CSA GROUP™

CSA S474:04
National Standard of Canada
(reaffirmed 2019)

Concrete structures

Standards Council of Canada
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Update No. 2
CAN/CSA-S474-04
July 2007

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Title: *Concrete structures* — originally published August 2004

Revisions issued: Update No. 1 — July 2005
If you are missing any updates, please contact CSA Information Products Sales or visit **www.ShopCSA.ca**.

The following revisions have been formally approved and are marked by the symbol delta (Δ) in the margin on the attached replacement pages:

Revised	Clause 8.3.2
New	None
Deleted	None

CAN/CSA-S474-04 originally consisted of **60 pages** (x preliminary and 50 text), each dated **August 2004**. It now consists of the following pages:

August 2004	iii–x, 1–22, and 25–50
July 2005	Cover, National Standards of Canada text, title page, and copyright page
July 2007	23 and 24

- Update your copy by inserting these revised pages.
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8.2.2
The element stiffness used in the elastic analysis may be based on the secant modulus of the concrete and the entire concrete cross-section, ignoring the reinforcement. In lieu of these gross stiffness values, procedures involving reductions in local stiffness to account for the influence of cracking may be used.

8.2.3
The sectional deformations throughout the structure that are caused by imposed deformations may be assumed to have the values determined from an elastic analysis. The resulting sectional forces caused by imposed deformations can be determined by multiplying the sectional deformations by the appropriate secant sectional stiffness.

8.2.4
For structural elements exposed to direct water pressure on the concrete surface, the influence of water pressure penetrating a crack on the magnitude of the sectional forces shall be taken into account. In lieu of determining the depth of penetration, the section may be checked for the two limiting cases of no penetration and full penetration.

8.2.5
For structures or portions of structures where second-order effects are significant, the influence of displacements and geometric imperfections shall be accounted for when sectional forces are determined. The stiffnesses used in the analyses should reflect the distributions of stiffnesses anticipated under the load combinations corresponding to the limit states in question.

8.3 Determination of factored sectional resistances

8.3.1
The factored sectional resistances shall be calculated using the factored material stress-strain relationships shown in Figure 8.1.

Δ 8.3.2
The factored sectional resistances of elements that can be regarded as beams, columns, ties, or struts shall be determined using the procedures described in CSA A23.3. However, elements loaded by direct water pressure on the concrete surface shall be designed for the full shear force at the face of the support.

8.3.3
The factored sectional resistances of slab or shell elements subjected to the sectional forces shown in Figure 8.2 may be determined using the procedures described below:

(a) It may be assumed that the in-plane concrete strains, ε_x, ε_y, and ε_{xy}, vary linearly over the thickness of the element.

(b) It may be assumed that the strain in a reinforcing bar is equal to the strain in a fibre of concrete adjacent to and parallel to the bar.

(c) It may be assumed that the strain in a prestressing tendon is equal to the strain in the adjacent concrete fibre plus the difference in strain between the tendon and the adjacent concrete fibre. This difference in strain can be determined from specifics of the prestressing operation and may be assumed to remain constant throughout the life of the structure.

