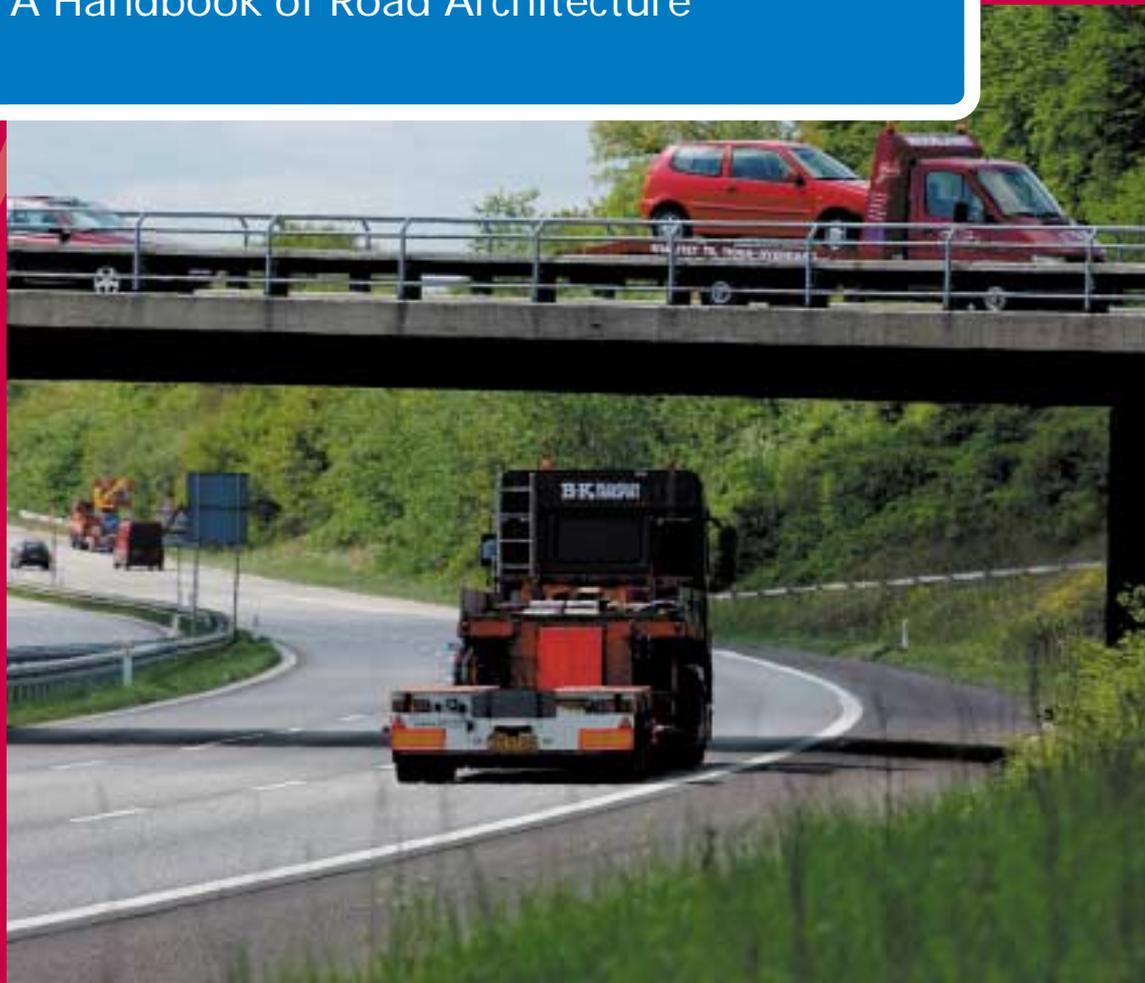




Beautiful Roads

A Handbook of Road Architecture



Road Directorate
Ministry of Transport - Denmark

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Henning Christiansen
Director General

Why we need road architecture

The Danish Road Directorate formulated its "Strategy for Beautiful Roads" in 1995 to set out objectives for work with the architectural and visual aspects of road planning.

The strategy describes a number of aims for old and new roads that could be used in education, planning, information, and quality control in order to create the most harmonious and best-designed roads possible. The Danish Road Directorate has issued a number of reports on architectural themes in road planning to augment the strategy.

Work has been done with architecture and visual qualities in road building for several decades. Architectural considerations have dictated the alignment and other design aspects of the Danish freeway network, and this network in fact largely sets the standard for Danish road architecture. In cities, the design of pedestrian streets, shopping districts, and traffic-calming measures in residential streets have also gained increasing importance

Since practically all road projects today receive critical attention from many sides, architectural and aesthetic considerations

should be given equal weight in the initial preparatory and planning stages along with other aspects.

