

**Issued: February 28, 2018**

**Program: Industrial Electrician**

**To:** ITA Training Providers  
Articulation Chair  
System Liaison Person  
School Districts

**Subject: Industrial Electrician (IE) Program Update**

**OPSN No.: OPSN 2017 004.3**

**Effective Date: December 1, 2018**

**Date:** This amended notification (**OPSN 2017 004.3**) replaces **OPSN 2017 004.2**, **OPSN 2017 004.1** and **OPSN 2017 004**.

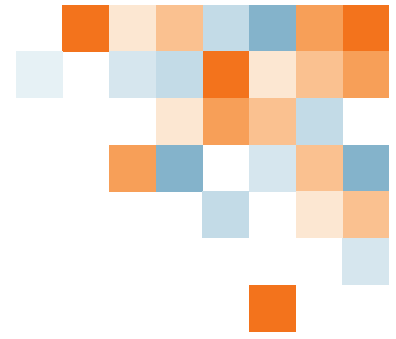
The effective date of the Harmonized Program Outline has been revised. Level 1 and Level 2 classes starting on or after **December 1, 2018** will follow the Harmonized Program Outline content. The Harmonized Program Standards come into effect as per the CE/IE transition plan.

**Summary of Change:** Please be advised that a new Program Outline has been posted to the Industry Training Authority (ITA) website.

The following changes have been made to the Industrial Electrician program in BC:

- Revision to the sequence of training topics to align with recommended Harmonization sequencing. See the revised Occupational Analysis Chart in the Program Outline.
- The Harmonized sequencing will allow for levels 1, 2 and 3 to be delivered as Electrician Common Core to serve both Construction Electrician and Industrial Electrician programs.

**Rationale:** The Industrial Electrician National Occupational Analysis (NOA, 2011) was reviewed and updated as part of the pan-Canadian **Harmonization Initiative** (see *General Information* below for more details). After a series of consultations, workshops and pan-Canadian webinars, a new Red Seal Occupational Standard (RSOS) was developed to replace the NOA. The revised RSOS and the finalized harmonization recommendations prompted a full program review in BC. A review was conducted in November - December 2016 to align the BC Industrial Electrician Program to the IE RSOS.



**Details:** The four Harmonization priorities for Industrial Electrician are as follows:

Industrial Electrician	Changing in BC?	What will it be?
Trade Name	No	Industrial Electrician
Number of Training Levels	No	4 (300 hrs per level)
Total Hours (Technical Training + Work Based)	No	7200 (1200 technical training + 6000 work-based)
Training Sequence (Order of subjects taught)	Yes	Some changes to training sequence resulting in 3 levels of common training for Construction Electrician and Industrial Electrician

**GENERAL INFORMATION: The Harmonization Initiative**

At the request of industry, the Canadian Council of Directors of Apprenticeship (CCDA)'s Harmonization Initiative was launched in Fall 2013, and endorsed by the Forum of Labour Market Ministers (FLMM) in 2014. The goal of Harmonization is to *substantively align* apprenticeship systems across Canada by making apprenticeship training requirements more consistent in Red Seal trades.

In consultation with stakeholders, the CCDA identified four harmonization priorities:

1. Use of Red Seal **trade name**
2. Consistent **total training hours** (in-school and on-the-job)
3. Same number of **training levels**
4. Consistent **sequencing** of training content, including use of most recent National Occupational Standard.

For more information on the Harmonization Initiative, please visit our website at <http://www.itabc.ca/our-trades-training-system/pan-canadian-harmonization-initiative>.

**Attachments:** CE-IE Program Review Details and Competency Migration

**For more information contact:** ITA Program Standards  
email: [programstandards@itabc.ca](mailto:programstandards@itabc.ca)

**cc:** All Staff

Key
Blue Text = Gap (Missed content)
Green Text = Overlap (Repeated content)
Orange Text= New
Black Text = No level change
** Some content only. See description of change in <i>Details of Changes</i> document
CL = Current Level
HL = Harmonized Level
CE = Construction Electrician
IE = Industrial Electrician

**Summary - Competency Migration**

**Overall:** The Occupational Analysis Charts (OACs) for CE and IE have been combined and aligned to the Red Seal Occupational Standards (RSOS). Therefore, **all of the competencies have been renamed and restructured**. This chart shows the finalized competency distribution for the Harmonized CE/IE programs. It summarizes the major changes to the competencies, specifically the level they will be taught in. Please note that this chart does **not include workplace-only competencies**.

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
Line A	APPLY CIRCUIT CONCEPTS	Line A	APPLY CIRCUIT CONCEPTS	Line A	APPLY CIRCUIT CONCEPTS	Line A	APPLY CIRCUIT CONCEPTS	Line A	APPLY CIRCUIT CONCEPTS
CL2→HL L1 **	A1 Use Electrical Circuit Concepts		A1 Use Electrical Circuit Concepts						
	A2 Analyze DC Circuits								
	A3 Analyze Principles of Electromagnetism								
			A4 Analyze Single-Phase AC Circuits						
					A5 Analyze Three-Phase AC Circuits				
	A6 Analyze Electronic Circuits		A6 Analyze Electronic Circuits	CL2→HL 3 **	A6 Analyze Electronic Circuits		A6 Analyze Electronic Circuits		
Line B	PERFORM SAFETY-RELATED FUNCTIONS	Line B	PERFORM SAFETY-RELATED FUNCTIONS	Line B	PERFORM SAFETY-RELATED FUNCTIONS	Line B	PERFORM SAFETY-RELATED FUNCTIONS	Line B	PERFORM SAFETY-RELATED FUNCTIONS
	B1 Use Personal Protection Equipment (PPE) and Safety Equipment								

