200 A Residential Services and Panel Upgrades in New Brunswick

Worked problems, visual equipment identification, Code navigation, utility coordination and field-ready learning for electricians and apprentices

AUDIENCE	TRAINING CASE	EDITION BASIS
Construction electricians and registered apprentices	100 A to 200 A Saint John-region changeover	NB adoption of C22.1-24; verify current requirements

SAFETY AND SCOPE This module teaches design reasoning, coordination and verification. It is not permission for unsupervised work, energized work or work outside a person's licence, registration, supervision or demonstrated competence. Follow GoRight procedures, NB occupational-safety requirements, utility rules and the authority having jurisdiction.

Learning outcomes

- Distinguish service rating, service box rating, panelboard rating and calculated load.
- Explain why a 200 A, 120/240 V service is approximately 48 kVA, not 24 kW.
- Assess an existing service, meter, service equipment, panelboard, grounding and installation environment.
- Navigate New Brunswick permit, Technical Inspection Services and utility coordination.
- Perform transparent capacity, load-balance, voltage-drop, loss and interrupting-rating checks.
- Plan, install, inspect, commission and document a safe 100 A to 200 A residential changeover.

TRAINING CASE The worked installation is a realistic New Brunswick teaching scenario built around an owner-occupied Saint John-region dwelling. Every value is stated so the reader can distinguish verified field facts from training assumptions and recalculate changed conditions.

1. New Brunswick regulatory foundation

A 200 A service upgrade in New Brunswick is a coordinated alteration to the complete service entrance—not merely a panel swap. Design begins with the currently adopted Canadian Electrical Code, provincial modifications, utility service-entrance standards, approved equipment, the wiring permit and the equipment manufacturer's instructions.

NB requirement	Practical meaning	Reference path
Adopted Code	Regulation 84-165 defines C22.1-24, 26th Edition, including errata and NB modifications.	NB Regulation 84-165 and Regulation 2026-5.
Installation class	A qualifying 200 A, single-phase supply below 300 V is Type II unless a Type III feature applies. Above 200 A is a Type III feature.	Definitions in NB Regulation 84-165.
Permit before work	A service changeover requires the correct wiring-permit type and coordination before construction or reconnection.	GNB wiring permits; NB Power application.
Utility requirements	Utility standards supplement—not replace—the CEC and provincial inspection requirements.	NB Power Utility Service Entrance Standards.
Approved equipment	The exact equipment and components must bear certification acceptable to the Chief Electrical Inspector.	NB Regulation 84-165, approved equipment.
Inspection and reconnection	Technical Inspection Services and the serving utility have distinct roles in inspection and energization.	Permit conditions and utility work order.

NB FIELD RULE Confirm the serving utility. Saint John-area projects may involve NB Power or Saint John Energy; never assume that one utility's meter, connection or scheduling requirement automatically applies to another.

2. What "200 A" actually means

The 200 A marking is a current rating of the applicable service equipment—not a promise that every connected load can operate at full nameplate simultaneously. The dwelling service is sized from the calculated demand and every component in the current path must have suitable ratings.

Term	Meaning	Do not confuse it with
Service rating	Permitted current capacity of the service arrangement.	The arithmetic sum of branch-breaker handles.
Service box	The main disconnecting means and associated overcurrent protection.	A downstream panelboard or splitter.
Panelboard bus rating	Maximum marked current for the panelboard assembly.	Automatic permission to install a larger main breaker.
Main breaker rating	Marked trip/current rating of the installed main device.	Calculated dwelling demand or available fault current.
Calculated load	Demand determined using the applicable Section 8 method.	A clamp reading from one moment in time.
Circuit count / spaces	Physical capacity for compatible branch devices.	Electrical capacity of the service.

3. System picture: the complete service entrance

Component	Function	Field verification
Supply connection	Utility point at which the customer service is supplied.	Utility ownership, clearances and approved connection method.
Service mast / raceway / head	Supports and protects overhead service conductors where used.	Structure, height, guying, weatherhead, fittings and clearances.
Consumer service conductors	Carry current from supply connection toward service equipment.	Material, insulation, ampacity, routing, terminations and protection.
Meter mounting device	Provides approved metering interface.	Utility approval, socket rating, bypass/configuration and location.
Service box / main disconnect	Disconnects the service and provides main overcurrent protection.	Rating, location, accessibility, interrupting rating and bonding.
Panelboard	Distributes power to feeders and branch circuits.	Bus rating, breaker compatibility, circuit directory and working space.
Grounding and bonding system	Provides fault-current path and establishes required grounding connections.	Electrode, conductor, bonding, continuity and terminations.
Utility transformer and conductors	Source that determines supply characteristics and contributes fault current.	Utility coordination; do not assume values.

SERVICE-BOX LOCATION NB Regulation 84-165 modifies Rule 6-206(1)(c): subject to the stated conditions, the service box is placed inside as close as practicable to where consumer's service conductors enter, and that distance may not exceed 5 m. The regulation also lists prohibited or unsuitable locations.

4. Representative Saint John-region changeover

Item	Training value	Why it matters
Existing service	100 A, 120/240 V, single-phase overhead	Existing equipment and utility connection require replacement/verification.
Proposed service	200 A, 120/240 V, single-phase	Qualifying configuration remains Type II unless another Type III feature applies.