This handbook contains a number of general and thematic descriptions of good road architecture and moreover provides an introduction to the use of a checklist system in the planning, implementation, and maintenance stages.

The checklists do not hold all the answers and neither do they describe the easiest way to create beautiful roads. They provide a method for carrying out quality control by posing a number of relevant questions intended to minimize unintentional mistakes. High-quality architecture requires insight into the specific project, technical factors, the landscape, historical and biological contexts, and a well-developed talent for both overall and detailed design.

The ambition of this handbook is for road building to be based on a joint understanding of the interrelationship among aesthetic enjoyment, good architecture, good technical quality, good workmanship, traffic safety, and good economy.

A handwritten signature in red ink that reads "Henning Christ." with a stylized flourish at the end.

Henning Christiansen



Introduction



Road architecture

Architecture is an art form that is bound up with utilitarian, technical, and economic considerations and with the "sense of place" and physical conditions of a site. Architecture is thus often described as a balancing and coordination of aesthetic, functional, and technological considerations.

Road architecture is even more emphatically tied to a locality and concrete conditions. This makes specific demands of technical design, safety, visibility, and lighting. Since aesthetic considerations must be incorporated into these premises, the potentials for variation are limited.

Road architecture is moreover distinctive in that much of its aesthetics is dictated by the surroundings themselves. Creating road architecture consists in seeing and

understanding these qualities and incorporating them into our aesthetic experience of the road.

This handbook is intended for all those involved in planning roads: clients, project managers and planners, architects, and landscape architects, but also others interested in the appearance of our roads, for example politicians and the public.

The handbook gives a general description of a number of subjects that are important for road architecture. It also illustrates how aesthetic considerations can be incorporated into various road projects.

The handbook supplements a set of checklists that follow a project through a series of general questions that all deal with architectural conditions. The checklists contain questions for all the stages of a road project, from planning to implementation, startup, and maintenance.



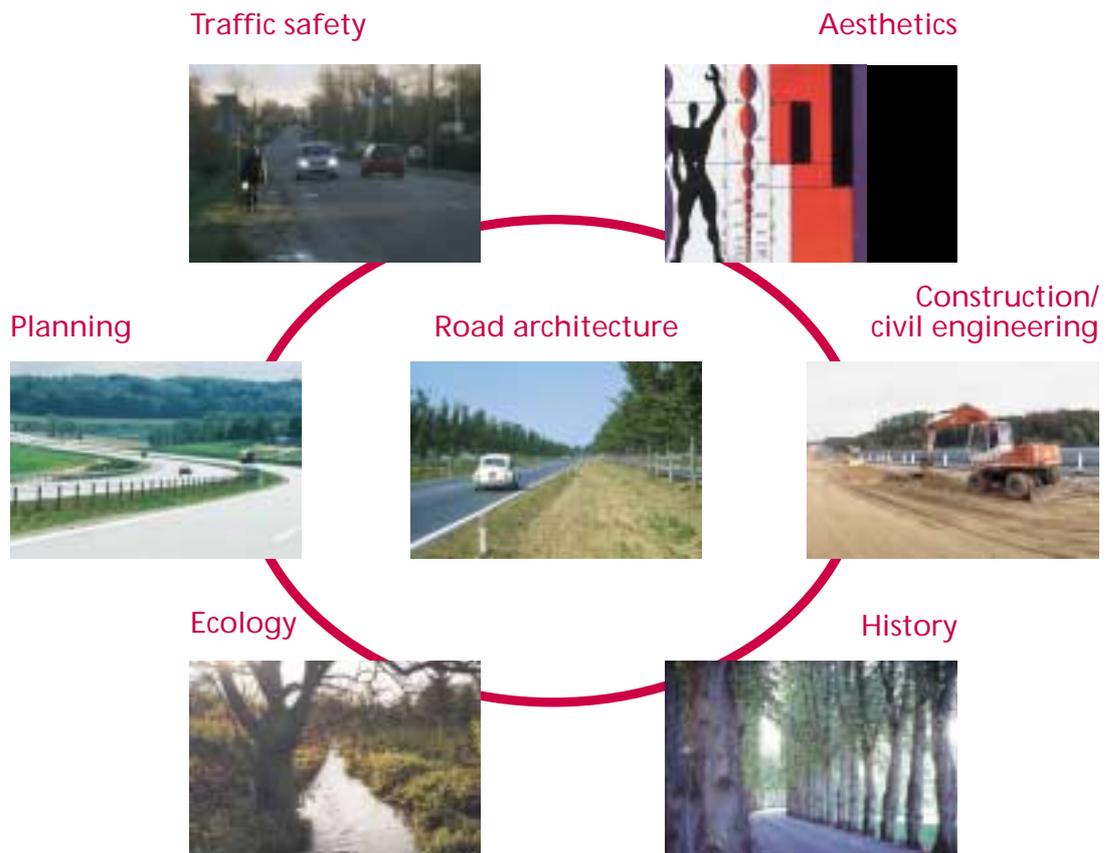
Road Architecture and Related Subjects

The road and landscape interact, and their interaction is important for planning. When a new road is being planned, decisions are made at an early stage on its alignment that will later have a major influence on how we experience the road aesthetically.