CE/IE Program Outline Review Details

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
	B2 Maintain Safe Work Environment								
	B3 Perform Lock-out and Tag-out Procedures								
<b>Line C</b>	<b>USE TOOLS AND EQUIPMENT</b>	<b>Line C</b>	<b>USE TOOLS AND EQUIPMENT</b>	<b>Line C</b>	<b>USE TOOLS AND EQUIPMENT</b>	<b>Line C</b>	<b>USE TOOLS AND EQUIPMENT</b>	<b>Line C</b>	<b>USE TOOLS AND EQUIPMENT</b>
	C4 Use Measuring and Testing Equipment				C4 Use Measuring and Testing Equipment				
<b>Line D</b>	<b>ORGANIZE WORK</b>	<b>Line D</b>	<b>ORGANIZE WORK</b>	<b>Line D</b>	<b>ORGANIZE WORK</b>	<b>Line D</b>	<b>ORGANIZE WORK</b>	<b>Line D</b>	<b>ORGANIZE WORK</b>
	D1 Interpret Plans, Drawings and Specifications		D1 Interpret Plans, Drawings and Specifications		D1 Interpret Plans, Drawings and Specifications		D1 Interpret Plans, Drawings and Specifications		D1 Interpret Plans, Drawings and Specifications
	D2 Use Canadian Electrical Code (CEC)								
				CE CL4→HL 3	D7 Identify Hazardous Locations				
<b>Line G</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>	<b>Line G</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>	<b>Line G</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>	<b>Line G</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>	<b>Line G</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>
New	G2 Use Mentoring Techniques								
<b>Line H</b>	<b>INSTALL AND MAINTAIN CONSUMER/SUPPLY SERVICES AND METERING EQUIPMENT</b>	<b>Line H</b>	<b>INSTALL AND MAINTAIN CONSUMER/SUPPLY SERVICES AND METERING EQUIPMENT</b>	<b>Line H</b>	<b>INSTALL AND MAINTAIN CONSUMER/SUPPLY SERVICES AND METERING EQUIPMENT</b>	<b>Line H</b>	<b>INSTALL AND MAINTAIN CONSUMER/SUPPLY SERVICES AND METERING EQUIPMENT</b>	<b>Line H</b>	<b>INSTALL AND MAINTAIN CONSUMER/SUPPLY SERVICES AND METERING EQUIPMENT</b>
	H1 Install Single-phase Consumer/ Supply Services and Metering Equipment		H1 Install Single-phase Consumer/ Supply Services and Metering Equipment						

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
					H2 Install Three-phase Consumer/Supply Services and Metering Equipment				
	H3 Maintain Single-phase Services and Metering Equipment								
					H4 Maintain Three-phase Services and Metering Equipment				
<b>Line I</b>	<b>INSTALL AND MAINTAIN PROTECTION DEVICES</b>	<b>Line I</b>	<b>INSTALL AND MAINTAIN PROTECTION DEVICES</b>	<b>Line I</b>	<b>INSTALL AND MAINTAIN</b>	<b>Line I</b>	<b>INSTALL AND MAINTAIN</b>	<b>Line I</b>	<b>INSTALL AND MAINTAIN</b>
		CE/IE CL3→H L2	I1 Install Overcurrent Protection Devices						
	I2 Install Ground Fault, Arc Fault and Surge Protection Devices		I2 Install Ground Fault, Arc Fault and Surge Protection Devices						
									I3 Install Under and Over Voltage Protection Devices
<b>Line J</b>	<b>INSTALL AND MAINTAIN LOW VOLTAGE DISTRIBUTION SYSTEMS</b>	<b>Line J</b>	<b>INSTALL AND MAINTAIN LOW VOLTAGE DISTRIBUTION SYSTEMS</b>	<b>Line J</b>	<b>INSTALL AND MAINTAIN LOW VOLTAGE DISTRIBUTION SYSTEMS</b>	<b>Line J</b>	<b>INSTALL AND MAINTAIN LOW VOLTAGE DISTRIBUTION SYSTEMS</b>	<b>Line J</b>	<b>INSTALL AND MAINTAIN LOW VOLTAGE DISTRIBUTION SYSTEMS</b>
CL2→H L1	J1 Install Low Voltage Distribution Equipment			CE/IE CL4→HL 3 **	J1 Install Low Voltage Distribution Equipment				
<b>Line K</b>	<b>INSTALL AND MAINTAIN POWER CONDITIONING, UNINTERRUPTIBLE POWER SUPPLY (UPS) AND SURGE SUPPRESSION SYSTEMS</b>	<b>Line K</b>	<b>INSTALL AND MAINTAIN POWER CONDITIONING, UNINTERRUPTIBLE POWER SUPPLY (UPS) AND SURGE SUPPRESSION SYSTEMS</b>	<b>Line K</b>	<b>INSTALL AND MAINTAIN POWER CONDITIONING, UNINTERRUPTIBLE POWER SUPPLY (UPS) AND SURGE SUPPRESSION SYSTEMS</b>	<b>Line K</b>	<b>INSTALL AND MAINTAIN POWER CONDITIONING, UNINTERRUPTIBLE POWER SUPPLY (UPS) AND SURGE SUPPRESSION SYSTEMS</b>	<b>Line K</b>	<b>INSTALL AND MAINTAIN POWER CONDITIONING, UNINTERRUPTIBLE POWER SUPPLY (UPS) AND SURGE SUPPRESSION SYSTEMS</b>

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
							K1 Install Power Conditioning, UPS and Surge Suppression Systems		K1 Install Power Conditioning, UPS and Surge Suppression Systems
							K2 Maintain Power Conditioning, UPS and Surge Suppression Systems		K2 Maintain Power Conditioning, UPS and Surge Suppression Systems
<b>Line L</b>	<b>INSTALL AND MAINTAIN BONDING, GROUNDING AND GROUND FAULT DETECTION SYSTEMS</b>	<b>Line L</b>	<b>INSTALL AND MAINTAIN BONDING, GROUNDING AND GROUND FAULT DETECTION SYSTEMS</b>	<b>Line L</b>	<b>INSTALL AND MAINTAIN BONDING, GROUNDING AND GROUND FAULT DETECTION SYSTEMS</b>	<b>Line L</b>	<b>INSTALL AND MAINTAIN BONDING, GROUNDING AND GROUND FAULT DETECTION SYSTEMS</b>	<b>Line L</b>	<b>INSTALL AND MAINTAIN BONDING, GROUNDING AND GROUND FAULT DETECTION SYSTEMS</b>
CE CL4→HL1 **	L1 Install Grounding and Bonding Systems	CE CL4→HL2 **	L1 Install Grounding and Bonding Systems	CE CL4→HL3 **	L1 Install Grounding and Bonding Systems				
				CE IE CL4→HL3 **	L3 Install Ground Fault Detection Systems				
<b>Line M</b>	<b>INSTALL AND MAINTAIN POWER GENERATION SYSTEMS</b>	<b>Line M</b>	<b>INSTALL AND MAINTAIN POWER GENERATION SYSTEMS</b>	<b>Line M</b>	<b>INSTALL AND MAINTAIN POWER GENERATION SYSTEMS</b>	<b>Line M</b>	<b>INSTALL AND MAINTAIN POWER GENERATION SYSTEMS</b>	<b>Line M</b>	<b>INSTALL AND MAINTAIN POWER GENERATION SYSTEMS</b>
					M1 Install AC (Alternating Current) Generating Systems				
					M2 Maintain AC Generating Systems				
		CE/IE CL3→HL2	M3 Install DC (Direct Current) Generating Systems						
		CE/IE CL3→HL2	M4 Maintain DC Generating Systems						