Item	Training value	Why it matters
Existing calculated demand	92 A	Starting value from a completed Section 8 dwelling calculation.
Added heat-pump load	30 A calculated contribution	Electrification load included before equipment purchase.
Added EVSE load	40 A continuous connected load	Included using current CEC treatment and proposed configuration.
Screened total	162 A	Below 200 A in the simplified training screen.
Supply arrangement	Overhead, utility site review required	Mast, conductors, clearances, meter and transformer capacity coordinated.
Panelboard	Approved 200 A main-breaker panel; exact model selected after review	Bus, main device, breakers and accessories must be compatible.
Permit type	Changeover—100 A to 200 A	Utility work order and permit required before scheduled change.
Shutdown	Planned utility disconnect/reconnect	Service conductors are not made safe by opening the existing main breaker.

5. Site assessment before design

- Confirm serving utility, account holder, civic address, supply voltage, overhead/underground arrangement and work-order requirements.
- Photograph meter, mast or underground entry, service conductors, service box, panelboard, grounding/bonding and surrounding structure.
- Record all nameplates, main-device ratings, panel/bus ratings, breaker types, conductor materials and terminal markings.
- Complete the applicable dwelling load calculation, including proposed heating, EVSE, hot tub, generator, storage or future electrification.
- Check working space, headroom, accessibility, moisture, corrosion, combustible storage, finished surfaces and service-box location.
- Identify asbestos or other hazardous building materials before cutting or disturbing finishes.
- Obtain utility fault-current information or required design data; do not infer interrupting ratings from panel size.
- Develop the shutdown, temporary-power, inspection and customer communication plan before quoting.

STOP POINT A 200 A main breaker, a 200 A bus and a large enclosure do not prove that the utility connection, meter device, conductors, grounding, fault rating or calculated load are acceptable. Verify the whole service path.

6. Worked problems

Worked problem 1 - Correct 200 A service power picture

System: 120/240 V, single-phase, 3-wire

Service current rating: 200 A

Apparent power at 240 V = V x I

S = 240 x 200 = 48,000 VA = 48 kVA

Answer: A 200 A, 120/240 V service corresponds to approximately 48 kVA at unity power factor.

Plain-language explanation: Using 200 A x 120 V gives 24 kVA on one 120 V leg only. The full split-phase service uses 240 V line-to-line; a balanced 120 V load can also total 48 kVA across both legs. Actual allowable dwelling load is governed by the Code calculation, not by treating 48 kVA as continuous usable capacity.

Code and standards reference: CEC Section 8 load calculations; CEC Section 6 service equipment; utility supply characteristics.

Worked problem 2 - Why branch-breaker totals exceed 200 A

Example sum of branch-breaker handles: 420 A

Service main rating: 200 A

420 A does not equal calculated demand

Coincident demand is determined by the applicable Section 8 method

Answer: The panel can legitimately contain branch-breaker ratings totalling more than 200 A.

Plain-language explanation: Loads do not all operate at full rating at the same time. The Code calculation applies demand rules to estimate the maximum expected coincident load. Breaker-handle arithmetic is neither a service calculation nor evidence of overload.

Code and standards reference: CEC Section 8; CEC Section 14; panelboard markings and instructions.

6. Worked problems - continued

Worked problem 3 - Simplified capacity screen

Existing calculated demand: 92 A

Added heat-pump contribution: 30 A

Added EVSE connected load: 40 A

Screened total = 92 + 30 + 40 = 162 A

Apparent margin = 200 - 162 = 38 A

Answer: The training case screens at 162 A, leaving 38 A below the 200 A service rating.

Plain-language explanation: This is a transparent training screen using already-calculated contributions. The field file must contain the complete current Section 8 calculation and correct treatment of every load. Do not substitute this addition for the adopted rule.

Code and standards reference: CEC Section 8, including dwelling calculations and EV load/EVEMS provisions; CEC Section 86 for EVSE.

Worked problem 4 - 120 V load imbalance

Balanced 240 V load: 12 kW / 240 V = 50 A on each leg

Leg L1 has 10 kW of 120 V load: 10,000 / 120 = 83.3 A

Leg L2 has 6 kW of 120 V load: 6,000 / 120 = 50.0 A

L1 current = 50 + 83.3 = 133.3 A

L2 current = 50 + 50.0 = 100.0 A

Neutral carries the vector difference of the 120 V leg currents: about 33.3 A

Answer: The service is not evenly loaded: L1 is about 133 A, L2 about 100 A and the neutral carries approximately 33 A from the imbalance.

Plain-language explanation: A 240 V load places equal current on both ungrounded conductors and does not use the neutral in this example. Unequal 120 V loads create neutral current and make one leg more heavily loaded. Balance circuits where practicable, but design from the Code—not from cosmetic breaker rearrangement alone.

Code and standards reference: CEC Sections 4, 8 and 12; panelboard circuit arrangement and conductor requirements.

Worked problem 5 - Illustrative service voltage drop

One-way length: 25 m; loop length for balanced 240 V load: 50 m = 0.050 km

Exercise conductor resistance: 0.32 ohm/km

Loop resistance R = 0.050 x 0.32 = 0.016 ohm

Load current I = 160 A

Voltage drop Vd = I x R = 160 x 0.016 = 2.56 V

Percent drop = 2.56 / 240 x 100 = 1.07%

Answer: About 2.6 V, or 1.1%, using the stated training assumptions.