Types of projects

Decisions on existing plantings, water, soil, the natural environment, and the relationship to buildings and other facilities are decisive for creating a beautiful road.

Improving existing roads is a different process, in which more attention must be paid to users, business and industry, residents, existing landscapes and urban spaces, squares, interchanges, parking facilities, etc. A number of very different factors consequently play a role in road architecture: historical heritage, civil-engineering work, traffic safety, ecology, legislation, other planning, economic interests, etc. All these factors influence road architecture and must be dealt with by taking an overall architectural approach to planning.



History

Many Danish roads are several centuries old. Instead of being planned, these roads emerged naturally and typically follow old property lines between fields and natural divisions in the landscape. The alignment of these roads reflects the period's modes of transportation, on either horseback or foot and later by carriage and wagon.

Proper road projects and road architecture in a modern sense first emerged in Denmark in 1761, when Frederik V decided to establish a national network of main roads. Since there was no local expertise, road engineers were brought in from France to construct the modern thoroughfares of the day. These new, almost ruler-straight royal roads, which were laid out mainly on the island of Zealand, were built according to the period's principles for military roads, high in the terrain. Almost a century passed before this network was completed. In addition to main roads, a number of new secondary roads were laid out according to the same principles at the same time.

The Road Ordinance of December 13, 1793, Denmark's first compilation of road legislation, contained regulations on how roads were to be laid out – their structure, cross-section, alignment, etc. The ordinance also contained rules on road equipment. Trees were to be planted along the new roads to protect travelers against wind and weather. This is the origin of many of the roads that were planted with rows of trees to provide shade and guide travelers. These roads characterized the Danish landscape until the 1950s, when increasing vehicular traffic required wider thoroughfares, making it necessary to cut down trees. This sparked a major debate for and against roadside trees, a debate that is still going on.



The Baroque avenues that linked manors with the landscape later became a theme for road architecture in many European countries.

Industrialization, which got under way in Denmark in earnest at the end of the 19th century, had caused mass migration to the rapidly growing cities. Copenhagen, in particular, changed, with new quarters springing up outside the old city limits and more major roads being laid out.

During the second half of the 19th century, highways lost their importance for long-distance transport, which was taken over by the railroads, and not many new highways were built during this period. Not until vehicular traffic began to grow in earnest in the course of the 1920s did roads again become increasingly important. When dust from dirt roads became a nuisance, it was necessary to pave highways, which were simultaneously expanded to accommodate the growing traffic. During this period (1920s-1930s), a number of new roads were also laid out and several large bridges built.

The freeway also made its advent, especially in Germany, where rules were even laid down for freeway design and how the road was to be incorporated into the landscape. These principles were followed when the first Danish freeways were built at the beginning of the 1950s.

Steadily increasing vehicular traffic following the Second World War necessitated major expansions of the road network, with the primary focus on freeways. Since these large-scale projects had a serious impact on the landscape, architects and landscape architects were brought in at the planning stage, giving them major influence on the roads' design and their integration into the landscape.

City streets also gained new architectural importance. The goal was to create more beautiful cityscapes and streets, and as a whole improve the urban milieu. Other factors were also included in this planning, for example improving traffic safety.

Both the road's own history and that of its surroundings may be taken into account in choosing the right architectural design.



The new Ørestad quarter.

Road legislation and the Road Standards

Neither legislation nor regulations can create beauty, good architecture, or attractive roads. Legislation can, however, indirectly help us improve the necessary conditions and potentials for incorporating aesthetic aspects into road design.

