeship Employer Onboarding
Knowledge Topics: This course introduces participants to the employer site tools, workflows, practices and procedures in an electronics manufacturing environment.
Estimated Hours: 16 hours

Category: Electrostatic Discharge (ESD) Control for Electronics Manufacturing
Knowledge Topics: Introduce participants to the causes of ESD and the steps you can take to mitigate its effects when handling, storing or transporting ESD-sensitive components in a manufacturing facility. These preventive measures and their application are based on American Nation Standards Institute (ANSI)/ESD S20.20 and other relevant standards.
Estimated Hours: 1 hour

Category: Safety for Electronics Manufacturing
Knowledge Topics: This course introduces participants to the most common safety practices and workplace hazards in electronics manufacturing. After completing this course, participants will be able to employ the key tools, materials, and processes designed to keep you and your coworkers safe within a manufacturing facility.
Estimated Hours: 1 hour

Category: Foreign Object Debris
Knowledge Topics: In this course, participants learn to identify the causes of foreign object debris and how to use the tools, materials, and processes designed to control its damaging effects. The best practices outlined in this course are based on industry consensus standards such as IPCs Guidance for the Development and Implementation of a Foreign Object Debris Control Plan and the the Foreign Object Debris/Damage Prevention Guidance Document.
Estimated Hours: 1 hour

Category: Printed Circuit Board Fabrication for Operators
Knowledge Topics: This course introduces the key concepts, tools, materials, and processes that operators need to know to do their best work. Participants can complete the core set of modules to receive their certificate of qualification, then select among nine voluntary modules for process specific training. After completing this course, participants will be able to employ the correct procedures for fabricating Printed Circuit Boards (PCBs) within an electronics manufacturing facility.
Estimated Hours: 40 hours

Category: IPC 6012 for Operators
Knowledge Topics: This course provides a practical introduction to the terms, concepts, and acceptability requirements of the IPC A 6012 standard as they apply to the role of the PCB Fabricator. After completing this course, you will be able to effectively navigate, locate, and apply the criteria specified in the IPC 6012 standard in your role as an PCB Fabricator, technician, or supervisor.
Estimated Hours: 8 hours

Category: IPC 6012 Certification Endorsement (Certified IPC Specialist**)**
Knowledge Topics: After successfully completing certification requirements to obtain the endorsement for this course, you will be able to effectively navigate, locate and apply the criteria specified in the IPC -6012 standard in your role as a PCB Fabricator, technician, or supervisor. The use of the IPC-6012 and the IPC-A-600 in parallel are encouraged. Any company that uses IPC-6012 or is considering its adoption can use the program to address the training requirement identified in the standard.
Estimated Hours: 40 hours

Category: IPC A 600 for Operators
Knowledge Topics: After successfully completing certification requirement of this course, you will be able to effectively navigate, locate, and apply the criteria specified in the IPC-A-600 standard in your role as PCB Fabricator, technician, or supervisor. Knowledge of acceptance criteria is essential in tracing nonconforming conditions to their origins in the manufacturing process. The IPC-A-600 Training and Certification Program establishes the important relationship between the IPC-A-600 and the IPC-6012. This program also makes a powerful statement to users of printed boards that a company is serious about continuous quality improvement. This certification demonstrates an industry-recognized, technically accurate credential for anyone involved in PCB fabrication.
Estimated Hours: 8 hours

Category: IPC A 600 Certification (Certified IPC Specialist**)**
Knowledge Topics: This certification course provides a practical introduction to the terms, concepts, and acceptability requirements of the IPC A 600 standard as they apply to the role of the PCB Fabricator. After completing this course, you will be able to effectively navigate, locate, and apply the criteria specified in the IPC A 600 standard in your role as an PCB Fabricator, technician, or supervisor.
Estimated Hours: 40 hours

ARTICLE V Ratio

The ratio of apprentices to professional workers shall be:

1) Ratio #1: Each professional worker may supervise one (1) apprentice(s)

DAS FILE # 101362

Attachment B-3
Training Schedule and Working Conditions

IPC

Occupation

Occupation: Printed Circuit Board Design Engineer
O*Net Code: 17-3012.00

Article I Term of Apprenticeship and Probation

The standard term of apprenticeship shall be a competency-based approach, with approximately 2,000 on-the-job training (OJT) hours, 158 related and supplemental instruction (RSI) hours, and completed within approximately 12 months.