Plain-language explanation: The resistance value is hypothetical and does not select a conductor. Actual design requires conductor material, size, temperature, length, configuration, correction factors, ampacity and utility requirements.

Code and standards reference: CEC Section 8 voltage-drop objectives; CEC Sections 4, 6 and 12; utility service standards.

6. Worked problems - continued

Worked problem 6 - Conductor loss and connection quality

Loop resistance from Problem 5: 0.016 ohm

Current: 160 A

Loss P = I squared x R

P = 160 x 160 x 0.016 = 409.6 W

Answer: Approximately 410 W distributed through the assumed loop at 160 A.

Plain-language explanation: Normal conductor resistance produces distributed heat. A loose or contaminated termination concentrates resistance and heating at one point, so preparation, connector suitability and specified torque are critical. Never invent torque values.

Code and standards reference: CEC Sections 4, 6 and 12; equipment markings and manufacturer instructions.

Worked problem 7 - Interrupting-rating check

Utility-provided available fault current at service equipment: 10,000 A rms symmetrical

Installed main-device interrupting rating: 10,000 A

Required condition: device rating must be at least available fault current

10,000 A >= 10,000 A: passes this single check

If available fault current were 14,000 A, the same device would fail

Answer: A 10 kA device is acceptable only when the available fault current at its location does not exceed 10 kA and all other conditions are satisfied.

Plain-language explanation: Service size does not reveal available fault current. Obtain or calculate defensible source data and verify every applicable equipment rating, including any documented series combination. Labels and manufacturer limitations matter.

Code and standards reference: CEC Sections 14 and 26; utility fault-current data; certified equipment ratings and series-rating instructions.

7. Load calculation and electrification planning

A service upgrade should solve the customer's documented present and future load problem—not simply replace old equipment with a larger box. Capture the customer's electrification plan before finalizing the service.

Load / plan	Design question	Possible response
Space heating / heat pumps	What is the calculated contribution and backup heat arrangement?	Complete Section 8 treatment; consider controls where permitted.

Load / plan	Design question	Possible response
EV charging	Maximum output, daily need and customer growth plan?	Full-rate circuit, reduced setting, approved EVEMS or future raceway.
Domestic hot water	Resistance, heat-pump water heater or other source?	Use actual nameplate and applicable demand treatment.
Cooking / laundry	Existing and proposed electric appliances?	Include current configuration and renovation scope.
Hot tub / pool	Exact equipment and seasonal operation?	Dedicated design, bonding and applicable special requirements.
Solar / storage	Future generation, batteries or backup mode?	Reserve space and coordinate Sections 64/84 and utility rules as applicable.
Generator	Loads served and transfer method?	Approved transfer equipment; prevent unintended backfeed.

8. Choosing the service equipment and panelboard

Decision	Required verification
Service rating	Every component in the applicable current path is suitable for the proposed service rating.
Main-breaker vs main-lug equipment	System architecture and service disconnecting means are correct; do not assume a main-lug panel can serve as the service box.
Bus and main-device compatibility	Main device, bus assembly and enclosure are a certified/approved combination.
Branch breakers	Exact breaker family, poles, ratings, accessories and limitations match the panelboard instructions.
Interrupting / series rating	Available fault current is within equipment ratings and any series rating is documented and labelled.
Neutral and bonding	Service bonding and downstream neutral isolation are correct for the actual architecture.
Spaces and circuits	Enough full-size spaces for present circuits, required protection and future plan; tandem use only where permitted by markings.
Enclosure and environment	Indoor/dry, outdoor/wet or corrosive conditions are matched by enclosure and fittings.
Working space and location	Safe access, headroom, illumination and prohibited-location checks are satisfied.
Documentation	Circuit directory, labels, torque records, settings and as-installed information are complete.

PRODUCT NEUTRALITY Choose by approval, ratings, compatibility, availability, support and project requirements—not by unverified internet brand rankings. Never mix breaker families because they appear to fit.

9. Existing-condition assessment

- Evidence of overheating: discolouration, insulation damage, melted components, odour or bus damage.
- Moisture or corrosion at the service head, meter device, conductors, enclosure, neutral or grounding connections.
- Improvised or incompatible breakers, double-lugged terminals, missing fillers or damaged deadfront components.

- Service conductors, mast, attachments or raceways that are damaged, undersupported or exposed to mechanical stress.
- Unverified neutral/ground connections, bonding jumpers, grounding-electrode conductors or downstream neutral bonds.
- Crowded splices, conductor damage, abandoned wiring or insufficient conductor length for safe transfer.
- Building conditions that affect scope: finished walls, fire separations, asbestos risk, water entry or structural repair.
- Recurring trips or flicker investigated as symptoms—not used alone as proof that a 200 A upgrade is required.

10. Utility, permit and inspection workflow

1. Customer initiates utility work order: Where the utility is required on site, the property owner obtains the work-order reference and provides project/contact information.

2. Contractor completes field assessment: Confirm utility, service type, ratings, route, meter location, grounding, load calculation and construction scope.

3. Utility/site coordination: Obtain the serving utility's requirements, site consultation and any contribution or customer work list.