A number of Danish laws, regulations, and norms have an influence on road architecture. The most important include:

The Road Act, which sets down the division of responsibility among the state, counties, and municipalities

The Act on Publicly Accessible Private Roads, which defines responsibility and authority for these roads

The Act on Nature Conservation, which defines a framework for non-destructive behavior and construction in the landscape

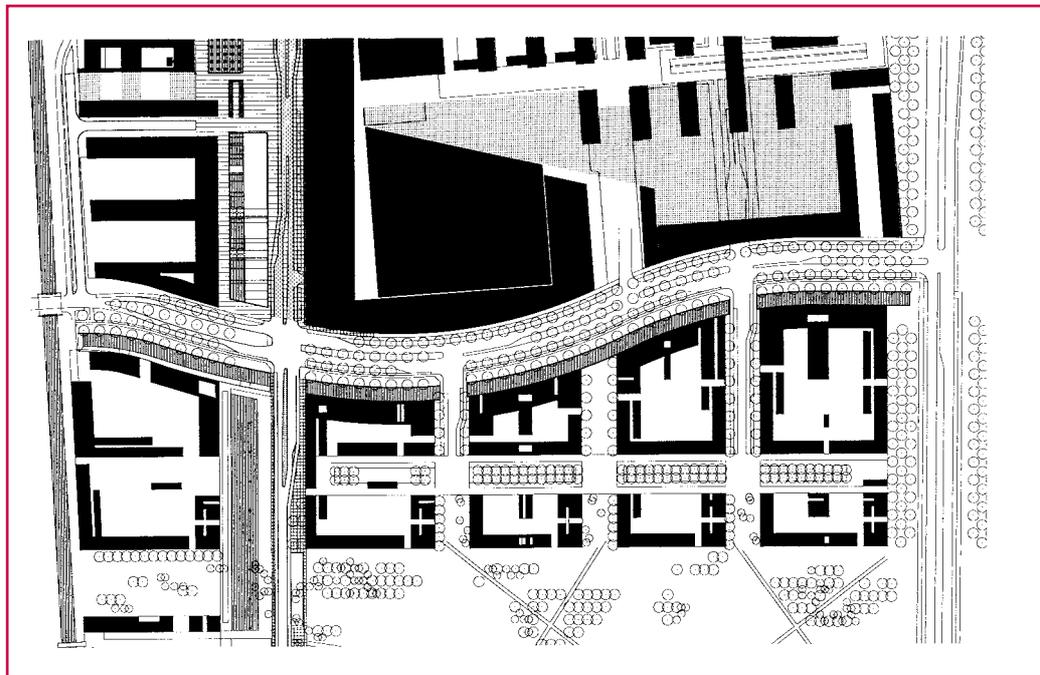
The Environmental Act, which in a broad

sense provides a framework for the design of Denmark's traffic system

The Planning Act, which ensures that counties and municipalities carry out physical planning in a way that ensures cohesion, revisions, and approval of planning issues by including public participation. The content and use of local plans are described in this act.

Local plans comprise an intermediate level between legislation and actual planning. The local plan is often drawn up as a direct extension or an integrated part of the actual planning process.

The Road Standards are formulated by the Road Standards Committee on behalf of the Minister for Transport to create the basis for a Danish road network with uniform characteristics and a generally good traffic-safety standard. The Road Standards provide norms, guidelines, and instructions for the construction, use, and maintenance of roads, including their relationship to their surroundings. The Road Standards ensure good technical design.



Arne Jacobsens Boulevard, flanked by canals and four rows of plane trees, runs across the urban strip, whose structure follows the competition's concept.



A graphic presentation of the boulevard as it will look in 30 years. Jeppe Aagaard Andersen, landscape architect.

Planning

Planning – especially under municipal auspices – is of great importance for road architecture. Urban development and land allocation are controlled through planning, which sites and defines roads long before their concrete design has even been considered.

Architectural work is done at a later point, for example when a new housing development is built. This is why it is important at an early stage of planning to form an impression of how the roads should be designed, whether there are variations among the different road categories, plantings, etc.

The streets' character and design are often set out in great detail in general plans for the city center, individual quarters, and urban-renewal projects. These are also where the overall impression of a quarter is determined, providing a good opportunity to coordinate road structure and architectural treatment.



A confused road picture causes traffic-safety problems.



Traffic safety

Traffic safety and road architecture are interlinked in many ways.

Roads and streets should be designed in a clear and simple way to facilitate orientation for all users. It should be easy for motorists to get an overview of the road, sidewalks, bicycle paths, and side-road junctions.

Roads should also be designed to ensure that motorists comply with the legal speed limit. Users should clearly understand the roads' standard so that they do not exceed safe speeds.

Roads with high speed limits should give users a clear and unequivocal picture of the road space from a suitable distance. Road architecture can create a calm framework with some measure of predictability, giving the road continuity and eliminating unpleasant surprises.

Safety also depends on providing enough room for traffic. Structures, plantings, and the terrain must not surprise the motorist or interfere with his vision or overview.

There might be a discordant profusion of buildings, markings, and road equipment. Businesses along the road might try to attract attention with advertising, producing a chaotic, distracting environment.

Poorly marked crossroads and confusing curves in the open countryside are dangerous for users; plantings and lighting can be used to make them clearer.

