SWOV Fact sheet

Zone 30: urban residential areas

Summary
In Sustainable Safety, a road categorization has been chosen which concentrates through traffic on motorways and other main roads. Residential areas have living, shopping, and work functions and therefore cars are discouraged from driving through residential areas by setting a speed limit of 30 km/hour, and speed reducing measures such as speed bumps, road narrowing etc. On average the number of injuries decreases by about 25% when a 50 km/hour residential area is redesigned as a 'Zone 30'. The Zones 30 also have a positive effect on the quality of life: there is less noise, crossing the road is easier, and the emissions are less. According to the requirements of Sustainable Safety, residential areas should be as big as possible, but 2 km^2 is the largest feasible area. A road structure of the 'limited access' type is the most suitable for a 30-km/hour area.

What are residential areas?
Residential areas are contiguous areas with living, shopping, and work functions. According to the Sustainable Safety principles, the only cars allowed are those going to or coming from addresses in that area. Cars with a different destination should use those roads and streets that are meant for this as much as possible. According to the road categorizing, these are distributor roads and urban and rural main roads, with speed limits of 50 and 80 km/hour respectively, and the through-roads, usually motorways and trunk roads with a speed limit of 100 or 120 km/hour. According to Sustainable Safety, residential areas have a speed limit of 30 km/hour because collisions at speeds lower than 30 km/hour rarely result in fatal crashes. Slow traffic (pedestrians, cyclists, and mopedists) and motor vehicles can mix safely at this speed limit. The quality of life also improves (noise level, ease of crossing the road, quantity of vehicle emissions).
Since 1983 it has been legally possible to introduce a 30-km/hour zone. The technological design was originally published in the *Manual for 30 km/hour measures* (MoT, 1984). According to this layout, quite a few measures per kilometre road length are necessary. In 1997, about 15% of the total length of residential streets had been redesigned as Zones 30. By late 2002, the Start-up Programme Sustainable Safety had in a short time increased this to 50%. However, the layout of the new 30-km/hour zones is sober (Infopunt DV, 2000); there were only speed reducing measures at 'dangerous' locations. Anyway, the sober layout is not the intended final situation but a transition situation. This is to quickly install many Zones 30 at relatively low costs in order to speed up making the urban road categorizing visible.

How safe are residential areas?
In 2002, there were 6,893 severe crashes, of which 348 were fatal. A third of these severe crashes involved motor vehicles and cyclists or pedestrians. 21% of the severe urban crashes occurred in residential streets, whereas these streets account for three quarters of the urban road length. The residential streets are thus safer than the average urban street (0.034 versus 0.120 severe crashes per kilometre road length in 2002) The difference is smaller when calculated per motor vehicle kilometre, but the residential streets are still safer than the average urban street (0.174 versus 0.238 severe crashes per motor vehicle kilometre). In 2002 in the Zones 30, there were 254 severe crashes registered as opposed to 1474 in all residential streets (see *Table* 1). If we assume that, in 2002, half of all residential streets were situated in a Zone 30, it means that Zones 30 are nearly three times as safe as the average residential street. This applies to the number of crashes per kilometre road length (35% of those in residential streets) as well as per motor vehicle kilometre (34% of those in residential streets). However, there are relatively more severe crashes between motor vehicles and cyclists or pedestrians. The total urban share of this crash type was one-third, whereas in Zones 30 this was nearly two-thirds (167 of the 254 severe crashes; see *Table 1*). This can be explained because of the greater than average numbers of cyclists and pedestrians in Zones 30.

Area	Road length in km	Fatal crashes A	In-patient crashes B	All severe crashes A+B	A+B per kilometre road length	A+B per million motor vehicle kilometre
Residential streets	42,845 (100%)	60 (100%)	1414 (100%)	1474 (100%)	0.034 (100%)	0.174 (100%)
Zone 30 residential streets (50% of residential street length	21,423 (50%)	13 (21,7%)	241 (17,0%)	254 (17,2%)	0.012 (35,3%)	0.060 (34,5%)
Zone 30 residential streets, only crash type MV*CYC/PED	21,423 (50%)	8 (13,3%)	159 (11,2%)	167 (11,3%)	0.008 (23,5%)	0.039 (22,4%)
MV = motor vehicle; CYC = ; PED = pedestrian				source: SWOV (VVR/WISDOM)		

Table 1. *Absolute numbers of severe crashes in residential street, per kilometre road length and per motor vehicle kilometre in 2002. In brackets are the percentages in residential streets.*

What is the safety effect of a 30-km/hour area?

The fact that 30 km/hour areas have a positive road safety effect has been shown in many Dutch and foreign studies. The average number of injury crashes decreases by about 25% when a residential area with a speed limit of 50 km/hour is redesigned as a Zone 30 (Elvik, 2001); the margin of this average is more than 20%. Vis & Kaal (1993) found a decrease of 22% (with a margin of 13%) in the number of injury crashes in 150 Dutch 30 km/hour areas. The large margins in crash reduction are mainly the result of the large differences in the characteristics of the areas studied. These are especially the size, the building density, the nature of the chosen speed reducing measures, and the traffic volume.

How large can a residential area be?