4. Wiring permit: Apply using the correct changeover/service category before construction; submit required building permit or waiver documents.

5. Equipment and schedule: Order approved equipment only after requirements are confirmed; coordinate outage, inspection and reconnection windows.

6. Safe disconnection: Utility establishes the required safe state. Opening the customer main breaker does not de-energize line-side service conductors.

7. Installation and verification: Complete service entrance, grounding/bonding, panel transfer, terminations, testing, labels and documentation.

8. Technical inspection: Arrange the required inspection with permit number and correct deficiencies.

9. Utility reconnect: Reconnection occurs only through the serving utility's authorized process.

10. Customer handoff: Explain operation, directories, future load limits, warranty, records and any outstanding items.

> **COORDINATION FACT** NB Power's public process separates the customer work order, contractor permit, utility engineering/site work, Technical Inspection Services inspection and utility disconnect/reconnect. Project timing depends on completing each dependency in order.

11. Grounding and bonding reasoning

Check	Reason
Identify the service point and service box	Determines where service bonding and grounded-conductor relationships are established.
Verify grounding electrode and conductor	Electrode type, conductor size, routing, protection and termination must suit the installation.
Verify bonding of service equipment	Metal enclosures and raceways require an effective fault-current path.
Keep downstream neutrals isolated where required	Unintended neutral-to-ground connections create objectionable current paths.
Bond metal water piping and other systems as applicable	Bonding is based on actual systems present and current Code requirements.
Inspect after conductor transfer	A visually similar connection can be electrically different; continuity and architecture must be verified.
Document concealed connections	Photos and records support inspection, maintenance and future alterations.

PLAIN LANGUAGE Grounding connects the system to earth for defined purposes. Bonding joins conductive parts to create a low-impedance fault-current path so protective devices can operate. Earth is not the normal substitute for a bonding conductor.

12. Safe-work and outage planning

- Prepare a documented hazard assessment, roles, communication plan and stop-work criteria.
- Coordinate utility isolation; verify the de-energized state with an adequately rated instrument using a live-dead-live method.
- Apply lockout/tagout and control every possible source, including generators, solar, storage and backfeed paths.
- Use appropriate PPE, insulated tools, barriers, covers and access control for the established condition.
- Protect occupants and critical loads; plan temporary power only through an approved, documented arrangement.
- Maintain apprentice supervision required by NB law and the actual task risk.
- Do not normalize energized service work for convenience or scheduling.

NB OCCUPATIONAL SAFETY New Brunswick Regulation 91-191 requires electrical equipment to be de-energized, locked out and tagged before work, subject to its stated provisions. GoRight’s work plan must also address the utility side, which remains outside customer-main control.

13. Installation workflow for the training case

Confirm: Verify permit, utility work order, approved drawings/instructions, equipment, outage and inspection schedule.

Document existing state: Record circuits, conductor identities, phasing/legs, special controls, generators and customer-critical loads.

Make safe: Utility disconnect, isolation, lockout/tagout, test-before-touch and controlled work zone.

Remove carefully: Preserve conductor identification; do not conceal heat damage, corrosion or structural deficiencies.

Install service entrance: Complete mast/raceway, conductors, meter equipment, service box and required mechanical support to utility and Code requirements.

Install panelboard: Secure enclosure, maintain working space, fit approved components and protect conductors.

Ground and bond: Complete service bonding, grounding electrode connections and downstream neutral isolation as designed.

Transfer circuits: Inspect conductors, maintain required protection, identify multiwire/shared-neutral arrangements and terminate correctly.

Torque and verify: Use manufacturer values, suitable tools and a recordable process; no invented values.

Label: Accurate circuit directory, service and fault/series labels, alternate-source warnings and required identification.

Test and inspect: Visual, continuity/bonding, insulation or other justified tests; correct deficiencies before energization.

Re-energize and commission: Utility reconnect, staged load restoration, voltage checks, operational verification and customer handoff.

14. Commissioning and closeout record

Check	Record
Utility / work order	________________________
Wiring permit / inspection	________________________
Service voltage L1-L2 / L1-N / L2-N	_______ / _______ / _______ V
Service and panel equipment	Manufacturer / model / serial
Main device / bus rating	_______ A / _______ A
Available fault current / rating	_______ A / _______ A
Service conductor / terminal basis	________________________

Check	Record
Grounding electrode / conductor	____________________________
Bonding and neutral architecture	Pass / deficiency
Torque records	Values / tool / verifier
Phase/leg loading check	L1 ______ A / L2 ______ A / N ______ A
Circuit directory and labels	Complete / outstanding
Functional / load restoration	Pass / deficiency
Photos and as-installed file	Location / reference
Customer demonstration	Complete / outstanding

15. Troubleshooting after a changeover

Symptom	Reasoning path—do not jump to conclusions
One group of circuits is dead	Verify breaker position, conductor identification, termination, bus engagement, splice and shared-neutral arrangement.
120 V voltages are unequal	Stop and assess neutral integrity immediately; check grounded-conductor connections and load conditions.
Main or branch breaker trips	Do not upsize. Measure load, identify fault/overload, verify breaker compatibility, conductor condition and settings.
Lights flicker under load	Check utility/source voltage, terminations, neutral, conductor drop and the specific cycling load.
Panel or meter area heats	Make safe; inspect connection resistance, conductor preparation, terminal suitability, torque and actual loading.
Generator backfeed concern	Stop energization; verify approved transfer equipment, interlocking, neutral treatment and alternate-source labels.
Inspection deficiency	Correct the cited condition and verify related work; do not treat the note as an isolated cosmetic item.