The Danish Road Directorate has issued a handbook on local traffic-safety plans (1998) and a proposal for standards for plantings in the open countryside (2002).

Ecology

Environmental and ecological aspects are gaining increasing influence on all physical planning. Taking a stand on them is also part of every road project.

Road transport is a significant source of air and noise pollution and moreover has other negative consequences – accidents, insecurity, the barrier effect, a drop in scenic value.

Since some of these detrimental effects can be reduced through proper planning, an overall study of the relationship between the traffic system and the environment should be made at the planning stage. Afterwards, planning decisions must be followed up when detailed work is done on the road design.

An EIA must include the following:

- A description of the project
- A list of alternatives that have been considered
- A detailed description of the project's impact on the surroundings and environment – including traffic accidents, noise and air pollution, the barrier effect, insecurity – as well as impact on the landscape, cultural heritage, soil, water, fauna, flora, raw materials, and refuse depots
- A description of assessment methods
- A description of the project's environmental optimization
- A list of technical deficiencies or missing information.

The road's relationship to the surroundings plays a major role. Every



Fauna passages over and under roads can help increase the motorist's contact with nature.



Danish law requires that all major road projects be subjected to an environmental impact assessment (EIA). The goal is to enable politicians, civil servants, and the public to evaluate the environmental advantages and disadvantages of a new project.

big road constitutes a barrier that has an enormous influence on the people who live around it, but also on habitats and plant and animal species.

A growing recognition of the road's impact on the physical environment resulted in the Road Directorate's guidelines for fauna and human passages. The guidelines describe the barrier effect and its consequences and give instructions on and examples of passage locations and

designs. The guidelines also set down the division of responsibility for planning and maintenance. Another publication from the Road Directorate describes the relationship between noise control and design in devising noise screens.

Environmental and ecological interests in road planning also have architectural aspects, opening up new potentials for including landscape elements in a new context.



Efforts are made to preserve and calm city centers. On Østre Kirkevej in Herning, this was done by recreating the classical paving.

Aesthetics

Our view of the landscape is generally conservative; we would like to hold on to a familiar image of it. A landscape that is characterized as untouched, unspoiled, or original usually evokes positive reactions. If a landscape is changed, in contrast, we say that values have been lost.

This means that we often limit activities that can change the status quo. For example, we do not permit construction along our coasts, and we want to preserve landscape elements such as ditches, woods, and hedgerows, although today the small family farms where they can be found are rare.

Conservatism also prevails in road architecture. Byroads planted with trees and beautifully integrated into the landscape give us a "genuine" experience that we can only get by leaving the "big roads."

This aesthetic conservatism has helped preserve the landscape's original beauty, but it can also hinder innovation. Road architecture can create new aesthetic values based on existing conditions.

This conflict is more obvious in cities, but also more easily influenced. A great deal of construction and building is going on today, and much of the work is urban renewal that preserves old buildings. New architecture is also being added, to the tune of much debate. The common concept of urban beauty is provoked by a different kind of architecture and new ideas.



Ancient monuments such as burial mounds are exciting attractions that put the landscape's history in relief. Holbæk road, Jerslev.



Randers Ringboulevard is a unity and the noise screen's design is part of the overall concept.

Basic Concepts in Road Architecture



The bridge over the Great Belt, with its impressive pylons, is an example of nonperceivable scale. We feel very small, but also secure, in crossing the Great Belt on a bridge that we are reasonably sure won't fall down.

Architecture – and road architecture – can be explained with architectural concepts such as scale, structure, space, and identity. These concepts are necessary for an understanding of both city and landscape and can give an overview of most road-planning projects.

Scale

Scale actually means a series of steps – as in a musical scale – but the term is used in architecture in the sense of a measure or dimension. A landscape consists of different scales that form various relationships.

Scale in architecture is described as perceivable, nonperceivable, and relative.

A *perceivable scale* means that we can understand the size of an object in relation to the size of the human body. We can understand a building's size because the stories are denoted with recognizable elements such as doors and windows.

A *nonperceivable scale*, in contrast, means that the human body cannot be used as a factor for judging the sizes of silos, pylons, and large bridges, for example.

In *relative scale*, size has been changed from familiar dimensions, for symbolic, architectural, or political reasons. Examples are the impressive, massive doors and windows of a cathedral, castle, or courthouse compared with the human body's dimensions. Large urban spaces and historical Baroque gardens and avenues also display some of the intentional, powerful effect that can be achieved using relative scale.

In road planning, we can also speak of a dynamic scale, in which speed is incorporated into the experience. The ornamental bushes at a rest stop might look beautiful when we park there, but it is senseless to plant them along a freeway, since we cannot take in this scale at high speeds.