The period of probation shall be reasonable in relation to the full apprenticeship term, with full credit given for such period toward completion of the apprenticeship, and in no event shall exceed the shorter of 25 percent of the length of the program or one year. The period of probation shall be three (3) months.

Article II Wage Schedule

Professional Worker Wage:

$ 26.42 per hour effective 12/15/2025.

Apprentice Wage and Advancement Schedule:

In no case shall an Apprentice receive a starting wage that is less than the applicable federal, state, or local entity (city or county) minimum wage, whichever is higher for the county or city where the apprentice is working. The applicable minimum wage law shall establish the effective date of the minimum wage.

To advance from one period to the next, the apprentice shall have met the following requirements:

1st period	0 Competencies	$ 21.42 /hour
2nd period	100% Competencies	$ 26.42 /hour

Apprentices may receive worker benefits at the discretion of the employer.

Hours of Work and Working Conditions and Overtime Provision:

Eight (8) hours of labor constitutes a day's work. Employment beyond eight (8) hours in any workday or more than six (6) days in any workweek requires the employee to be compensated for the overtime at not less than one and one-half times the employee's regular rate of pay for all hours worked in excess of eight (8) hours, up to and including 12 hours in any workday, and for the first eight (8) hours worked on the seventh (7) consecutive day of work in a workweek; and double the employee's regular rate of pay for all hours worked in excess of 12 hours in any workday and for all hours worked in excess of eight (8) on the seventh (7) consecutive day of work in a workweek. If employers utilize an alternative workweek schedule in accordance with the California Industrial Welfare Commission Orders, the overtime will be determined and paid in accordance with the applicable alternative workweek provisions.

The workday and workweek and all other conditions of employment for apprentices shall conform to all applicable laws and regulations and shall not be greater than for those of a professional worker.

Overtime shall not be allowed if it will interfere with or impair the training or be detrimental to the health and safety of the apprentice.

ARTICLE III Work-Training

1) The employer shall see that all apprentices are under the supervision of a qualified professional worker or instructor and shall provide the necessary diversified experience and training in order to develop the apprentice into a proficiently skilled worker, as outlined herein.
2) Each apprentice shall be trained in the use of new equipment, materials and processes as they come into use in the occupation.
3) The major categories in which apprentices will be trained (although not necessarily in the order listed) are as follows:

Competency Check List
Demonstrates Fundamentals: Apprentice can perform the task with some coaching.
Proficient in Task: Apprentice performs task properly and consistently.
Completion Date: Date apprentice completes final demonstration of competency.
Detailed Work Activities: Initial and date each task when Competency Check List has been completed.

1. **Create electrical schematics**
   a. Draft schematic drawings of circuit functions and interconnections showing circuit flow and behavior, wiring diagrams, and wiring connection specifications.
   b. Create documentation packages and produce drawing sets to be checked by an engineer.
   c. Use computer-aided design tools or conventional drafting stations, technical handbooks, tables, calculators, or traditional drafting tools, such as boards, pencils, protractors, or T-squares.

2. **Create fabrication drawings for bare printed circuit boards**
   a. Draft detail and fabrication drawings of design routing, circuitry placement, solder mask definition, legend definition, drilling and plating, and other printed circuit board fabrication requirements, using computer-assisted design tools or standard drafting techniques and devices.
   b. Define materials to be used in the Printed Circuit Board (PCB) fabrication.

3. **Evaluate designs or specifications to ensure quality**
   a. Review completed drawings and for accuracy and conformity to standards, requirements, and regulations.

4. **Confer with technical personnel to prepare designs or operational plans**
   a. Consult with engineers to discuss or interpret design concepts or determine requirements of detailed designs.
   b. Review customer specifications and consult with stakeholders to determine Schematic, Printed Circuit Board, Assembly, and Wiring requirements.

5. **Confer with other personnel to resolve design or operational problems**
   a. Confer with engineering staff and other personnel to resolve problems.
   b. Review work orders or procedural manuals and confer with vendors or design staff to resolve problems or modify design.