DIAGNOSTIC DISCIPLINE Observe -> make safe -> collect data -> form a hypothesis -> test -> correct the verified cause -> retest -> document. Parts replacement without evidence is not troubleshooting.

16. Common errors and their lesson

- Calling a 200 A, 120/240 V service “24 kW” by using only one 120 V leg.
- Choosing the service from home size, age or breaker-handle totals instead of a load calculation.
- Changing only the panel while leaving unsuitable meter, conductors, service box, grounding or utility connection.
- Installing a 200 A main device in equipment not approved for that rating or combination.
- Assuming all breakers that physically fit are compatible.
- Ignoring available fault current and interrupting/series-rating requirements.
- Bonding neutral and ground again in a downstream panel.
- Starting before the work order, permit, outage and inspection dependencies are ready.
- Failing to preserve circuit identification and shared-neutral relationships during transfer.
- Treating utility reconnection as permission to skip commissioning or customer documentation.

17. Apprentice exercises

1. Calculate the apparent-power basis of a 200 A, 120/240 V single-phase service. Explain why 200 A x 120 V is incomplete.
2. A completed existing dwelling calculation is 108 A. Proposed loads contribute 28 A and 40 A. Perform the simplified screen and state the result.
3. A balanced 240 V load draws 45 A. L1 has 7.2 kW of 120 V load and L2 has 4.8 kW. Calculate L1, L2 and neutral imbalance current.
4. For a 30 m one-way balanced 240 V circuit at 150 A and exercise resistance 0.30 ohm/km, calculate voltage drop and percentage.
5. Utility fault current is 12 kA. Can equipment marked 10 kA be used without another approved rating method? Explain.
6. List eight components or conditions that must be verified before quoting a 100 A to 200 A changeover.
7. Explain why opening the existing main breaker does not make a service-panel replacement safe.
8. Write the correct sequence from customer work order through permit, inspection and utility reconnection.
9. Explain the difference between grounding and bonding in plain language.
10. Create a five-line apprentice-safe work plan for circuit identification and transfer.

18. Answer key

Exercise	Answer
1	240 x 200 = 48,000 VA = 48 kVA. Using 120 V accounts for only one leg; balanced 120 V load exists across both legs.
2	108 + 28 + 40 = 176 A. The simplified screen is below 200 A by 24 A; the full adopted Section 8 calculation is still required.
3	45 A on both legs from the 240 V load. L1 120 V load = 60 A; L2 = 40 A. Totals: L1 105 A, L2 85 A, neutral imbalance about 20 A.
4	Loop = 0.060 km. R = 0.060 x 0.30 = 0.018 ohm. Vd = 150 x 0.018 = 2.7 V. Percent = 2.7/240 x 100 = 1.125%.
5	No. A 10 kA device is below 12 kA available fault current unless a documented approved series/combination or other permitted method establishes suitability.
6	Accept service/utility, meter, service conductors, service box, panel/bus, load calculation, fault rating, grounding/bonding, location, environment, structure, permit and shutdown checks.

Exercise	Answer
7	The main opens the load side but line-side conductors remain connected to the utility source. Utility isolation and verification are required.
8	Customer work order -> contractor assessment -> utility/site requirements -> wiring permit -> outage schedule -> installation -> TIS inspection -> authorized utility reconnect -> closeout.
9	Grounding connects the system to earth for defined purposes. Bonding joins conductive parts to create an effective fault-current path.
10	Accept plans covering verified isolation, identification method, controlled access, conductor inspection, supervision, termination verification and documentation.

19. Code and standards navigation map

Reference	Use in this module
NB Regulation 84-165	Adopts C22.1-24 with NB modifications; defines installation types, approved equipment, licensing, permits and service requirements.
NB Regulation 2026-5	Updates the adopted Code definition and provincial modifications.
CEC Section 2	General rules, approved equipment, markings, working space and instructions.
CEC Section 4	Conductor ampacity, temperature limitations and conductor selection.
CEC Section 6	Services and service equipment.
CEC Section 8	Calculated loads, circuit loading and dwelling demand.
CEC Section 10	Grounding and bonding.
CEC Section 12	Wiring methods, support, protection and environment.
CEC Section 14	Protection and control, including overcurrent and interrupting requirements.
CEC Section 26	Installation of electrical equipment, panelboards and applicable devices.
NB Power Utility Service Entrance Standards	Minimum utility requirements in addition to CEC and provincial inspection requirements.
NB OHS Regulation 91-191	Electrical safety, qualified persons and de-energization/lockout requirements.
Manufacturer instructions	Model-specific ratings, conductors, terminals, torque, accessories and installation limits.

COPYRIGHT AND AUTHORITY This module identifies Code topics for navigation but does not reproduce the Canadian Electrical Code. The complete official standard, NB amendments, utility standard, permit conditions, approved equipment instructions and authority interpretations govern.

20. New Brunswick legal and technical references

Government of New Brunswick - Regulation 84-165 - Adopted Code, NB modifications, installation types, approved equipment and service provisions.