We have an *agreement of scales* when we work with elements on the same scale. Roads in the open landscape belong in the landscape's large scale, and agreement is achieved by making the road fit in using elements on the same scale, for example forests and hedgerows.

A *contrast of scales* is achieved by mixing elements of very different sizes, for example laying out flowerbeds along large roads.

A *unity of scales* is achieved when elements of increasing sizes create a transition between the smallest and the largest scale.

In landscape architecture, plantings are often used to convey this transition from one scale to another. By planting avenues or individual trees along roads and streets, for example, a transition of scales is created between the small scale of flower tubs, street furniture, and shop windows and the larger scale of the cityscape.



A unity of scales between the road's geometry and its different elements has been achieved on this residential road in Ikast.



Structure

In architecture, structure describes the way in which a city or a landscape is built up. The concept refers to a principle or a pattern, but not necessarily a precisely repeated pattern.

The landscape's structure can vary a great deal. Structure is important for road planning since perceivable landscape elements are used in relation to a given road project.

The structure of a medieval city is quite different from that of a city built in the functionalist era with regard to geometry, sizes, distances, building forms, road widths, etc.

A road structure is the city's network of different roads, each with its special purpose, which create a system that functions in a distinctive way for the city in question.

The road's structure reflects the principles according to which this road was built up, for example the spacing of lighting sources, the spacing and species of trees, changes in the paving, etc.

Older roads often have a random design structure, resulting from repairs carried out here and there over the years. Creating unity from this randomness is an important task. The structure of new roads, in contrast, can be decided upon from the beginning, based on an overall idea.

Space

The different spaces in a landscape can be compared to the rooms in a house. The sky is the ceiling, the earth the floor, and landscape elements such as hedges, forests, and terrain create more or less important walls in a room that is furnished with trees, buildings, and roads.

In the city's "room," buildings, plantings, masonry, etc. are the walls, while the paving is the floor.

A well-defined room is not too large and provides intimacy, calm, and protection. A diffuse room is expansive and provides a view, an overview, excitement, and drama.

An understanding – and use – of space is central in road planning. The landscape contributes to the road a number of spatial progressions determined by natural and cultural conditions.

This visual range is experienced from the road. By studying spatial conditions at an early stage, planners can decide on what the motorist will see and experience from the road. Often quite small changes in the alignment or design can provide greater spatial variation, for example a view, and consequently give a richer visual experience.





Identity

The term "identity" is used in road architecture to describe the project's character. A project can gain an identity by being associated with a special landscape, for example.

When we say that a landscape has its own identity, we are naturally attributing characteristics to it. Examples of landscapes with a strong identity are marshlands and moors. It is difficult to change these landscapes without them losing their identity, and consequently the feeling of identity we experience when we visit them.

The landscape's identity must consequently be taken into account when a road project is being designed. We must evaluate whether the road can contribute to or should be dominated by this identity, or alternately, whether the road should give the landscape a completely new identity.





Unity and context

Unity is often an important element in our view of urban and rural architecture, and a decisive concept for road architecture. Roads and streets themselves create new unities but are experienced largely together with their surroundings.

Many cities are working to recreate and strengthen the identity of the city center. In order to achieve this unity, roads must be well designed and coordinated with their surroundings.

An integrated or independent element?

A road can harmonize with the landscape's rhythm in different ways. If the goal is a road environment that is dominated by its surroundings, it does not necessarily have to be planted. One goal of planting might be to accentuate a character that is already present in the landscape.



The road can also be an independent element in relation to its surroundings, a unity that remains unchanged in the landscape types that it crosses. If the road is intended to be experienced as an independent element, a strong architectural statement must be made to emphasize this character. The road must provide a beautiful experience in itself and not because of its surroundings, have unity on its own premises.

Both principles can yield distinctive and beautiful results but uncertainty about which principle should be chosen can produce an architecturally untenable design.

Simplicity or diversity?

Designing a road is not a matter of just giving rein to ideas and trying to realize them. It is much more a question of

keeping them in check, choosing the best, and developing them as recurrent themes.

Simplicity in both form and material can pose difficulties in the creative process, but simple, sturdy choices nonetheless help make roads beautiful.

A simple design heightens intensity and highlights the concept, making it clearer to the observer. Since roads and streets often interact with highly varied surroundings, it is important for the project to be easily grasped, clear, and understandable.





Each section in the analysis is illustrated with simple sketches.

Methods

Although there is a demand for methods to be used in planning beautiful roads, it is impossible to formulate specific guidelines for how good road architecture can be created. The quality of a specific design is always based on the site and project's conditions and on the planner's knowledge and skill. Methodological means such as different types of analyses can, however, be used for structuring and illustrating the foundation on which decisions must be made.

