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BUILDING PRACTICE NOTE

BUILDING DRAWINGS CHECKLIST: ELECTRICAL DRAWINGS FOR HOUSING

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Division of Building Research, National Research Council Canada

Ottawa, February 1983

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BUILDING DRAWINGS CHECKLIST:
ELECTRICAL DRAWINGS FOR HOUSING

by

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Ottawa

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PREFACE

This drawing checklist is the fourth of the series, complementing the Building Practice Note 29, Building Drawings Checklist: Architectural Drawings, Note 39, Building Drawings Checklist: Structural Drawings and Note 40, Building Drawings Checklist: Mechanical Drawings. It provides electrical engineers with a convenient tool for the final review of drawings prepared under their supervision.

Since this list is a general one, it cannot claim to cover all the special situations which can occur in practice; nevertheless it should prove helpful as a basic guide. Users of this checklist are strongly urged, before putting it to use, to consult the Canadian National Standard CAN3-B 78.3-M77 Building Drawings (published by and available from the Canadian Standards Association, 178 Rexdale Blvd., Rexdale Ontario) or the Manual on Metric Building Practice (published by and available from the Division of Building Research, National Research Council of Canada).

Part I of this checklist serves as a reminder of various items to the person checking the drawings. The matter of "crispness of drawings", for example, cannot be over-emphasized, particularly in plans drawn at 1:100 scale.

Part II presents, in tabulated form, a checklist sheet for every sheet in a traditional set of working drawings for housing. These tables can be photocopied and attached to the appropriate drawings during the checking stage. Free space is provided on the sheets for additional items. Using the tables will thus simplify the process of reprinting check sets and/or establishing permanent records of all verifications and approvals. They can also supplement computeraided design (CAD) software.

The architect must critically review his own work before releasing it to a contractor for execution. It is his professional responsibility, an obligation to his client and the key to a good business reputation.

The author wishes to thank Mr. F.W. Steel of DBR for reviewing the manuscript and offering many useful suggestions.

PARTI

1. CHECKING DIMENSIONS AND UNITS

The dimensioning method should be consistent, meticulous and in accordance with the National Standards of Canada CAN3-B 78.3-M77 Building Drawings.

- 1.1 Linear dimensions should be expressed in millimetres (mm) on building drawings, and in metres (m) on site plans. According to the standard convention in drafting, the unit symbol can be omitted if the following requirements are met:
 - a) a note including the unit used is displayed in a conspicuous place on the drawing sheet;
 - b) all linear dimensions including those for spot levels and land elevation contours are given in one dimensioning unit only.

For easier reading, group the digits in triads on both sides of the decimal marker (e.g., 123 456 789). All dimensions shown in metres must be taken to three decimal places, even when all decimals are zeros (e.g., 1.235, 1.000).

- 1.2 Area dimensions should be expressed in:
 - a) hectares (ha) for areas on survey plans, plans of subdivisions and lot plans to three decimals (e.g., 1.234 ha).
 - b) square metres (m²) for floor areas of rooms, large glass panes, to two decimals (e.g., 1.23 m²).
 - square millimetres (mm²) for sectional areas of wires, using no decimals.

Symbols of these units MUST ALWAYS BE SHOWN on drawings where appropriate.

- 1.3 Volume dimensions should be expressed in:
 - a) cubic metres (m^3) for air and fluid distribution in large quantities.
 - b) litres (L) for volumes pertaining to containers of fluids or gases.