Government of New Brunswick - Regulation 2026-5 - March 2026 amendment adopting C22.1-24 and updating provincial modifications.

Government of New Brunswick - Electrical wiring permits - Permit thresholds, application, utility work-order and inspection information.

NB Power - Utility Service Entrance Standards - Minimum utility service requirements that supplement Code and inspection rules.

NB Power - Building and Renovations - Work order, site consultation, inspection and disconnect/reconnect workflow.

NB Power - Electrical Wiring Permits - Application and Technical Inspection Services coordination.

New Brunswick OHS Regulation 91-191 - Electrical-safety and lockout requirements.

REVISION CONTROL Prepared August 2026. Review whenever New Brunswick adopts a new Code edition, issues an electrical bulletin, revises permit or inspection processes, or the serving utility updates its service-entrance standard.

NB 200 A service final release check

- Serving utility, work order, supply characteristics and utility requirements confirmed.
- Current NB-adopted Code, amendments, wiring permit and inspection requirements confirmed.
- Complete Section 8 dwelling-load calculation and future electrification plan documented.
- Service entrance, meter device, service box, panelboard, conductors and fault ratings verified.
- Grounding, bonding, neutral architecture, location and working-space requirements verified.
- Approved equipment, compatible devices, conductor/terminal limits and torque values recorded.
- Utility isolation, lockout/tagout, inspection and reconnection sequence completed.
- Commissioning, circuit directory, labels, photos, customer handoff and as-installed file closed.

Appendix A. Visual field atlas - NB residential service work

This atlas turns the written module into a visual recognition and inspection guide. It is built for New Brunswick residential 120/240 V service work, but photographs can show equipment from other jurisdictions or product families. Use each image to identify functions and inspection questions—not to select an ampacity, breaker family, enclosure rating or installation method by appearance.

HOW TO USE EVERY IMAGE 1) Identify the component and its position in the service path. 2) Find the actual certification mark, nameplate and model instructions on the installed equipment. 3) Compare the field condition with the current NB-adopted CEC, provincial modifications, serving-utility standard and permit requirements. 4) Stop if the equipment architecture, ratings or ownership boundary is uncertain.

Figure A-1 - Brand-neutral service equipment identification board

Top row: weatherhead/mast, meter socket and service-rated disconnect. Bottom row: panelboard, large service conductors/lugs, and PVC/metal raceway samples. AI-generated training image; verify every real product by markings and instructions.

Figure A-1 component map and field questions

No.	Equipment	Recognition cue	NB field question
1	Weatherhead and mast	Downward-facing service head on a mechanically supported raceway.	Who owns each part, and do height, attachment, clearances and utility requirements match the site?
2	Meter mounting device	Round meter opening, line/load jaws and utility-sealing provisions.	Is the exact socket/bypass/configuration approved by the serving utility and rated for the service?
3	Service-rated disconnect	Enclosed switching device with an external handle.	Is it the service box or another disconnect, and are bonding, rating, location and fault duty correct?
4	Panelboard/loadcentre	Main device, bus, branch breakers, neutral and bonding provisions.	Is it service equipment or downstream equipment, and are the installed breakers listed for this exact panel?
5	Service conductors and lugs	Large insulated conductors with compression/mechanical termination hardware.	Are material, insulation, ampacity, terminal material/temperature and torque verified?
6	Raceways and fittings	PVC and metallic conduit with purpose-made fittings.	Is the wiring method permitted for the location, supported, bonded and protected from damage?

A1. Panelboard and breaker recognition

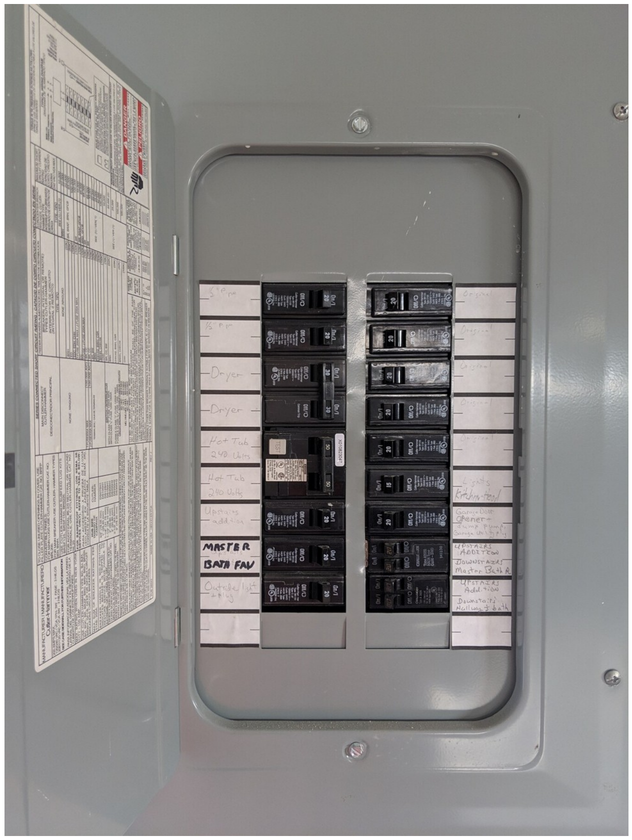

Figure A-2 - Open North American breaker panel

Recognition example only. The deadfront/door is open; internal components remain hazardous until the correct source isolation and verification process is complete.