Landscape analyses

It is fundamentally important to know and understand the composition of a landscape or a city before a decision is made on where a road should be located. Much of the preparatory work is to draw in the elements found in a landscape and then systematize them.

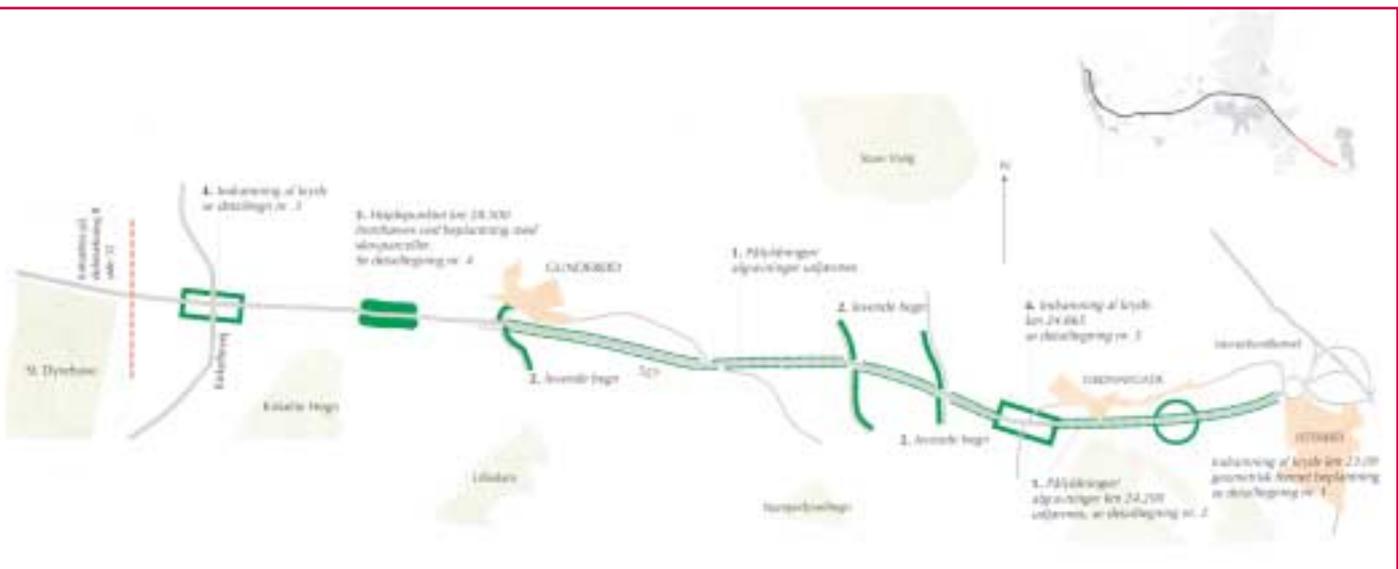
Physical, historic, cultural, and environmental criteria can be used to register and systematize the content of a landscape or city, and these elements can be analyzed to give them values.

Even the most comprehensive landscape analyses, however, cannot guarantee a good and beautiful project. The methods provide an overall view but do not exempt the planner from assessing and making personal choices.

Section analyses

Changes in a road or street are often based on section analyses. The road is divided into sections with different characters or functions. Content and other aspects that may influence the road architecture are reviewed and used as a basis for further design work.

Altering or laying out a street that is rich in detail and variation is often an architectural task comparable to constructing a building. Important details are registered, surveyed, and sketched out, and all conditions are assessed. A sketch is made of the project, either taking the entire section or varying parts to harmonize with the surroundings.



Section analysis and proposal for the Isterød road project, from the report on road aesthetics and traffic safety, Danish Road Directorate

Route 9 between Odense and Svendborg is upgraded to a freeway. Through visualization on an aerial photograph, the project is clearly illustrated and its consequences for the landscape can be assessed accordingly.



Consequence analyses

A consequence analysis is a visual assessment of a road progression in a project sketch or plan. It can describe views, how we experience a spatial progression, the road alignment, and technical facilities. Consequence analysis is also used to assess the project's impact on its surroundings. The method was developed in conjunction with the construction of a number of freeway sections in around 1970.

A careful mapping-out of different sitings and alignments is a highly practical and easily understandable tool for judging the future appearance of a road and its impact on the surroundings. As a rule, there is an interaction between idea and analysis in reaching the final project, where the ideal situation is that nearly all parameters have been taken into account.

The sense of place

The sense of place can be described as the inspiration that can be derived from our immediate experience of a locality.