6. **Collect data about project sites**
   a. Measure factors that affect progress on design completion.
   b. Visit vendors to ensure design meets requirements and standards as defined on the master drawings.

7. **Operate computer systems**
   a. Locate files relating to specified design project in database library, load program into computer, and record completed job data.
   b. Key and program specified commands and engineering specifications into computer system to change functions and test final layout.

8. **Verify mathematical calculations**
   a. Compare element configuration on display screen with engineering schematics and calculate figures to convert, redesign, or modify design.

9. **Generate manufacturing data packages**
   a. Generate computer-aided manufacturing files of final layout design to produce layered data to be used to produce the printed circuit boards and assemblies.

10. **Explain engineering drawings, specifications, or other technical information**
    a. Explain drawings to production or other stakeholders and provide adjustments, as necessary.

11. **Prepare technical reports for internal use**
    a. Write technical reports and draw charts that display statistics and data.

12. **Train personnel on proper operational procedures**
    a. Train students to use Computer-Aided Design tools and to prepare schematic diagrams, PCB fabrication drawings, PCB assembly drawings, block diagrams, control drawings, logic diagrams, integrated circuit drawings, or interconnection diagrams.

13. **Estimate technical or resource requirements for development or production projects**
    a. Prepare and interpret specifications, time, cost, complexity, and other risk factors.

14. **Create electrical schematics**
    a. Draft schematic drawings of circuit functions and interconnections showing circuit flow and behavior, wiring diagrams, and wiring connection specifications.
    b. Create documentation packages and produce drawing sets to be checked by an engineer.
    c. Use computer-aided design tools or conventional drafting stations, technical handbooks, tables, calculators, or traditional drafting tools, such as boards, pencils, protractors, or T-squares.

Apprenticeship Competencies – Behavioral

In addition to mastering all the essential technical competencies, an apprentice must consistently demonstrate at an acceptable level the following behavioral competencies in order to complete the apprenticeship. Behavioral competencies embrace the core values and beliefs of a business organization's culture. They apply across all positions and all occupations of that organization and must be demonstrated as an apprenticeship and as a fully competent worker.

- Maintains an acceptable attendance record

- Reports to work on time
- Completes assigned tasks on time
- Follows safety rules
- Demonstrates respect for co-workers and supervisors
- Maintains a positive attitude
- Cooperate with and assists co-workers
- Follows instructions/directions
- Works under supervision
- Accepts constructive feedback and criticism
- Adheres to work policies/rules/regulations
- Take care of equipment and workplace
- Keeps work area neat and clean
- Meets supervisor's work standards
- Demonstrates trust, honesty, and integrity

ARTICLE IV Related Instruction

Apprentices shall satisfactorily complete prescribed courses of related and supplemental instruction, which will not be less than 158 hours per year. Related and supplemental instruction will be provided IPC and sanctioned by El Camino College.

Time spent in related and supplemental instruction may not be compensated.

Courses	**Hours**
Introduction to Printed Circuit Board (PCB) Design for Manufacturability (Micromodules)	2
Introduction to PCB Design I	36
Introduction to PCB Design II	48
PCB Design for Manufacturability	12
PCB Design – Advanced Course Listing - Apprentice chooses at least one class from the following: • PCB Design for Military & Aerospace Applications • PCB Design for Rigid-Flex Boards • Advanced Design Concepts • PCB Design or Radio Frequency (RF) Boards	36
IPC Certified Interconnect Designer - Basic (CID)	24
Total	**158**

Course Topic Descriptions

Category: Introduction to Printed Circuit Board (PCB) Design for Manufacturability (Micromodules)
Knowledge Topics: This course introduces participants to some of the key concepts required to optimize the design of printed circuit boards for manufacture.