Figure A-2 inspection questions

Look for	Why it matters	Do not assume
Main device and bus markings	Establish ratings and architecture.	A large enclosure or 200 A label on one part proves the whole service is 200 A.
Breaker manufacturer/type markings	Compatibility comes from the panel label and certified combination.	A breaker that clips onto the bus is approved for that panel.
Neutral and bonding arrangement	Service equipment and downstream panels are treated differently.	White and bare conductors on the same bar are always correct.
Circuit directory and conductor identification	Supports safe isolation, troubleshooting and transfer.	Handwritten room names are complete or still accurate.
Heat, corrosion, missing fillers and damaged parts	Can reveal unsafe conditions and scope changes.	Cleaning or replacing one breaker corrects bus or enclosure damage.

APPRENTICE PROMPT Without touching the equipment, name five items you must record from labels or field observations before designing a panel replacement. Then explain which facts still require utility or manufacturer confirmation.

A2. Metering equipment and the service boundary

Figure A-3 - Outdoor meters and service enclosures

Commercial example used to teach enclosure, metering and ownership recognition. It is not an NB residential layout template.

Field check	Question to answer
Serving utility	NB Power, Saint John Energy or another serving authority?
Ownership boundary	Which conductors, meter, seals, socket and connection points are utility-controlled?
Meter-device approval	Is the exact meter mounting device/configuration accepted for the proposed service?
Environment	Does the enclosure, hub, gasket, fitting and conductor entry suit the wet/outdoor location?
Rating path	Are meter device, conductors, disconnect/service box and panel all suitable for the proposed rating?
Work sequence	Are work order, permit, isolation, inspection and reconnect dependencies confirmed?

CRITICAL BOUNDARY Removing a meter or opening the customer main device is not an electrician-controlled substitute for the utility's authorized isolation process. Treat all line-side parts as energized until the utility action and test-before-touch process establish otherwise.

A3. Disconnecting means and service-box reasoning

Figure A-4 - Enclosed utility disconnect example

This photographed unit serves a 3-phase commercial service. Use it only to recognize an enclosed disconnect and external operating handle—not as a residential product-selection example.

Verify on the actual project	Reason
Device role: utility disconnect, service box, feeder disconnect or equipment disconnect	The Code treatment, bonding and ownership boundary depend on the role.
Voltage, current, poles, fuse/breaker arrangement and interrupting rating	Appearance does not establish electrical suitability.
Service-equipment marking and approved enclosure type	A generic disconnect enclosure is not automatically acceptable as service equipment.
Location, accessibility and NB service-box distance/location rules	NB Regulation 84-165 modifies the service-box location requirement.
Line/load terminals, conductor range/material and torque	Every termination must match the installed conductor and manufacturer instructions.
Locking, labelling and alternate-source considerations	Generator, PV or storage sources can create additional hazards and identification needs.

A4. Conductors: identify before calculating

Figure A-5 - Stranded copper power cable

Large multiconductor example; not a Canadian service-conductor selection table.

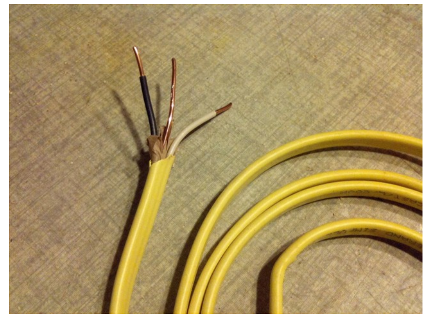

Figure A-6 - North American nonmetallic-sheathed cable

Common branch-circuit cable form; not automatically permitted in every location or for service conductors.

A photograph can help recognize construction, but conductor selection is a calculation and approval task. Record the full jacket and conductor markings, then verify the applicable CEC tables, correction/derating conditions, termination temperature limitations, utility requirements and installation method.

Identify	What must be verified
Conductor metal	Copper or aluminum; connector and preparation must be suitable for that material.
Insulation/jacket marking	Type, voltage, temperature, wet/dry suitability and any sunlight/direct-burial marking.
Conductor size and configuration	Exact size, number of current-carrying conductors, neutral treatment and parallel restrictions.
Termination	Listed conductor range/material, temperature basis, preparation, oxide treatment if instructed, and torque.
Environment and wiring method	Raceway/cable suitability, support, mechanical protection, sealing and transition details.
Calculated duty	Ampacity, load, continuous loading where applicable, voltage drop and fault-current withstand context.

A5. Raceways, fittings and conductor protection

Figure A-7 - Flexible/corrugated electrical conduit example

International wet-room example. It teaches raceway recognition only; confirm the Canadian product marking, permitted use, fill, support, fittings and bonding method.

Raceway question	Inspection reasoning
What exact wiring method is this?	Trade names and appearance are not enough; read the product marking and approval.
Is the location dry, damp, wet, corrosive, concealed or exposed to damage?	The environment controls enclosure, raceway, fitting and conductor requirements.
How is it supported and terminated?	Check spacing, structure, bushings, hubs, connectors, locknuts and strain/mechanical protection.
How is metallic continuity established?	Metal raceways and enclosures need an effective bonding path; verify joints and bonding provisions.
Are fill and bending limits satisfied?	Use the adopted rules and manufacturer limits; do not judge by visual crowding alone.
Where must water entry be controlled?	Service heads, outdoor hubs, meter equipment and transitions need coordinated weather protection.