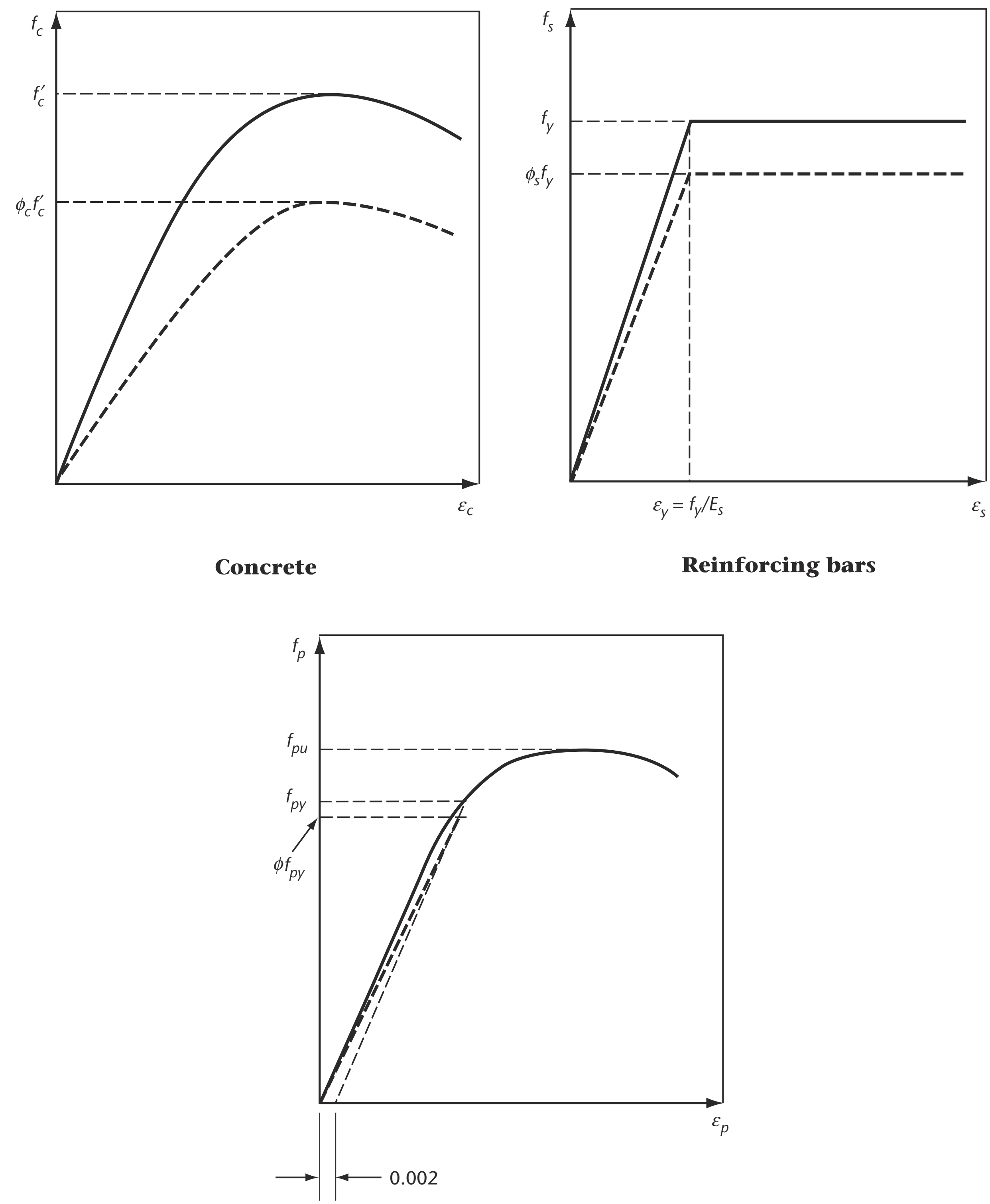
(d) The stress in reinforcement may be determined from the calculated strain by using the factored uniaxial stress-strain relationship appropriate for the reinforcement.

(e) The principal stresses in the concrete may be calculated from the principal strains by using the factored multiaxial stress-strain relationships of concrete.

Notes:

(1) *The factored sectional resistances are the highest values of the sectional forces for which a valid strain state can be found.*

(2) *A valid strain state is one in which the stress resultants found by integrating the resulting stresses over the section faces balance the applied sectional forces.*



Prestressing tendons

Figure 8.1
Factored material stress-strain relationships
(See Clause 8.3.1.)

Update No. 1
S474-04
July 2005

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The following revisions have been formally approved:

Revised	Outside front cover and title page
New	National Standards of Canada text
Deleted	None

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