1.4 UNITS FOR USE IN ELECTRICAL ENGINEERING CALCULATIONS

	SI	Re	ecommended Unit	
Quantity	Unit Symbol	Symbol	Name	Typical Application
Electric current (intensity)	A	kA A mA μA	kiloampere ampere milliampere microampere	Service rating of an electrical installation. Leakage current.
Electric charge, quantity of electricity	С	kC C µC nC pC	kilocoulomb coulomb microcoulomb nanocoulomb picocoulomb	The voltage on a unit with capacitative type characteristics may be related to the amount of charge present (e.g., electrostatic precipitators). Storage battery capacities.
Electric potential, potential difference, electromotive force	V	kV mV μV	kilovolt millivolt microvolt	The electric field strength gives the potential gradient at points in space. May be used to calculate or test electrical parameters such as dielectric strength.
Electric field strength	V/m	kV/m mV/m μV/m	kilovolt per metre millivolt per metre microvolt per metre	
Capacitance	F	F mF µF nF pF	farad millifarad microfarad nanofarad picofarad	Electronic components. Electrical design and performance calculators.
Current density	A/m ²	A/m ² kA/m ²	ampere per square meter kiloampere per square meter	Design of cross-sectional area of electrical conductor.

	SI	Re	commended Unit	
Quantity	Unit Symbol	Symbol	Name	Typical Application
Magnetic field strength	A/m	A/m	ampere per metre	Used in calculation of mag netic circuitry such as
		kA/m	kiloampere per metre	transformers, magnetic amplifiers and general cores.
Magnetomotive force,	A	kA	kiloampere	Used in calculations involved in magnetic
magnetic		A	ampere	circuits.
potential difference		mA	milliampre	
arrietence		THE STATE OF THE S	miliample	
Impedance,	Ω	kΩ	kilohm	The design of electrical
reactance		mΩ	milliohm	motors, generators and transmission lines.
Active Power	W	kW	kilowatt	Useful power in an
		W	watt	electrical circuit.
		mW	milliwatt	
		μW	microwatt	
Apparent Power	V • A	kV•A	kilovolt ampere	Total volt-amperes in
		V•A	volt ampere	an electrical circuit.
		mV • A	millivolt ampere	
		μ V• A	microvolt ampere	
Conductance,	S	kS	kilosiemens	The design of electri-
admittance,		S	siemens	cal devices with
susceptance		mS μS	millisiemens microsiemens	finite resistance such
		μЗ	micros iemens	as motors, generators, heaters.
Resistivity	Ω•m	kΩ•m	kilohm metre	
,		Ω• m	ohm metre	
		mΩ•m	milliohm metre	
		μΩ• m	microohm metre	
		nΩ•m	nanoohm metre	

	SI	Re	commended Unit	
Quantity	Unit Symbol	Symbol	Name	Typical Application
Conductivity	S/m	kS/m S/m µS/m	kilosiemens per metre siemens per metre microsiemens per metre	The design of electrical devices with finite resistance. A parameter for measuring water quality.
Resistance	Ω	kΩ Ω mΩ	kilohm ohm milliohm	
Reluctance	H-1	н-1	reciprocal henry	Design of motors and generators.
Permeance	Н	н	henry	
Permeability	H/m	H/m µH/m nH/m	henry per meter microhenry per meter nanohenry per meter	Gives the relationship between magnetic flux density and magnetic field strength.
Flux of magnetic induction, magnetic flux	WЪ	mWb	milliweber	Used in calcula- tions involved in magnetic circuits.
Magnetic flux density, magnetic induction	Т	T mT μT nT	tesla millitesla microtesla nanotesla	
Magnetic vector potential	Wb/m	kWb/m	kiloweber per meter	

	SI Unit	Recommended Unit		*
Quantity		Symbol	Name	Typical Application
Self-	н	Н	henry	Used in analysis and
inductance,		mH	millihenry	calculations involving
mutual		μН	microhenry	transformers.
inductance		nH	nanohenry	
		pH	picohenry	¥).

2. SCALES

Preferred Scales Commonly Used for Different Types of Drawings*

Stage	Type of Drawing	Scale	Notes
Design	Sketch and prelimi- nary drawings		Scales will vary but it is recommended that preference be given to those used in the working drawing stage.
	Location drawings		Scale will vary according to maps used as reference.
	Block plan	1:2000 1:1000	
Working drawing	Site plan	1:500 1:200	
	General location drawings	1:200 1:100 1:50	
	Component range drawings	1:100 1:50 1:20	The preferred scale is 1:50
	Assembly drawings	1:20 1:10 1:5	
	Component detail drawings	1:10 1:5 1:1	

^{*} This table is reprinted from the Canadian National Standard CAN 3-B 78.M77 Building Drawings. The recommended range of scales may be extended to both sides, provided that the new scale can be derived from a recommended scale by multiplying the numerator or denominator by a power of 10.

