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BUILDING PRACTICE NOTE

BUILDING DRAWINGS CHECKLIST:
STRUCTURAL DRAWINGS FOR HOUSING

by

ANALYZED

Charles S. Strelka and Vaclav W. Kuchar

Division of Building Research, National Research Council Canada

Ottawa, November 1982



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PREFACE

This drawing checklist is the second in the series. It complements Building Practice Note No. 29, entitled Building Drawing Checklist: Architectural Drawings and will be followed by similar checklists for mechanical and electrical drawings. It provides structural 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.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 Canada).

Part I of this checklist, which is presented in narrative form, serves as a reminder of various items to the person checking the structural drawings.

Part II presents, in tabulated form, a checklist sheet for every sheet in a traditional set of working drawings. These tables can be photocopied and attached to the appropriate drawings during the checking stage. Free space is provided on most of 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 computer-aided design (CAD).

The engineer 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.

PART I

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:

- 1) a note indicating the unit used is displayed in a conspicuous place on the drawing sheet;
- 2) all linear dimensions including those for spot levels and land elevation 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:

- 1) square metres (m^2) to two decimals (e.g., 1.23 m^2) for floor areas of rooms, cross-section areas of earthworks, etc.
- 2) square millimetres (mm^2), using no decimals, for structural members and other sections, areas, bars, etc.

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

1.3 Volume dimensions should be expressed in:

- 1) cubic metres (m^3) for volumes of earthwork, excavations, concrete, fluids in large quantities, etc.
- 2) litres (L) for volumes pertaining to containers of fluids or gases only.

Symbols of these units MUST ALWAYS BE SHOWN on the drawings.

1.4 Other units used in structural calculations and drawings should be expressed as follows:

- 1) Pressure, loads and stress, in megapascals (MPa).
- 2) Mass, in kilograms (kg) or tonnes (t).

- 3) Moments of bending, in kilonewton-metres (kN.m).
- 4) Section moduli, in millimetres to the third power (mm^3); and moments of inertia (i.e., the second moment of area), in millions of millimetres to the fourth power (10^6 mm^4).

Symbols for all these units MUST ALWAYS BE SHOWN on the drawings.

2. SCALES

Preferred Scales Commonly Used for Different Types of Drawings*

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

* This is an adapted version of a table from the Canadian National Standard CAN3-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.

3. GENERAL NOTES

It is customary for a set of structural working drawings to contain an extensive list of general notes. Depending on the type of structure, not all of the following examples will necessarily be used in a particular set of drawings. Refer to the standards where appropriate.

- 3.1 Design note - refers to the building codes and other requirements or by-laws according to which the structural design has been executed. Comment on earthquake design where appropriate.
- 3.2 Soil note - comments on or quotes from the soil investigation report for the given building site.
- 3.3 Concrete note - contains information on grades of concrete for various structural members, compressive strength, etc.
- 3.4 A special note should deal with expansion joints in concrete and masonry.
- 3.5 Formwork note - describes requirements for the preparation and removal of concrete formwork.
- 3.6 Backfilling note - states conditions for backfilling and acceptable types of backfill material.
- 3.7 Steel notes.
 - 3.7.1 Reinforcing steel - specifies the types and grades of reinforcing steel and requirements for its bending, lapping and placing.
 - 3.7.2 Structural steel - specifies the types and grades of steel for structural members and requirements for bolting or welding them.
- 3.8 Masonry note - describes the masonry units to be used, the type of mortar, masonry anchors and reinforcing when required, and the bearing capacity of the masonry walls.
- 3.9 Structural lumber note - specifies requirements for lumber and lumber assembly grades to be used, and, where required, fastening and special lumber treatment.
- 3.10 Lintel notes - describes the cover material and any necessary reinforcing and anchoring of all lintels in concrete, masonry and wood frame walls.

4. SITE REFERENCE PLAN

- 4.1 When structural work is required outside the building proper, prepare a site reference plan showing the location of structural elements on the site.

- 4.2 Refer to this plan for foundation details, sections, reinforcing schedules etc. regarding all retaining walls, underground tanks, outside stairs, ramps, concrete pads and other structures not directly connected with the building.

5. FOUNDATION PLAN

- 5.1 Establish a structural gridline pattern.
- 5.2 Indicate the foundation walls, caissons, piles, perimeter beams and/or footings for all bearing walls and columns. Refer to the architectural drawings for overall building dimensions.
- 5.3 Show the dimensions and indicate the material of all foundation structural members. Show reinforcing where applicable.
- 5.4 Show the footings and foundations of the building components directly adjacent to but outside the building proper; e.g., exterior stairs, ramps, loading dock platforms, concrete pads at entrances, etc.
- 5.5 Indicate the unexcavated areas.
- 5.6 Refer to the foundation component details.
- 5.7 Note the description of the floor slab and its finished elevation.
- 5.8 Indicate any changes in the floor slab thickness, elevation and slope.
- 5.9 Show all expansion, control and perimeter joints and the pit openings to be provided in the floor slab.
- 5.10 Check for the openings in the foundation walls or the floor slab required by the electrical or mechanical design.
- 5.11 Tabulate all footings, walls, slabs, beams and columns, giving the location, dimensions and reinforcement where appropriate.

6. FLOOR FRAMING PLANS

- 6.1 Follow the established structural gridline pattern.
- 6.2 Check the architectural drawings to ensure that all walls, posts and/or columns are shown and designed on the structural drawings.
- 6.3 Check against the mechanical and electrical drawings to ensure that all ducts, vents, conduits and other openings are considered in the design and indicated on the structural drawings.

