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1 Urban road hierarchy, road cross-section elements, IRC design standards and traffic signs

Urban roads are graded from expressways and arterials (mobility) down to collectors and local streets (access), and each class gets its own right of way, design speed and cross-section, set by IRC codes and, in Maharashtra, by the UDCPR road-width tables.

Core facts

- **Urban road hierarchy (IRC:86-1983):** Arterial → Sub-arterial → Collector → Local street. **Expressways** sit above arterials as a separate, access-controlled class.
- **Recommended right of way (ROW), IRC:86:**
 - Arterial **50–60 m**
 - Sub-arterial **30–40 m**
 - Collector **20–30 m**
 - Local street **10–20 m**
- **Design speeds, IRC:86:** arterial **80**, sub-arterial **60**, collector **50**, local **30 km/h**.
- **Lane width:** **3.5 m** per lane on multi-lane roads; two-lane carriageway **7.0 m** (**7.5 m** with raised kerbs); single-lane carriageway **3.75 m** on rural roads (IRC:73-1980; IRC:86 takes 3.5 m for urban roads).
- **Roadway (formation width) = carriageway + shoulders.** **ROW** = the whole land width acquired for the road.
- **Footpath:** minimum clear width **1.8 m** (IRC:103-2012).
- **Road plans of India:** **Nagpur 1943** (five-fold classification, star-and-grid pattern); **Bombay 1961–81** (32 km per 100 sq km); **Lucknow 1981–2001** (82 km per 100 sq km).
- **Traffic signs (IRC:67):** **circular = mandatory/regulatory**; **triangular with red border = cautionary (warning)**; **rectangular = informatory**. **STOP** is **octagonal**; **GIVE WAY** is an **inverted triangle**.

Explained

Function of each urban road class

Class	Main job	Access to plots	Typical spacing of junctions
Arterial	Through traffic across the city	Restricted	Widely spaced, often signalised
Sub-arterial	Links arterials, carries some through traffic	Partly restricted	Closer than arterial
Collector	Collects traffic from local streets to arterials	Allowed	Frequent

Class	Main job	Access to plots	Typical spacing of junctions
Local street	Access to plots	Full	Very frequent

Mobility falls and access rises as you go down the hierarchy. A good network connects each class only to the class next above or below it.

Nagpur Road Plan five-fold classification (non-urban roads)

- **National Highways (NH):** main highways across the country, linking state capitals and ports.
- **State Highways (SH):** main trunk roads of a State, linking district headquarters.
- **Major District Roads (MDR):** connect areas of production and markets with each other and with NH, SH and railways.
- **Other District Roads (ODR):** serve rural areas and link them to markets, taluka headquarters and MDRs.
- **Village Roads (VR):** connect villages to each other and to the nearest higher road.

Cross-section elements

Element	What it is
Carriageway	Paved width used by moving vehicles
Shoulder	Strip beside the carriageway for stopped vehicles, emergency use and lateral support
Roadway / formation width	Carriageway + shoulders (+ median, if any)
Median	Divider between opposite directions
Kerb	Raised edge between carriageway and footpath or median
Right of way	Whole land width, including future widening

- **Kerb types:** low or mountable (about 100 mm), semi-barrier (about 150 mm), barrier (about 200 mm).
- **Camber** (cross slope for drainage): about **1.7–2.0%** for cement concrete and high-type bituminous surfaces; **2.5–3.0%** for WBM and gravel; **3.0–4.0%** for earth roads. Rougher surfaces need steeper camber. Heavy rainfall areas take the upper value.

Worked example (ROW from elements) Two-lane carriageway 7.0 m + one parking lane 2.5 m + footpaths $2 \times 1.8 \text{ m}$ + utility strips $2 \times 1.5 \text{ m} = 7.0 + 2.5 + 3.6 + 3.0 = \mathbf{16.1 \text{ m}}$.

UDCPR road widths (Maharashtra)

- **Reg 3.3.2, Table 3A** – internal roads in a residential layout:
 - length up to 150 m: **9.0 m**
 - above 150 m up to 300 m: **12.0 m**
 - above 300 m: **15.0 m**
- **Table 3B** (non-residential): 12.0 m, 15.0 m, 18.0 m or more for the same lengths.
- **Table 3C** (group housing): 7.5 m (to 150 m), 9.0 m (to 300 m), 12.0 m (to 600 m), 15.0 m (above 600 m).

- **Reg 3.3.8** – ROW of classified roads, unless the DP, RP or TP scheme says otherwise (applies to ADAs, metropolitan and special planning authorities, new towns and RP areas):

Road	ROW	Remark
National Highway	60 m	Includes 12 m service roads on both sides
State Highway	45 m	Includes 9 m service roads on both sides
Major District Road	24 m	No service road
Other District Road	18 m	No service road
Village Road	15 m	No service road

- Plots along highways take access from **service roads**; highway amenities such as fuel stations may have direct access (Reg 3.3.8(a)).
- Classified roads passing through municipal areas are **treated as city roads** (Reg 3.1.6).

Traffic signs (IRC:67)

Group	Shape and colour	Examples
Mandatory / regulatory	Circle; red border for prohibitory, blue disc for compulsory	No entry, speed limit, compulsory left
Cautionary / warning	Triangle, apex up, red border	School ahead, narrow bridge, sharp bend
Informatory	Rectangle	Direction, parking, hospital, fuel

STOP (red octagon) and GIVE WAY (inverted triangle) are regulatory signs with special shapes so drivers recognise them from the back or in poor light.

Common traps

✗ "The hierarchy is arterial, collector, sub-arterial, local." ✓ **Arterial** → **sub-arterial** → **collector** → **local**.

✗ "Roadway means the right of way." ✓ **Roadway = carriageway + shoulders**; ROW is the whole land width.

✗ "IRC lane width is 3.75 m on multi-lane roads." ✓ **3.5 m** per lane; **3.75 m** is the single-lane carriageway of rural roads (IRC:73).

✗ "Triangular red-bordered signs are mandatory." ✓ They are **cautionary (warning)**; circular signs are mandatory.

✗ "The Nagpur Road Plan target was 82 km per 100 sq km." ✓ **82** is the **Lucknow** plan; **Bombay** was **32**.

✗ "UDCPR NH width is 60 m excluding service roads." ✓ **60 m including 12 m service roads on both sides.**

Quick revision

- Arterial, sub-arterial, collector, local (IRC:86-1983); expressway above.
- ROW: 50–60, 30–40, 20–30, 10–20 m.
- Design speed: 80, 60, 50, 30 km/h.
- Lane 3.5 m; two-lane 7.0 m; single lane 3.75 m (rural).
- Roadway = carriageway + shoulders.
- Footpath at least 1.8 m (IRC:103-2012).
- Nagpur 1943 five-fold; Bombay 32; Lucknow 82 km/100 sq km.
- IRC:67: circle mandatory, triangle warning, rectangle informatory.
- UDCPR Table 3A: 9 / 12 / 15 m for up to 150 / 300 / above 300 m.
- UDCPR 3.3.8: NH 60, SH 45, MDR 24, ODR 18, VR 15 m.