According to the requirements of Sustainable Safety, residential areas should be 'as big as possible'; there is no exact indication. Their size depends on the structure and density of the road network, geographical features often determine them. In practice, the size varies considerably, from 0.2 km^2 to 2 km^2. For the quality of life (noise level, ease of crossing the road, amount of emission) it is not justified to lead more than 5,000 motor vehicles per 24-hours through a 30 km/hour street. Large areas can also comply with this by increasing the number of entries to the area to be proportional to the area size (for example 2 entries for 0.2 km^2 and 16 for 2 km^2). In general there is the rule of, for a Zone 30 larger than 2 km^2 it is no longer possible to keep the 24-hour traffic volumes at an acceptable level. For a residential area larger than 1 km^2 , the surrounding roads will have (too) many motor vehicles per hour. This will especially make it more difficult for pedestrians and cyclists to cross the road

Which road structure is suitable for a residential area?

Traffic engineers usually make a distinction between three distinctive road structures for residential areas: 1) a grid or lattice structure (Alexander, 1966), 2) a tree or organic structure (Reichow, 1959), and 3) a mixed or 'limited access' structure (Marks, 1957); see *Figure 1*. According to Dijkstra (2000), history teaches us that road safety in residential areas is best served by a system based on entry limitations and speed; this is so in the case of the organic structure and the limited access. The quality of life and accessibility are optimal in a grid system because the traffic is dispersed over many streets. The construction and maintenance costs of the traffic structure are the most favourable for the 'limited access' because of the short total road length in the area. If the features of these structure types are totalized, the 'limited access' scores positively in all aspects (Dijkstra, 2000).

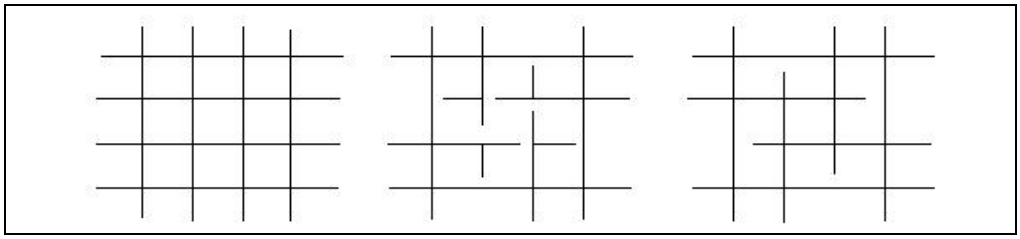

Figure 1. *Traffic structures, (from left to right) grid or lattice, organic or tree, mixed or limited access.*

How can you keep out through traffic in an existing structure?
It is possible to keep through traffic out of a residential area by making direct routes impossible or unattractive. Introducing detours can do this, or taking speed reducing measures, such as speed bumps and narrowing or zigzagging the road axis. These ways of limiting car traffic may not hinder the area's accessibility for cyclists and pedestrians. Extra short cuts and any priority regulating must prevent delay along bicycle routes.

Does the driving time of emergency services and busses increase much?
Larger Zones 30 lead to longer driving times for emergency services and busses. An emergency vehicle needs 11 seconds more in a 0.25 km^2 area, up to 31 seconds in a 2 km^2 area. A bus needs an extra minute in a 0.7 km^2 area. All these extra driving times have been calculated in comparison with an area the same size in a 50-km/hour area.

Do motorists really not drive faster than 30 km/hour?
During the initial period of the 'Zone 30" measure, speed measurements were conducted (Vis, 1991) in areas that had been redesigned according to the *Manual for 30 km/hour measures* (MoT, 1984). The driving speed of 85% of the motor vehicles then decreased to below the 35 km/hour. The Dutch Traffic Safety Association 3VO (2004) has recently conducted measurements throughout the Netherlands in dozens of 30 km/hour areas, among which the soberly designed areas. Only 14% of motor vehicles drove slower than 30 km/hour, but the vast majority of the 85% did not drive faster than 45 km/hour. According to a recent study in soberly designed areas (Steenaert, Overkamp & Kranenburg, 2004) residents accepted that the speed was faster than 30 km/hour on some road segments if speed reducing facilities had been positioned at intersections.

Is the speed bump necessary as speed limiter?
There regularly is a lot of criticism of the use of the 'classic' speed hump. Speed measurements have shown that the 'classic' speed hump has the greatest effect of all speed reducing measures (Vis, 1991). For the time being, there is no good alternative for the speed hump so long as automatic speed limiters are not commonplace. The actual designs and location of speed humps deviate sometimes, anyway, from the design guidelines (CROW, 2002). A better application of these guidelines would be able to prevent a lot of nuisance for residents and passers-by. Restraint is required when using the speed reducing measures on the surrounding through-roads, especially at places where there is are lot of crossing the road. Too many hindrances of the traffic flow on these through-roads can, after all, lead to cars using roads and streets that were not meant for this.

How much do measures in residential areas cost?
SWOV has estimated the costs of soberly designed 30 km/hour areas at about €22,000 per kilometre. This measure costs €86,000 per victim (deaths or in-patients) saved (Wesemann, 2000).

Conclusions and recommendations
A road categorizing has been chosen in Sustainable Safety that concentrates the cars driving through on motorways and other main roads. Through traffic is kept out of the residential areas and slower speeds are ensured, especially by speed reducing measures. The reduction of through traffic and driving speeds are indispensable for a successful residential area. Both road safety and the quality of life (noise level, being easy to cross the road, emission quantity) benefit. However, if a 30 km/hour area is larger than 1 km^2, it leads to a lot of traffic on the surrounding through-roads. We recommend taking this into account by limiting Zones 30 to smaller than 1 km2, or by adapting surrounding roads, especially their ease of crossing over. We also recommend a traffic structure using 'limited access' for a Zone 30. This favours all aspects: road safety, quality of life, accessibility, and construction and maintenance costs.

Publications and sources
(Mainly in Dutch; SWOV reports contain an English summary)

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