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
Line N	INSTALL AND MAINTAIN RENEWABLE ENERGY GENERATING AND STORAGE SYSTEMS	Line N	INSTALL AND MAINTAIN RENEWABLE ENERGY GENERATING AND STORAGE SYSTEMS	Line N	INSTALL AND MAINTAIN RENEWABLE ENERGY GENERATING AND STORAGE SYSTEMS	Line N	INSTALL AND MAINTAIN RENEWABLE ENERGY GENERATING AND STORAGE SYSTEMS	Line N	INSTALL AND MAINTAIN RENEWABLE ENERGY GENERATING AND STORAGE SYSTEMS
		CL4→H L2 **	N1 Install Renewable Energy Generating and Storage Systems				N1 Install Renewable Energy Generating and Storage Systems		N1 Install Renewable Energy Generating and Storage Systems
Line O	INSTALL AND MAINTAIN HIGH VOLTAGE SYSTEMS	Line O	INSTALL AND MAINTAIN HIGH VOLTAGE SYSTEMS	Line O	INSTALL AND MAINTAIN HIGH VOLTAGE SYSTEMS	Line O	INSTALL AND MAINTAIN HIGH VOLTAGE SYSTEMS	Line O	INSTALL AND MAINTAIN HIGH VOLTAGE SYSTEMS
							O1 Install High Voltage Systems		O1 Install High Voltage Systems
							O2 Maintain High Voltage Systems		O2 Maintain High Voltage Systems
Line P	INSTALL AND MAINTAIN TRANSFORMERS	Line P	INSTALL AND MAINTAIN TRANSFORMERS	Line P	INSTALL AND MAINTAIN TRANSFORMERS	Line P	INSTALL AND MAINTAIN TRANSFORMERS	Line P	INSTALL AND MAINTAIN TRANSFORMERS
			P1 Install Extra-Low and Low-Voltage Single-Phase Transformers						
					P3 Install Low-Voltage Three-Phase Transformers				
				CE IE CL4 →HL3 **	P5 Install High-Voltage Transformers				
Line Q	INSTALL AND MAINTAIN RACEWAYS, CABLES AND ENCLOSURES	Line Q	INSTALL AND MAINTAIN RACEWAYS, CABLES AND ENCLOSURES	Line Q	INSTALL AND MAINTAIN RACEWAYS, CABLES AND ENCLOSURES	Line Q	INSTALL AND MAINTAIN RACEWAYS, CABLES AND ENCLOSURES	Line Q	INSTALL AND MAINTAIN RACEWAYS, CABLES AND ENCLOSURES
CE CL3/4 → HL1 **	Q1 Install Conductors and Cables	CE CL3/4 → HL2 **	Q1 Install Conductors and Cables						

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
CE CL4 → HL1 **	Q2 Install Raceways, Boxes and Fittings	CE CL4 → HL2 **	Q2 Install Raceways, Boxes and Fittings						
			Q3 Maintain Conductors, Cables, Raceways, Boxes and Fittings						
<b>Line R</b>	<b>INSTALL AND MAINTAIN BRANCH CIRCUITRY</b>	<b>Line R</b>	<b>INSTALL AND MAINTAIN BRANCH CIRCUITRY</b>	<b>Line R</b>	<b>INSTALL AND MAINTAIN BRANCH CIRCUITRY</b>	<b>Line R</b>	<b>INSTALL AND MAINTAIN BRANCH CIRCUITRY</b>	<b>Line R</b>	<b>INSTALL AND MAINTAIN BRANCH CIRCUITRY</b>
CL2 → HL1 **	R1 Install Luminaires		R1 Install Luminaires						
	R2 Install Wiring Devices		R2 Install Wiring Devices		R2 Install Wiring Devices				
CL2 → HL1 **	R3 Install Lighting Controls		R3 Install Lighting Controls						
New	R4 Install Lighting Standards								
			R5 Maintain Luminaires, Wiring Devices, Lighting Controls, Lighting Standards and Branch Circuitry						
						New	R6 Install and Maintain Airport Runway Lighting Systems		
						New	R7 Install and Maintain Traffic Signal Lights and Controls		
<b>Line S</b>	<b>INSTALL AND MAINTAIN HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS</b>	<b>Line S</b>	<b>INSTALL AND MAINTAIN HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS</b>	<b>Line S</b>	<b>INSTALL AND MAINTAIN HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS</b>	<b>Line S</b>	<b>INSTALL AND MAINTAIN HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS</b>	<b>Line S</b>	<b>INSTALL AND MAINTAIN HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) SYSTEMS</b>
		CE/IE CL4 → H	S1 Install HVAC Systems and Controls						



CE/IE Program Outline Review Details

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
		L2							
		CE/IE CL4→H L2	S2 Maintain HVAC Systems and Controls						
Line T	<b>INSTALL AND MAINTAIN EXIT AND EMERGENCY LIGHTING SYSTEMS</b>	Line T	<b>INSTALL AND MAINTAIN EXIT AND EMERGENCY LIGHTING SYSTEMS</b>	Line T	<b>INSTALL AND MAINTAIN EXIT AND EMERGENCY LIGHTING SYSTEMS</b>	Line T	<b>INSTALL AND MAINTAIN EXIT AND EMERGENCY LIGHTING SYSTEMS</b>	Line T	<b>INSTALL AND MAINTAIN EXIT AND EMERGENCY LIGHTING SYSTEMS</b>
		CL4→ HL2	T1 Install Exit and Emergency Lighting Systems						
		CL4→ HL2	T2 Maintain Exit and Emergency Lighting Systems						
Line U	<b>INSTALL AND MAINTAIN CATHODIC PROTECTION SYSTEMS</b>	Line U	<b>INSTALL AND MAINTAIN CATHODIC PROTECTION SYSTEMS</b>	Line U	<b>INSTALL AND MAINTAIN CATHODIC PROTECTION SYSTEMS</b>	Line U	<b>INSTALL AND MAINTAIN CATHODIC PROTECTION SYSTEMS</b>	Line U	<b>INSTALL AND MAINTAIN CATHODIC PROTECTION SYSTEMS</b>
		New	U1 Install Cathodic Protection Systems						
		New	U2 Maintain Cathodic Protection Systems						
Line V	<b>INSTALL AND MAINTAIN MOTOR STARTERS AND CONTROLS</b>	Line V	<b>INSTALL AND MAINTAIN MOTOR STARTERS AND CONTROLS</b>	Line V	<b>INSTALL AND MAINTAIN MOTOR STARTERS AND CONTROLS</b>	Line V	<b>INSTALL AND MAINTAIN MOTOR STARTERS AND CONTROLS</b>	Line V	<b>INSTALL AND MAINTAIN MOTOR STARTERS AND CONTROLS</b>
		CL1 → HL2	V1 Install Motor Starters and Controls	CL2→HL 3 **	V1 Install Motor Starters and Controls				
		CE/IE CL3→ HL2 **	V1 Install Motor Starters and Controls						