- 6.4 Show the dimensions and indicate the material of all structural members. Show reinforcing where applicable.
- 6.5 Indicate the elevation of the top of floor (concrete slab, rough wood floor, top of steel as appropriate) and all parts of the floor plane that are depressed or stepped up.
- 6.6 Indicate the ceiling bulkheads and the window and door lintels. Provide a tabulated lintel schedule for the given floor indicating the dimensions and material.
- 6.7 If the floor framing plan is broken down into two or more parts, the following rules should be observed.
 - 1) Draw all the parts with the same orientation.
 - 2) Overlap each part to a point midway between the structural grid lines.
 - 3) Show the overall dimensions for each part.
 - 4) Include a small-scale reference showing the location of all parts of the floor framing plan on each sheet.
- 6.8 Show all openings in the floor assembly larger than 0.25 m² in area (e.g., for stairwells, lightwells, mechanical openings, etc.).
- 6.9 Show the concrete curbs at the transformer vault and oil tank storage room entrances, if any.
- 6.10 Indicate the floor slope and floor drains where appropriate.
- 6.11 Indicate the non-slip provisions for ramps and show the slope.
- 6.12 Show any expansion and/or construction joints.
- 6.13 Design the elevator shaft and show that it conforms to the loading and dimensional specifications provided by the elevator supplier.
- 6.14 Refer to the wall sections and/or details where applicable.

7. ROOF FRAMING PLAN

- 7.1 Follow the established structural gridline pattern.
- 7.2 Show the dimensions and indicate the material of all structural members. Show the reinforcing fastening and/or anchoring of all framing members where applicable.

- 7.3 For flat roofs indicate the elevation of the top of roof slab or top of steel and any variations.
- 7.4 Show all openings in the roof framing assembly larger than 0.25 m² in area (e.g., stairwells, attic hatches, lightwells, mechanical openings, chimneys, gas heater stacks, roof vents).
- 7.5 Indicate any skylights and other structures or equipment protruding through or installed above the roof plane.
- 7.6 Indicate the roof slope if achieved by the roof-bearing structure.
- 7.7 Show all expansion, control and construction joints in the roof-framing assembly.
- 7.8 Indicate all curbs, fire-wall protrusions, etc. dividing the roof plane, if any.
- 7.9 Refer to the wall sections and/or details where applicable.

8. WALL SECTIONS

- 8.1 Show the material, dimensions and reinforcing for all the foundation and bearing walls, footings, piles or caissons and their caps, beams, columns, etc. Refer to the schedules.
- 8.2 Relate all concrete, steel or wood beams, lintels, etc., that occur in the wall section to datum lines such as the finished floor, or the general top of steel.
- 8.3 Indicate the depth below grade at the underside of all footings for the finished grade and floor elevations set by architectural drawings.
- 8.4 For masonry walls indicate the type and spacing of masonry ties.

9. STAIR DETAILS

- 9.1 A floor framing plan at each landing level is desirable. (The basement plan is frequently omitted, frequently resulting in the misplacement of the foundation walls around stairs.)
- 9.2 It is advisable to draw a section through the entire stairwell to show all the dimensions and the required headroom.
- 9.3 Locate and dimension the landing support beams, columns and walls.
- 9.4 Show, describe and dimension all stair structural members.

- 9.5 Indicate reinforcing in stairwell walls, columns, beams and slabs.
- 9.6 All large-scale stair plans should be dimensioned in detail.

10. MISCELLANEOUS STRUCTURAL DETAILS

- 10.1 Whenever possible, group relevant details on the same sheet with the floor framing plan for easier reading on site.
- 10.2 Detail all of the following:
 - footings
 - foundation walls
 - caissons
 - piles
 - grade beams
 - retaining walls
 - floor-roof connections to bearing walls
 - shear walls
 - large area openings
 - perimeter walls
 - lintels
 - wall beams
 - columns
- 10.3 Detail all supports and/or anchoring for building components "supplied by others".
- 10.4 Detail all special structures such as archways, suspended corridors, escalators, and free-standing masts.
- 10.5 Provide roof trusses, diagrams and a framing plan.
- 10.6 Detail all expansion, control and construction joints.

11. SCHEDULES

It is possible to combine the various tabulated schedules on one sheet. However, it is recommended, for construction convenience, to keep them separate and place them on the sheet of the plan to which they refer.

- 11.1 Footing schedules
 - 1) Indicate the type of footing.
 - 2) Note the dimensions (length, width, depth).
 - 3) Show the number, type and spacing of the reinforcing bars.
- 11.2 Concrete member reinforcing schedule (columns, walls, beams, etc.)
 - 1) Indicate the designation of the structural member.
 - 2) Note the dimensions of the structural member.

- 3) Show the number, type and spacing of the bottom reinforcing bars.
- 4) Show the number, type and spacing of the vertical reinforcing bars.
- 5) Show the number, type and spacing of the top reinforcing bars.
- 6) Show the number, type and spacing of the stirrups.
- 7) Indicate and describe the other elements.

11.3 Framing schedule

- 1) Note the designation and material of the framing member.
- 2) Indicate the dimensions of all framing members used.
- 3) Show the dimensions of the base plate.
- 4) Note the number, type and length of the anchors and/or connectors.
- 5) Note the material grouping, if any.

11.4 Lintel schedule (steel, concrete, wood)

- 1) Note the designation and material of the lintel.
- 2) Note the dimensions of the lintel.
- 3) Indicate the support of the lintel.
- 4) Show the number, type and length of the connectors, if any, to the structure.

11.5 Wall plate schedule

- 1) Note the designation and material of the plate.
- 2) Show the dimensions of the plate.
- 3) Indicate the location, number, type and length of the anchors.

Part II

DRAWING: SITE REFERENCE PLAN

DRAWN BY:

CHECKED BY:

ITEM

CHECKED

[illegible]

DRAWING: STAIRS AND ELEVATORS

DRAWN BY:

CHECKED BY:

[illegible]