A6. Grounding and bonding: learn from a flawed example

Figure A-8 - Grounding electrode installation used as an error-spotting exercise

This Australian installation is not an NB template and its coiled grounding conductor is specifically presented as a poor practice example.

Observe	NB-focused lesson
Grounding electrode and exposed connection	Identify the electrode type, accessibility, protection and suitability for the actual site.
Coiled conductor	Do not copy a visually neat coil; routing should meet the current adopted requirements and avoid unnecessary length/bends.
Nearby metallic systems	Determine required bonding from the actual water piping, building systems and service architecture.
Conductor protection	Verify exposure to damage, support, routing and termination hardware.
Grounding vs bonding	Earth reference and an effective metallic fault-current path are related but not interchangeable functions.

APPRENTICE PROMPT Circle or list every visible feature that requires verification. Then draw the service point, grounded conductor, service bonding connection, equipment bonding path and grounding electrode conductor for the actual NB training case—without copying this foreign installation.

A7. Panel condition comparison and diagnostic observation

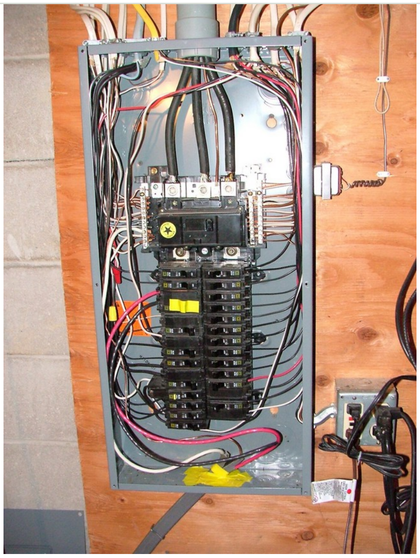

Figure A-9 - Older basement panel example

Use for condition-assessment practice; it is not an NB acceptance decision.

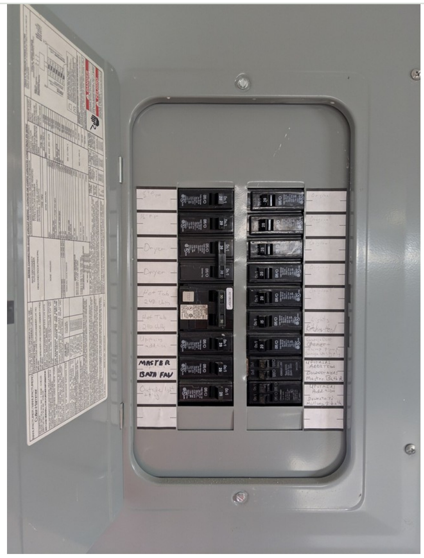

Figure A-10 - Newer labelled panel example

Use for directory, breaker and enclosure observation; ratings still come from markings.

Observation task	Record
Enclosure condition, openings and covers	______________________________________
Breaker family/compatibility evidence	______________________________________
Conductor condition and termination concerns	______________________________________
Neutral/bonding architecture questions	______________________________________
Heat, corrosion or moisture indicators	______________________________________
Working-space or location concerns	______________________________________
Facts requiring utility/manufacturer/AHJ confirmation	______________________________________

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A8. Breaker shapes across systems: a deliberate contrast

Figure A-11 - DIN-rail miniature circuit breakers

These devices illustrate why physical familiarity is not approval. They are not the plug-on branch breakers normally used in the North American residential loadcentre shown elsewhere in this guide.

Question	Correct training response
Does a breaker protect a conductor merely because its handle rating matches?	No. Voltage, poles, trip characteristics, interrupting rating, equipment compatibility and conductor/load requirements also matter.
Can a physically fitting breaker be installed in a panel?	Only when the exact panel/equipment markings and approved combination permit it.
Does “200 A panel” establish branch-breaker interrupting capacity?	No. Available fault current and every applicable device/equipment rating must be verified.
Can a photo establish certification?	No. Read the actual certification mark, product label, model documentation and applicable approval requirements.

A9. Visual pre-evaluation worksheet

Complete this worksheet during a supervised site assessment. Do not remove covers, meters or seals unless the work is authorized, isolated and within the safe-work plan.

Visual checkpoint	Photo/file reference	Verified fact or unresolved question
Supply connection / mast / service head	______________	____________________________
Meter and mounting device	______________	____________________________
Service conductors / raceway	______________	____________________________
Service box / main disconnect	______________	____________________________
Panelboard / bus / main device	______________	____________________________
Branch breakers / directory	______________	____________________________
Neutral / bonding arrangement	______________	____________________________
Grounding electrode system	______________	____________________________
Working space / environment	______________	____________________________
Alternate sources / backfeed	______________	____________________________
Utility / AHJ / manufacturer question	______________	____________________________

RELEASE GATE A photograph documents condition; it does not close a design question. The quote and work package must convert every unresolved visual observation into a verified field measurement, calculation, utility answer, approved-product check, permit requirement or explicit scope exclusion.

A10. Image licences and visual-use notes

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