CE/IE Program Outline Review Details

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
		CL1 → HL2	V2 Maintain Motor Starters and Controls	CL2→HL3 **	V2 Maintain Motor Starters and Controls				
		CE/IE CL3→HL2 **	V2 Maintain Motor Starters and Controls						
Line W	INSTALL AND MAINTAIN DRIVES	Line W	INSTALL AND MAINTAIN DRIVES	Line W	INSTALL AND MAINTAIN DRIVES	Line W	INSTALL AND MAINTAIN DRIVES	Line W	INSTALL AND MAINTAIN DRIVES
				IE CL4 →HL3	W1 Install Drives				
Line X	INSTALL AND MAINTAIN NON-ROTATING EQUIPMENT AND ASSOCIATED CONTROLS	Line X	INSTALL AND MAINTAIN NON-ROTATING EQUIPMENT AND ASSOCIATED CONTROLS	Line X	INSTALL AND MAINTAIN NON-ROTATING EQUIPMENT AND ASSOCIATED CONTROLS	Line X	INSTALL AND MAINTAIN NON-ROTATING EQUIPMENT AND ASSOCIATED CONTROLS	Line X	INSTALL AND MAINTAIN NON-ROTATING EQUIPMENT AND ASSOCIATED CONTROLS
							X1 Install Non-Rotating Equipment and Associated Controls		X1 Install Non-Rotating Equipment and Associated Controls
									X2 Maintain Non-Rotating Equipment and Associated Controls
Line Y	INSTALL AND MAINTAIN MOTORS	Line Y	INSTALL AND MAINTAIN MOTORS	Line Y	INSTALL AND MAINTAIN MOTORS	Line Y	INSTALL AND MAINTAIN MOTORS	Line Y	INSTALL AND MAINTAIN MOTORS
					Y1 Install AC Motors				
					Y2 Maintain AC Motors				
		CE/IE CL3→HL2	Y3 Install DC Motors						
		CE/IE CL3→	Y4 Maintain DC Motors						

CE/IE Program Outline Review Details

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
		HL2							
Line Z	INSTALL AND MAINTAIN SIGNALING SYSTEMS	Line Z	INSTALL AND MAINTAIN SIGNALING SYSTEMS	Line Z	INSTALL AND MAINTAIN SIGNALING SYSTEMS	Line Z	INSTALL AND MAINTAIN SIGNALING SYSTEMS	Line Z	INSTALL AND MAINTAIN SIGNALING SYSTEMS
							Z1 Install Fire Alarms Systems		Z1 Install Fire Alarms Systems
							Z3 Install Security and Surveillance Systems		Z3 Install Security and Surveillance Systems
Line AA	INSTALL AND MAINTAIN COMMUNICATION SYSTEMS	Line AA	INSTALL AND MAINTAIN COMMUNICATION SYSTEMS	Line AA	INSTALL AND MAINTAIN COMMUNICATION SYSTEMS	Line AA	INSTALL AND MAINTAIN COMMUNICATION SYSTEMS	Line AA	INSTALL AND MAINTAIN COMMUNICATION SYSTEMS
CE/IE CL4 →HL1 **	AA1 Install Voice/Data/Video (VDV) Systems						AA1 Install Voice/Data/Video (VDV) Systems	IE CL3→ IE HL4 **	AA1 Install Voice/Data/Video (VDV) Systems
							AA3 Install Nurse Call systems		
Line AB	INSTALL AND MAINTAIN BUILDING AND AUTOMATION SYSTEMS	Line AB	INSTALL AND MAINTAIN BUILDING AND AUTOMATION SYSTEMS	Line AB	INSTALL AND MAINTAIN BUILDING AND AUTOMATION SYSTEMS	Line AB	INSTALL AND MAINTAIN BUILDING AND AUTOMATION SYSTEMS	Line AB	INSTALL AND MAINTAIN BUILDING AND AUTOMATION SYSTEMS
							AB1 Install Building Automation Systems		AB1 Install Building Automation Systems
Line AC	INSTALL, PROGRAM AND MAINTAIN AUTOMATED CONTROL SYSTEMS	Line AC	INSTALL, PROGRAM AND MAINTAIN AUTOMATED CONTROL SYSTEMS	Line AC	INSTALL, PROGRAM AND MAINTAIN AUTOMATED CONTROL SYSTEMS	Line AC	INSTALL, PROGRAM AND MAINTAIN AUTOMATED CONTROL SYSTEMS	Line AC	INSTALL, PROGRAM AND MAINTAIN AUTOMATED CONTROL SYSTEMS
							AC1 Install Automated Control Systems	IE CL3→ IE HL4**	AC1 Install Automated Control Systems

Electrician Common Core Level 1 (HL)		Electrician Common Core Level 2 (HL)		Electrician Common Core Level 3 (HL)		Construction Electrician Level 4 (HL)		Industrial Electrician Level 4 (HL)	
							AC3 Program Automated Control Systems	IE CL3→ IE HL4**	AC3 Program Automated Control Systems
									AC4 Optimize System Performance
Line AD	<b>INSTALL AND MAINTAIN PNEUMATIC, HYDRAULIC CONTROL AND PUMPING SYSTEMS</b>	Line AD	<b>INSTALL AND MAINTAIN PNEUMATIC, HYDRAULIC CONTROL AND PUMPING SYSTEMS</b>	Line AD	<b>INSTALL AND MAINTAIN PNEUMATIC, HYDRAULIC CONTROL AND PUMPING SYSTEMS</b>	Line AD	<b>INSTALL AND MAINTAIN PNEUMATIC, HYDRAULIC CONTROL AND PUMPING SYSTEMS</b>	Line AD	<b>INSTALL AND MAINTAIN PNEUMATIC, HYDRAULIC CONTROL AND PUMPING SYSTEMS</b>
									AD1 Install Pneumatic Control Systems
									AD3 Install Hydraulic Control Systems
									AD5 Install and Maintain Pumping Systems

Key
Blue Text = Gap (Missed content)
Green Text = Overlap (Repeated content)
Red Text = Removed
Black Text = No change
CL = Current Level
HL = Harmonized Level
CE = Construction Electrician
IE = Industrial Electrician

## Details of Changes

### Current Program Outlines to Harmonized Program Outline Mapping

**Overall:** The Occupational Analysis Charts (OACs) for CE and IE have been combined and aligned to the Red Seal Occupational Standard. Therefore, all of the competencies have been renamed and restructured. The following provides a side by side comparison with notes of major changes.