- PCB Fabricator Capability
- PCB Material Selection and Stackup Selection
- Conductive Features
- Drilled Holes and Slots
- Mechanical Features
- Mask And Inks
- Impedance and Signal Loss
- Flexible and Rigid-Flex PCBs
- Documentation Quality

Estimated Hours: 2 hours

Category: Introduction to PCB Design I
Knowledge Topics: This introductory course will focus on front-end design concepts such as schematic capture, library parts creation, basic electrical engineering concepts, and documentation. Upon completion, participants will be able to:

- Define and create schematic symbols and PCB footprints that comply with applicable IPC Standards
- Create simple schematics for use in simulation and prototyping applications
- Implement industry best practices for:
    - o Schematic capture
    - o Hierarchical design implementation
    - o Documentation
    - o Parts list generation
- Recognize the trade-offs between the different schematic methodologies and when to use each type
- Assess different component types and attachment methods
    - o Differentiate when to use each type of component
- Define standard schematic notes
    - o Apply best practices in negotiating these terms with customers

Estimated Hours: 36 hours

Category: Introduction to PCB Design II

Knowledge Topics: This program is designed to provide circuit board designers with a balanced foundation of theoretical knowledge and practical skills in printed circuit board design. Upon completion, participants will be able to:

- Define and create Design Rule Check (DRC) rules to the appropriate IPC Standards
- Create Rigid and Rigid-Flex boards to meet a wide variety of applications
- Implement industry best practices for:

- Manufacturability
- Reliability
- Documentation
- Manufacturing file generation

• Recognize the trade-offs between the different layout types and when to use each type

• Assess different component types and attachment methods

- Differentiate when to use each type of component

• Define standard Printed Wiring Board (PWB) and Circuit Card Assembly (CCA) notes

- Apply best practices in negotiating these terms with customers

Estimated Hours: 48 hours

Category: PCB Design for Manufacturability

Knowledge Topics: Course content presents an extensive presentation on the key PCB attributes that commonly have issues along with key information on supplier capabilities and suggested best-in-class documentation notes for these major areas:

• Design for Manufacturability (DfM) Course Introduction, Fabricator Capability and Materials

• Panelization, Stackups and Surface Finishes

• Conductive Features, Holes/Vias and Other Mechanical Features

• Masks and Inks, Impedance and Signal Loss, and Electrical Test

• Flexible Printed Circuit (FPC), Documentation and Specifications

Estimated Hours: 12 hours

Category: PCB Design – Advanced Course Listing Apprentice Choice

Knowledge Topics

• **PCB Design for Military & Aerospace Applications**

- This course addresses specific challenges encountered in military and aerospace applications, including the effects of vibration, shock, radiation, altitude, extended operating temperature range, and other design considerations for high-reliability applications. The class also focuses on the impact of these designs on manufacturing and assembly techniques, documentation, and manufacturing file generation.

• **PCB Design for Rigid-Flex Boards**

- This course provides the skills necessary to effectively implement designs requiring flex and rigid-flex circuits in accordance with product requirements. The class also focuses on the impact of these designs on manufacturing and assembly techniques, documentation, and manufacturing file generation.

• Advanced Design Concepts

- The course will start with design of High Density Interconnect (HDI) and advanced packaging concepts. This will be followed by embedded component design and the students will see how concepts from HDI are used in the implementation of embedded components. Next, concepts necessary for the design of wearable electronics and how the use of concepts from HDI and Embedded are required to achieve the small size and light weight of wearable electronics.

• PCB Design or Radio Frequency (RF) Boards

- This course provides the theoretical knowledge and practical skills required to create IPC-compliant PCB designs for high-speed analog, radio (RF), and microwave frequencies. This program is designed to provide circuit board designers with a balanced foundation of theoretical knowledge and practical skills in printed circuit board design.

Estimated Hours: 36 hours

Category: IPC Certified Interconnect Designer - Basic (CID)

Knowledge Topics: After successfully completing certification requirements to obtain the endorsement for this course, you will be obtain a valuable professional credential recognized throughout the electronics industry. This technical education holds the most benefit for PCB designers with at least 2 years of hands-on experience. Because Designer Certification builds a foundation in design decision-making and practical application of IPC standards, the program is open to all engineering staff and managers with interest in design: Sales, Purchasing, Research and Development (R&D), Quality, Test.

Estimated Hours: 24 hours

ARTICLE V Ratio

The ratio of apprentices to professional workers shall be:

1) Ratio #1: Each professional worker may supervise one (1) apprentice(s)