SITE PLAN

- 3.1 Show all lot lines, lot designation and designations of adjoining private and municipal lands.
- 3.2 Indicate lot orientation by north arrow.
- 3.3 Show in outline the proposed building and all other structures on the property: driveways, sidewalks, parking areas, freestanding signs.
- 3.4 Indicate existing service lines (electrical, telephone, cable TV) overhead or buried. Show existing poles if any.
- 3.5 Show connections (overhead or buried) from existing service lines to building. Indicate location where services enter the building. Co-ordinate with architectural, structural and mechanical drawings.
- 3.6 Show new poles or trenches for connecting services.
- 3.7 Indicate location of exterior transformer, if any, for pad- or pole-mounted transformer. Co-ordinate pad design requirements with structural drawings.
- 3.8 Show location and type of exterior lighting fixtures (lighting on poles, mounted on building, area floodlighting).
- 3.9 Show location and service to car heater plugs.
- 3.10 Show location and type of photocells governing lighting, or barrier or door opening devices.
- 3.11 Indicate easements for municipal utility services.
- 3.12 For convenience, place legend on first drawing of the set and place details on the first drawing to which they apply.

FLOOR PLANS

- 4.1 Check for proper location of all walls, partitions and columns, according to latest issued architectural drawings. Outline in thin line. Show all doors and windows. Show gridlines.
- 4.2 Check all coding names or numbers of individual rooms and spaces against coding in architectural floor plans.
- 4.3 Locate points of incoming electrical, telephone, cable TV and security services when applicable.
- 4.4 Indicate building or individual metering devices; show panel location and identification.

- 4.5 Locate furnace; indicate type and required service.
- 4.6 Locate laundry equipment; indicate type and required service.
- 4.7 Locate hot water heaters; indicate type, capacity and required service.
- 4.8 Locate transformer. Check for fireproofing and ventilation of transformer vault. Co-ordinate with architectural, structural and mechanical drawings.
- 4.9 Check the location of the emergency generator when required. Indicate capacity, fuel supply, ventilation, cooling, transfer switch.
- 4.10 Check electrical service requirements for elevator machine room. At typical floors, show location of elevator control panels.
- 4.11 Check distribution of wall receptacles; indicate use.
- 4.12 Check location of switches; indicate which fixture they control; show panel and circuit number.
- 4.13 Show location of lighting fixtures; indicate type.
- 4.14 Check location and size of electrical heating units; indicate type and heating capacity.
- 4.15 Check location of electric thermostats. Co-ordinate with mechanical drawings.
- 4.16 Show location of all motors. Indicate use, type, power, panel and circuit number or starter number.
- 4.17 Check for emergency lighting.
- 4.18 Check fire alarm system: location of required pull stations, smoke/heat detectors, alarm bells.
- 4.19 Check connections to flow switches and tamper indicators.
- 4.20 Locate all kitchen equipment requiring electrical service.

 Indicate use, type, power required, panel and circuit number.

 Co-ordinate with mechanical drawings.
- 4.21 Locate individual telephone stations.
- 4.22 Locate cable TV outlets.
- 4.23 Locate doorbell or annunciator panel, voice communication stations, electrical door opening devices, exit signs.
- 4.24 Indicate security equipment: scanning cameras, security station and interconnection if required.

- 4.25 Check for special fixtures for handicapped if required.
- 4.26 Large scale detailed floor plans of specific rooms or areas (see section 6. Detailed Floor Plans) should be shown, if possible, on the same floor plan to which they apply.