Level 1 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line B</b>	<b>USE SAFE WORK PRACTICES</b>				
B1	Perform Lockout Procedures	B3	Perform Lock-out and Tag-out Procedures	1	no change
B2	Apply WCB Standards and Regulations	B2	Maintain Safe Work Environment	1	no change
B3	Apply Safe Work Practices	B1	Use Personal Protection Equipment (PPE) and Safety Equipment	1	no change
		B2	Maintain Safe Work Environment	1	
B4	Apply WHMIS	B2	Maintain Safe Work Environment	1	no change
B5	Use a Daily Safety Plan	B2	Maintain Safe Work Environment	1	no change
		D6	Finalize Required Documentation	W	
<b>B6</b>	<b>Use Safe Rigging Techniques</b>	C3	Use Rigging, Hoisting and Lifting Equipment	W	Removed from technical training
<b>Line D</b>	<b>APPLY CIRCUIT CONCEPTS</b>				
D1	Use Electrical Circuit Concepts	A1	Use Electrical Circuit Concepts	1,2	No change See D1 in Level 2
D2	Analyze DC Circuits	A2	Analyze DC Circuits	1	no change
D3	Solve Problems Using the Principles of Electromagnetism	A3	Analyze Principles of Electromagnetism	1	no change
D6	Analyze Electronic Circuits	A6	Analyze Electronic Circuits	1,2,3,	no change

Level 1 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
				4CE	
<b>Line E</b>	<b>USE TEST EQUIPMENT</b>				
E1	Use Analog Meters				Taught in context with C4
E2	Use Digital Meters	C4	Use Measuring and Testing Equipment	1,3	no change
<b>Line F</b>	<b>READ AND INTERPRET DRAWINGS AND MANUALS</b>				
F1	Use Circuit Drawings	A1	Use Electrical Circuit Concepts	1,2	no change
F2	Use Construction Drawings and Specifications	D1	Interpret Plans, Drawings and Specifications	1,2,3,4CE	Split between levels is now defined as L1=residential/ wood frame construction L2=commercial/ concrete L3=institutional L4CE=industrial L4IE=industrial
F3	Use Manuals and Manufacturers' Instructions	D1	Interpret Plans, Drawings and Specifications	1,2,3,4CE	no change
<b>F4</b>	<b>Plan Time and Materials</b>	D3 D4	Organize Materials and Supplies Plan Project Tasks and Procedures	<b>W</b> <b>W</b>	<b>removed from technical training</b>
<b>Line G</b>	<b>INSTALL LOW VOLTAGE DISTRIBUTION SYSTEMS</b>				
G1	Apply Codes, Regulations and Standards	D2	Use Canadian Electrical Code (CEC)	1	no change
G2	Install Service Equipment	H1 H3	Install Single-phase Consumer/ Supply Services and Metering Equipment Maintain Single-phase Services and Metering Equipment	1,2 1	L1 = Determine single-phase service equipment requirements when CTs and PTs <b>are not</b> required. L2 = Determine single-phase service equipment requirements when CTs <b>are</b> required.
G3	Install Grounding and Bonding	L1 L2	Install Grounding and Bonding Systems Maintain Grounding and Bonding Systems	1,2,3 W	no change
G4	Install Distribution Centres	J1	Install low-voltage distribution equipment	1,3	no change
G5	Install Raceways, Boxes and Fittings	Q2 Q3	Install Raceways, Boxes and Fittings Maintain Conductors, Cables, Raceways, Boxes and Fittings	1,2 2	Clarified somewhat differently across levels in Harmonized: L1=common L2=specialty  Current program L1=residential L2=single phase L3=three phase, low voltage L4CE=electrical installation

Level 1 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
G6	Install Conductors and Cables	Q1	Install Conductors and Cables	1,2	no change
G7	Install Utilization Equipment and Devices	R3	Install Lighting Controls	1,2	Some content (Incandescent and LED) moved from CL2→HL1
<b>Line H</b>	<b>INSTALL ELECTRICAL EQUIPMENT</b>				
H3	Install Protective Devices	I2	Install Ground Fault, Arc Fault and Surge Protection Devices	1,2	no change
<b>Line I</b>	<b>INSTALL CONTROL CIRCUITS AND DEVICES</b>				
I1	Install Manual Motor Controls	V1 V2	Install Motor Starters and Controls Maintain Motor Starters and Controls	2,3 2,3	CL1→HL2
I2	Install Magnetic Motor Controls	V1 V2	Install Motor Starters and Controls Maintain Motor Starters and Controls	2,3 2,3	Moved to level 2

Level 2 – Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line A</b>	<b>USE ESSENTIAL SKILLS</b>				
A4	Solve Problems Using Applied Mathematics	A1	Use Electrical Circuit Concepts	2	No change
<b>Line D</b>	<b>APPLY CIRCUIT CONCEPTS</b>				
D1	Use Electrical Circuit Concepts	A1	Use Electrical Circuit Concepts	1,2	CL2→HL1 the following learning tasks moved to Level 1 (A1): Describe the generation of an alternating voltage Describe the features of alternating current Describe the difference between DC ohmic and effective AC resistance
D4	Analyze Single-phase AC Circuits	A4	Analyze Single-Phase AC Circuits	2	No change
D6	Analyze Electronic Circuits	A6	Analyze Electronic Circuits	1,2,3,4CE	CL2→HL3 the following learning task moved to Level 3 (A6): Describe the features of field effect transistors and IGBTs.
<b>Line E</b>	<b>USE TEST EQUIPMENT</b>				
E3	Use Scopes	C4	Use measuring and testing equipment	1,3	Analog scopes removed Digital scopes (scope meters) taught in context in HL2
<b>Line F</b>	<b>READ AND INTERPRET DRAWINGS AND MANUALS</b>				
F2	Use Construction Drawings and Specifications	D1	Interpret Plans, Drawings and Specifications	1,2,3,4CE	Split between levels is now defined as L1=residential L2=commercial L3=institutional L4CE=industrial
<b>Line G</b>	<b>INSTALL LOW VOLTAGE DISTRIBUTION SYSTEMS</b>				
G1	Apply Codes, Regulations and Standards	D2	Use Canadian Electrical Code (CEC)	1	Was in L1,2,3,4CE moved into Level 1, but also taught in context
G2	Install Service Equipment	H1 H3	Install Single-phase Consumer/ Supply Services and Metering Equipment Maintain Single-phase Services and Metering Equipment	1,2 1	L1 = Determine single-phase service equipment requirements when CTs and PTs <b>are not</b> required. L2 = Determine single-phase service equipment requirements when CTs <b>are</b> required.
G3	Install Grounding and Bonding	L1 L2	Install Grounding and Bonding Systems Maintain Grounding and Bonding Systems	1,2,3 W	No change
G4	Install Distribution Centres	J1	Install Low Voltage Distribution Equipment	1,3	CL2→HL1



Level 2 – Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
					<a href="#">120/240 single-phase services/combo panels</a>
G5	Install Raceways, Boxes and Fittings	Q2 Q3	Install Raceways, Boxes and Fittings Maintain Conductors, Cables, Raceways, Boxes and Fittings	1,2 2	New program L1=common L2=specialty  old program L1=residential L2=single phase L3=three phase, low voltage L4CE=electrical installation
G6	Install Conductors and Cables	Q1	Install Conductors and Cables	1,2	No change
G7	Install Utilization Equipment and Devices	R2 R5	Install Wiring Devices Maintain Luminaires, Wiring Devices, Lighting Controls, Lighting Standards and Branch Circuitry	1,2,3 2	Split somewhat differently across levels in new: L1=receptacles and switches L2=single phase wiring devices L3=three phase wiring devices  old program L1= residential branch circuits L2= branch circuits L3= industrial branch circuits L4CE=installation requirements for branch circuits
<b>Line H</b>	<b>INSTALL ELECTRICAL EQUIPMENT</b>				
H1	<a href="#">Install Lighting and Lighting Controls</a>	R1 R3	<a href="#">Install Luminaires</a> <a href="#">Install Lighting Controls</a>	1,2 1,2	<a href="#">CL2→HL1</a> Some content moved to Level 1 <a href="#">Describe control of incandescent lamps</a> <a href="#">Describe basic LED lighting</a>
H2	Install Transformers	P1	Install Extra-Low and Low-Voltage Single-Phase Transformers	2	No change
H3	Install Protective Devices	I1 I2	Install Overcurrent Protection Devices Install Ground Fault, Arc Fault and Surge Protection Devices	2 1,2	No change
<b>Line I</b>	<b>INSTALL CONTROL CIRCUITS AND DEVICES</b>				
I2	<a href="#">Install Magnetic Motor Controls</a>	V1 V2	<a href="#">Install Motor Starters and Controls</a> <a href="#">Maintain Motor Starters and Controls</a>	2,3 2,3	<a href="#">CL2→HL3</a> Some content (i.e. controls) moved to Level 3 <a href="#">Describe features of common motor control devices</a> <a href="#">Describe features and applications of plugging switches</a> <a href="#">Draw circuit diagrams involving automatic and sequence control</a> <a href="#">Connect and test circuits utilizing auxiliary control devices</a>



Level 3 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line D</b>	<b>APPLY CIRCUIT CONCEPTS</b>				
D5	Analyze Three-phase Circuits	A5	Analyze Three-Phase AC Circuits	3	No change
D6	Analyze Electronic Circuits	A6	Analyze Electronic Circuits	1,2,3,4CE	CL2-->HL3 FETS moved IGBTs new in L3
<b>Line E</b>	<b>USE TEST EQUIPMENT</b>				
E4	Use Power Quality Analyzers	C4	Use Measuring and Testing Equipment	1,3	No change
<b>Line F</b>	<b>READ AND INTERPRET DRAWINGS AND MANUALS</b>				
F2	Use Construction Drawings and Specifications	D1	Interpret Plans, Drawings and Specifications	1,2,3,4CE	Split between levels is now defined as L1=residential L2=commercial L3=institutional L4CE=industrial
<b>Line G</b>	<b>INSTALL LOW VOLTAGE DISTRIBUTION SYSTEMS</b>				
G1	Apply Codes, Regulations and Standards	D2	Interpret Plans, Drawings and Specifications	1	Was in L1,2,3,4CE moved into Level 1, but also taught in context
G2	Install Service Equipment	H2	Install Single-phase Consumer/ Supply Services and Metering Equipment	3	No change
G3	Install Grounding and Bonding	L1 L2	Install Grounding and Bonding Systems Maintain Grounding and Bonding Systems	1,2,3 W	No change
G4	Install Distribution Centres	J1	Install Low Voltage Distribution Equipment	1,3	No change
G5	Install Raceways, Boxes and Fittings	Q2 Q3	Install Conductors and Cables Maintain Conductors, Cables, Raceways, Boxes and Fittings	1,2 2	Defined somewhat differently across levels in new: L1=common L2=specialty L3&L4=taught in context  old program L1=residential L2=single phase L3=three phase, low voltage L4CE=electrical installation
G6	Install Conductors and Cables	Q1	Install Conductors and Cables	1,2	Split somewhat differently across levels in new: L1=residential circuits L2=ICI circuits

Level 3 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
					L3&L4=taught in context  old program L1=residential circuits L2=circuits (non-specified?) L3=three phase, low voltage L4CE=electrical installations
G7	Install Utilization Equipment and Devices	R2 R5	Install Wiring Devices Maintain Luminaires, Wiring Devices, Lighting Controls, Lighting Standards and Branch Circuitry	1,2,3 2	defined somewhat differently across levels in new: L1=receptacles and switches L2=single phase wiring devices L3=three phase wiring devices  old program L1= residential branch circuits L2= branch circuits L3= industrial branch circuits L4CE=installation requirements for branch circuits
<b>Line H</b>	<b>INSTALL ELECTRICAL EQUIPMENT</b>				
H2	Install Transformers	P3 P4	Install Low-Voltage Three-Phase Transformers Maintain Low-Voltage Three-Phase Transformers	3 W	No change
H3	Install Protective Devices	I1 I2 I4	Install Overcurrent Protection Devices Install Ground Fault, Arc Fault and Surge Protection Devices Maintain Protection Devices	2 1,2 W	CL3→HL2
H4	Install DC Motors and Generators	Y3 Y4 M3 M4	Install DC Motors Maintain DC Motors Install DC (Direct Current) Generating Systems Maintain DC Generating Systems	2 2 2 2	CL3→HL2
H5	Install AC Motors and Alternators	Y1 Y2 M1 M2	Install AC Motors Maintain AC Motors Install AC (Alternating Current) Generating Systems Maintain AC Generating Systems	3 3 3 3	No change
<b>Line I</b>	<b>INSTALL CONTROL CIRCUITS AND DEVICES</b>				
I2	Install Magnetic Motor Controls	V1	Install Motor Starters and Controls	2,3	Some content moved CL3-->HL2