ROOF PLAN

- 5.1 Indicate in thin line the outline of the roof.
- 5.2 Show penthouses, roof hatches and other parts of building structure above main roof level.
- 5.3 Show location and wiring distribution to roof lighting fixtures and electrical receptacles.
- 5.4 Indicate requirements (wiring, type and capacity of motor) of swing stage window cleaning equipment, if any.
- 5.5 Show location and wiring for roof-mounted TV antennas and receiving dishes, if any. Co-ordinate support and anchoring with structural drawings.
- 5.6 Provide electrical service in elevator penthouse (lighting, ventilating, elevator machine).
- 5.7 Show location and provide service for mechanical equipment mounted at roof level.
- 5.8 Show location and provide service for closed circuit security cameras, if any.

DETAILED FLOOR PLANS

- 6.1 General show in thin line all parts of building structure and equipment by others, indicate gridlines to orient detailed floor plan to the rest of the building.
- 6.2 Electrical room/closet and transformer vault.
- 6.2.1 Show cable trenches, their pull rings, drainage and covers.
- 6.2.2 Locate transformer, indicate type, grounding, security screen, transformer oil containment system (separate from plumbing).
- 6.2.3 Show cable raceways and buss ducts.
- 6.2.4 Locate switches, splitters, panels and meter(s).
- 6.2.5 Indicate space lighting, heating and ventilation of room.
- 6.2.6 Show high temperature alarm.
- 6.2.7 Locate telephone, TV scanner, fire detector.

- 6.3 Provide single line distribution diagram of wiring in the electrical room/closet and transformer vault.
- 6.4 To show vertical relation of various equipment in the electrical room, it is good practice to supplement a detailed floor plan by a section drawing showing placement of equipment (to scale).
- 6.5 Co-ordinate with architectural drawing for size of the electrical room, openings and fireproofing.
- 6.6 Co-ordinate with structural drawings for special foundation and/or anchoring requirements of equipment.
- 6.7 Co-ordinate with mechanical drawings for requirements on drainage, heating and ventilating.

7. DISTRIBUTION DIAGRAMS AND SCHEMATICS

- 7.1 Show the single line power distribution system diagram; check mains disconnect, transformers and secondary distribution, indicate type and rating of breakers in secondary switchboard, stepdown transformers, splitters and disconnects; identify panels served. Check for emergency disconnect, transfer switch and distribution.
- 7.2 For typical floor electrical closet diagram, show distribution and rating of disconnect, transformer and metering devices.
- 7.3 In mechanical room diagram, check for distribution and rating of disconnects of mechanical equipment and elevator. Show emergency supply to elevators.
- 7.4 In riser diagram for power distribution, check the location of disconnects, transformers, individual metering devices and panels, including all cable and conduit sizes.
- 7.5 Provide separate riser diagrams for door release-intercom, telephone, cable TV system, building security monitoring. Check for conduit size and number of outlets.
- 7.6 Fire alarm system riser diagram must show the quantity and location of all pull stations, exit signs, flow switches, tamper switches, heat/smoke detectors, balance resistors, alarm bells and voice communication system. Check conduit size.
- 7.7 Provide schedule of connections to motors and other equipment requiring electrical power, check motor/equipment identification, location, voltage, phase, power, full load current, switch size, fuse rating and type, starter size, panel or circuit number.

PART II

DRAWING: SITE PLAN				
DRAWN BY: CHECKED BY:				
ITEM	CHECKED			
=	lst	2nd	final	
Lot lines, lot designation, north arrow				
Building outline				
Other structures				
Driveways, parking, sidewalks				
Existing services lines: electricity	+-			
telephone	-			
cable TV Connecting service lines: electricity	+			
telephone	-			
cable TV	+			
Free-standing transformer				
Exterior lighting: poles				
on building				
floodlighting				
Photo cells				
Car heater plugs				
Easements				
Details				
Co-ordination with: architectural drawings				
structural drawings				
mechanical drawings				
and the same of th	+			
	_			
	-			
	-			
	+			
	-			
	-	-		
	+			
	-	7		