### CE/IE Program Outline Review Details

Level 3 - Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
		V2	Maintain Motor Starters and Controls	2,3	DC motor controllers
I3	Install Electronic Motor Controls	W1	Install Drives	3	No change

Level 4 – Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line D</b>	<b>APPLY CIRCUIT CONCEPTS</b>				
D2	Analyze DC Circuits				
D4	Analyze Single-phase AC Circuits				
D5	Analyze Three-phase Circuits				
D6	Analyze Electronic Circuits	A6	Analyze Electronic Circuits	4CE	No change
<b>Line E</b>	<b>USE TEST EQUIPMENT</b>				
E5	Perform Structured Cable Testing and Reporting	AA1	Install Voice/Data/Video (VDV) Systems	1,4CE	Coaxial and CAT5 CL4→HL1
<b>Line F</b>	<b>READ AND INTERPRET DRAWINGS AND MANUALS</b>				
F2	Use Construction Drawings and Specifications	D1	Interpret Plans, Drawings and Specifications	1,2,3,4CE	Split between levels is now defined as L1=residential L2=commercial L3=institutional L4CE=industrial L4IE=industrial
<b>Line G</b>	<b>INSTALL LOW VOLTAGE DISTRIBUTION SYSTEMS</b>				
G1	Apply Codes, Regulations and Standards	D2 D7	Use Canadian Electrical Code (CEC) Identify Hazardous Locations	1 3	Was in L1,2,3,4CE moved into Level 1, but also taught in context Wiring methods for Hazardous Locations moved to HL3
G2	Install Service Equipment	J1	Install Low Voltage Distribution Equipment	1,3	PDC moved to CE CL4→HL1 single phase, 3 wire services CE CL4→HL2 single phase, AC systems CE CL4→HL3 three phase, three phase services
G3	Install Grounding and Bonding	L1  L2 Q2	Install Grounding and Bonding Systems  Maintain Grounding and Bonding Systems Install Raceways, Boxes and Fittings	1,2,3  W 1,2	CE CL4→HL1 single phase, 3 wire services, system ground and bonding conductor CE CL4→HL3 three phase, three phase services, system ground and bonding conductor  Taught in context in CE HL4
G4	Install Distribution Centres	J1	Install Low Voltage Distribution Equipment	3	(Level 4 J1 content was review)
G5	Install Raceways, Boxes and Fittings	Q2 Q3	Install Conductors and Cables Maintain Conductors, Cables, Raceways, Boxes and Fittings	1,2 2	Defined somewhat differently across levels in new: L1=common L2=specialty L3&L4=taught in context  old program L1=residential

Level 4 – Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
					L2=single phase L3=three phase, low voltage L4CE=electrical installation
G6	Install Conductors and Cables	Q1	Install Conductors and Cables	1,2	Split somewhat differently across levels in new: L1=residential circuits L2=ICI circuits L3&L4=taught in context  old program L1=residential circuits L2=circuits (non-specified?) L3=three phase, low voltage L4CE=electrical installations
G7	Install Utilization Equipment and Devices	R2	Install Wiring Devices	2	Taught in context across levels
<b>Line H</b>	<b>INSTALL ELECTRICAL EQUIPMENT</b>				
H3	Install Protective Devices	O1 O2	Install High Voltage Systems Maintain High Voltage Systems	CE4/IE4 HL4 CE4/IE4 HL4	No change
H6	Install HVAC	S1 S2	Install HVAC Systems and Controls Maintain HVAC Systems and Controls	2 2	CE/IE CL4 → HL2
H7	Install Emergency Power Systems	K1 K2 T1 T2	Install Power Conditioning, UPS and Surge Suppression Systems Maintain Power Conditioning, UPS and Surge Suppression Systems Install Exit and Emergency Lighting Systems Maintains Exit and Emergency Lighting Systems	4CE 4CE 2 2	CL4 → HL2 CL4 → HL2
H8	Install Alternative Power Systems	N1 N2	Install Renewable Energy Generating and Storage Systems Maintain Renewable Energy Generating and Storage Systems	2,4CE W	Types of alternative power systems is introduced in Level 2
<b>Line I</b>	<b>INSTALL CONTROL CIRCUITS AND DEVICES</b>				
I2	Install Magnetic Motor Controls				
I4	Install PLCs	AC1 AC3	Install Automated Control Systems Program Automated Control Systems	4CE 4CE	No change
I5	Install Automated Controls	AC1 AC3	Install Automated Control Systems Program Automated Control Systems	4CE 4CE	No change
<b>Line J</b>	<b>INSTALL SIGNAL AND COMMUNICATION SYSTEMS</b>				

Level 4 – Construction Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
J1	Install Fire Alarm and Suppression Systems	Z1	Install Fire Alarms Systems	4CE	No change
J2	Install Structured Cabling Systems	AA1	Install Voice/Data/Video (VDV) Systems	1 4CE	Coaxial and CAT5 CL4→HL1 Termination of fibre optic cable
J3	Install Nurse Call Systems	AA3	Install Nurse Call systems	4CE	No change
J4	Install Building Integrated Control Systems	AB1	Install Building Automation Systems	4CE	No change
J5	Install Sound Systems	AB1	Install Building Automation Systems	4CE	No change
J6	Install Entertainment Systems				Removed
J7	Install CATV Systems				Removed
J8	Install Security Alarm Systems	Z3	Install Security and Surveillance Systems	4CE	No change
<b>Line K</b>	<b>INSTALL HIGH VOLTAGE SYSTEMS</b>				
K1	Apply High Voltage Safety Procedures	O1	Install High Voltage Systems	4CE	No change
K2	Install High Voltage Cables	O1	Install High Voltage Systems	4CE	No change
K3	Install High Voltage Switch Gear	O1 P5	Install High Voltage Systems Install High Voltage Transformers	4CE 3	Calculate Voltage, Current, kVA Non-destructive testing, Describe installation of high voltage transformers
K4	Use of High Voltage Test Equipment	O2	Maintain High Voltage Systems	4CE	No change