DRAWING: FLOOR PLAN			
DRAWN BY: CHECKED BY:			
ITEM	C	неск	ED
	lst	2nd	final
Outline of building stucture		-	
Gridlines, room coding			
Points of incoming service: electricity			
telephone			
cable TV			
Metering devices			
Panels			
Furnace, kitchen equipment			
Hot water heaters, laundry equipment			
Transformer			
Elevator machine			
Emergency generator			
Lighting fixtures, wall receptacles, switch	es		
Heating fixtures, thermostats			
Electrical motors			
Emergency lighting, exit signs, door opener	s	U.02	
Pull stations, alarm bells, fire/smoke			
detectors			
Telephone outlets			
Cable TV outlets			
Door bell/annunciator panel/voice intercom			
Security equipment			
Special fixtures for handicapped			
Details			
Co-ordination with: architectural drawings			
structural drawings			
mechanical drawings			

DRAWING: ROOF PLAN	1				
DRAWN BY: CHECKED BY	′ :				
ITEM	C	CHECKED			
	ls	t 2nd	final		
Roof outline, gridlines					
Stuctures above roof plane					
Floodlighting fixtures and service					
Electrical motors, location and service					
Mechanical equipment, location and servi	ce				
Elevator machine					
Elevator machine room: lighting					
ventilating					
TV antennas/dishes, location and service					
Security equipment, location and service					
Co-ordination with: architectural drawi		-			
structural drawings mechanical drawings					
mechanical drawings		-			
		+-	+		
		+	-		
		_	1		
		_	1		
		-	1		
			-		
		-			
		-			
		+	-		
		+			
		_	-		
		-			
		-	 		
		-	+		
		+			

DRAWING: DETAILED FLOOR PLAN				
DRAWN BY: CHECKED BY:				
ITEM		CHECKED		
	lst	2nd	final	
Building structure outline, gridlines	+			
Cable trenches, pull rings, drainage, covers				
Transformer: type			4	
grounding				
security screen				
oil containment system				
Cable raceways/buss ducts				
Switches				
Panels				
Splitters				
Meter				
Space lighting				
heating				
ventilating				
Telephone, TV scanner, fire detector				
Distribution diagram				
Section: placement of equipment				
dimensioning				
Co-ordination with: architectural drawings				
structural drawings				
mechanical drawings				
	-			
	-			
	-			
	-			
	-			
	1			
	-			
	-			

DRAWING.	DISTRIBUTION DIAGRAMS, SCHEDULE					
DRAWN BY:	CHECKED BY:					
	ITEM	C	нескі	ED		
		lst	2nd	final		
Power distribution						
system:	mains disconnect					
	transformers					
	secondary distribution					
	breakers in secondary					
	switchboard					
	stepdown transformer					
	splitters					
	panel disconnects					
	panel identification					
	emergency disconnects					
	transfer switch					
Floor electrical						
closet:	disconnects distribution					
	disconnects rating		2/11/			
	transformer					
	metering					
Mechanical room:	disconnects distribution					
	disconnects rating					
	mechanical equipment					
	elevators					
	emergency supply for	_				
	firemen's elevator					
Motor connection						
schedule:	identification					
	location	-				
	voltage	-				
	phase	+				
	power	-				
	full load current					
	switch size	1				
	fuse/breaker rating	-				
	starter size	-				
	panel/circuit number	-				
		1				
		+		-		
		+				
		+				
		-				

Di	RAWING: RISER DIAGRAMS			
DRAWN BY:	CHECKED BY:			
1	ITEM	CI	iecki	ED
		lst	2nd	final
Power distribution:	disconnect locations			
	transformers			
	metering devices			
	panels			
	cable/conduit size			
Door release/				
intercom:	location of stations			
	number of stations			
	conduit size			
Telephone:	location of outlets			
	number of outlets			
	conduit size			-
Cable TV:	location of outlets			
	number of outlets			
	conduit size			
Building security:	location of scanning			
	cameras			
	number of scanning			
	cameras			
	location of receivers			
	number of receivers			
	conduit size			
Fire alarm system:	pull station numbers			
	pull station locations			
	exit signs			
	flow switches			
	tamper switches			
	heat/smoke detectors			
	balance resistors			
	alarm bells			
	voice communication			
	conduit size			