Level 3 - Industrial Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line D</b>	<b>CIRCUIT CONCEPTS</b>				
D6	Demonstrate knowledge of three-phase theory [IE129-3TC]	A5	Analyze Three-Phase AC Circuits	3	No change
<b>Line J</b>	<b>CONTROL CIRCUITS</b>				
J3	Demonstrate knowledge of AC motor controls [IE227-3TC]	V1 Y1	Install Motor Starters and Controls Install AC Motors	3	No change
<b>Line L</b>	<b>ELECTRIC MOTORS</b>				
L1	Demonstrate knowledge of AC machines [IE150-3TC]	Y1 Y2 M1 M2	Install AC Motors Maintain AC Motors Install AC (Alternating Current) Generating Systems Maintain AC Generating Systems	3 3 3 3	No change (most content is in Y1, but LT13 moved to M1)
L2	Demonstrate knowledge of DC machines [IE192-3TC]	Y3 Y4 M3 M4	Install DC Motors Maintain DC Motors Install DC (Direct Current) Generating Systems Maintain DC Generating Systems	2 2 2 2	CL3→HL2
<b>Line M</b>	<b>PROGRAMMABLE LOGIC CONTROLLERS</b>				
M1	Demonstrate and apply knowledge of PLC operation, installation and maintenance [IE134-3TC]	AC1 AC3	Install Automated Control Systems Program Automated Control Systems	4IE 4IE	IE CL3→IE HL4
M2	Demonstrate and apply knowledge of communication buses and PLC interfaces [IE135-3TC]	AC1 AC3	Install Automated Control Systems Program Automated Control Systems	4IE 4IE	IE CL3→IE HL4
M3	Demonstrate knowledge of programming language and of installing and maintaining PLC software [IE138-3TC]	AC3 AA1	Program Automated Control Systems Install Voice/Data/Video (VDV) Systems	4IE 4IE	IE CL3→IE HL4 TCP/IP, device net, modbus, etc.
<b>Line N</b>	<b>POWER DISTRIBUTION SYSTEMS</b>				
N1	Demonstrate knowledge of installation and maintenance of transformers [IE143-3TC]	P3	Install Low-Voltage Three-Phase Transformers	3	No change
N2	Calculate power factor correction [IE144-3TC]	A5	Analyze Three-Phase AC Circuits	3	No change
<b>Line S</b>	<b>ELECTRONICS</b>				
S1	Demonstrate knowledge of electronics [IE111-3TC]	A6	Analyze Electronic Circuits	3	No change
S2	Demonstrate knowledge of semiconductor power devices [IE228-3TC]	A6	Analyze Electronic Circuits	3	No change

Level 4 - Industrial Electrician					
Current Competencies		Harmonized Competencies		Harmonized Level(s)	Description of Change **
<b>Line E</b>	<b>TEST EQUIPMENT</b>				
E5	Demonstrate knowledge of measurement and calibration test equipment [IE225-4TC]	O2	Maintain High Voltage Systems	CE/IE 4	No change
<b>Line H</b>	<b>LOW VOLTAGE DISTRIBUTION SYSTEMS</b>				
H9	Demonstrate knowledge of installing and terminating fibre optic cables [IE194-4TC]	AA1	Install Voice/Data/Video (VDV) Systems	4IE	No change
<b>Line I</b>	<b>ELECTRICAL EQUIPMENT</b>				
I3	Demonstrate knowledge of installing and maintaining HVAC equipment [IE156-4TC]	AC1	Install Automated Control Systems	4IE	No change
I4	Demonstrate knowledge of pumps [IE158-4TC]	AD5	Install and Maintain Pumping Systems	4IE	No change
I5	Demonstrate knowledge of the installation and maintenance of Robotic Control Systems [IE176-4TC]	AC1	Install Automated Control Systems	4IE	No change
<b>Line J</b>	<b>CONTROL CIRCUITS</b>				
J4	Demonstrate knowledge of variable speed drive (VSD) and starting systems [IE178-4TC]	W1	Install Drives	3	IE CL4→HL3
<b>Line K</b>	<b>COMPUTER SYSTEMS</b>				
K2	Demonstrate and apply knowledge of network diagnostic tools [IE147-4TC]	AA1	Install Voice/Data/Video (VDV) Systems	1,4IE	IE CL4→HL1 CAT5 - Pin outs, termination, testing
K3	Demonstrate and apply knowledge of communication protocols [IE148-4TC]	AA1	Install Voice/Data/Video (VDV) Systems	4IE	No change
<b>Line L</b>	<b>ELECTRIC MOTORS</b>				
L3	Design and demonstrate knowledge of motor controls and motor control programs [IE226-4TC]	AC3	Program Automated Control Systems	4IE	No change
<b>Line N</b>	<b>POWER DISTRIBUTION SYSTEMS</b>				
N3	Demonstrate knowledge of the installation and maintenance of high voltage circuits [IE152-4TC]	O1 O2	Install High Voltage Systems Maintain High Voltage Systems	4IE 4IE	No change
<b>Line O</b>	<b>POWER SUPPLIES</b>				
O1	Demonstrate knowledge of back-up power equipment, UPS, battery banks and battery charging systems [IE181-4TC]	K1 K2	Install Power Conditioning, UPS and Surge Suppression Systems Maintain Power Conditioning, UPS and Surge Suppression Systems	4IE 4IE	No change

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Line P	POWER GENERATION EQUIPMENT				
P1	Demonstrate knowledge of power generation controls and standby power generating systems [IE160-4TC]	K1 K2	Install Power Conditioning, UPS and Surge Suppression Systems Maintain Power Conditioning, UPS and Surge Suppression Systems	4IE 4IE	No change
P2	Describe co-generation principles and operations [IE164-4TC]	N1	Install Renewable Energy Generating and Storage Systems	2,4IE	Types of alternative power systems is introduced in Level 2
P3	Demonstrate knowledge of portable generator and portable electric welding equipment [IE165-4TC]	X1 X2	Install Non-Rotating Equipment and Associated Controls Maintain Non-Rotating Equipment and Associated Controls	4IE 4IE	No change
Line Q	CONTROL AND MONITORING SYSTEMS AND DEVICES				
Q1	Demonstrate knowledge of control systems [IE168-4TC]	AC1 AC3 AC4 AD1 AD3	Install Automated Control Systems Program Automated Control Systems Optimize System Performance Install Pneumatic Control Systems Install Hydraulic Control Systems	4IE 4IE 4IE 4IE 4IE	No change
Q2	Describe signal, communication and alarm systems [IE185-4TC]	Z1 Z3	Install Fire Alarm Systems Install Security and Surveillance Systems	4IE 4IE	No change