This experience is not necessarily bound up with rational considerations. We must be present on the site and let impressions affect our senses.

A direct experience of the sense of place can provide an important impetus for the creative process.

It can also be a decisive factor during the process, when analytical conclusions block the flow of ideas or when a choice has to be made between two ideas that in theory seem equally good.



The residential road's design signals an informal spirit.

The Character of Different Road Types



Denmark's impressive freeway bridges provide a fine driving experience, an attraction for the locality, and an important milestone along the way.

The way we experience a road is important for our familiarity with and understanding of open landscapes. By far most of our contact with nature, farmland, and forests takes place through a car window. This must be considered when roads are planned and designed.

The motorist sees the landscape like a movie that runs in long sequences. In the open countryside, the road and journey are experienced in interplay with the surroundings, and the landscape is part of the experience as far as the eye can see.

Variation and rhythm are consequently also part of our travel experience. We are stimulated by variation but dulled by monotony. At high freeway speeds, the landscape's large scale is what attracts



The open rows of poplars along Dutch highways enhance both the beautifully designed road and the farmland that surrounds it.

the motorist's attention. On smaller roads at lower speeds, the landscape's smaller elements become part of the user's experience.

The bicyclist's experience

Danish municipalities and counties have planned and laid out an extensive network of bicycle paths in recent decades. Entirely new dedicated bicycle paths have been built and bicycle paths laid out along roads. Bypaths, abandoned railroad tracks, and forest roads have also been incorporated into the bicycle path network.

The bicyclist's experience of the landscape is different from the motorist's. It is more intense because of his closer contact with the surroundings, slower speed, and greater physical movement. Long, monotonous sections seem protracted and quickly become tiring, while small detours to more varied landscapes can make the trip more attractive. The bicyclist generally has many opportunities to get off into the countryside on paths that motorists cannot use.

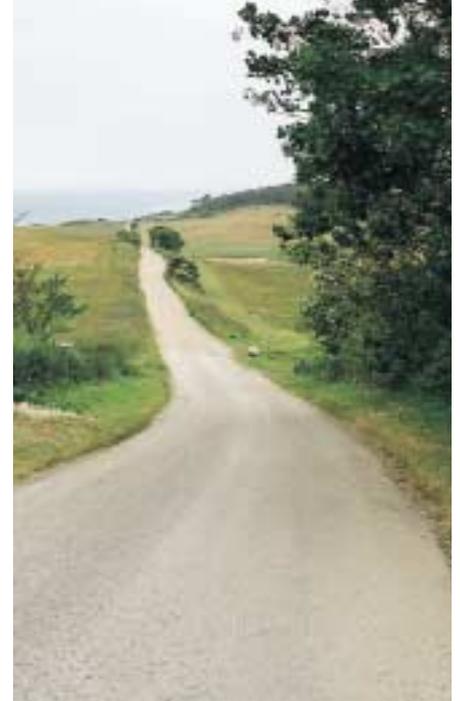
While the bicycle path between home and work is intended to take the bicyclist to his destination quickly and safely, the tourist's route must be planned carefully to make it as varied and interesting as possible. This is done by exploiting the variety already found in the landscape. Good rest stops, vantage points, detailed information, and proper signage are necessary prerequisites for a pleasant journey.

Culture and nature as effects

The travel experience can also be bound up with the landscape's historical features. Cultural offerings can tempt the motorist to break his trip down into smaller sections. The motorist should be able to see historical sites; churches, castles, manors, and old mills should have an influence on both the road's alignment and its plantings.

Many old roads form an important cultural environment together with their surroundings. Cultural features such as bridges, milestones, inns, plantings, monuments, and stone walls are found along the roads and are part of a historical road environment that should be protected and preserved in its entirety.

The landscape's natural elements provide good and inexpensive architectural effects. Landscape types, terrain shapes, bodies of water, forests and other kinds of vegetation can contribute to a pleasant and varied driving experience and be important landmarks on a trip. Proximity to naturally beautiful areas consequently plays an important part in choosing the road's alignment. It is also important to make motorists aware of nearby or alternative routes with natural attractions, giving them opportunities to decide whether they want to enjoy the sights or save time by driving on big roads at high speeds.



Paths give the bicyclist a much better opportunity than other road users to visit the most remote landscapes.

The bicyclist can also experience the intimacy of the cultural landscape better than the motorist.



Lindens at Gunderslevholm are still trimmed the way roadside trees were two centuries ago and provide a unique historical road milieu.



Even dominating freeways provide views of beautiful nature areas on a large scale. Sdr. Felding Ådal



Roads in the open countryside

Freeways

Denmark's freeway network was laid out after the Second World War. Although architectural aspects were already included in the work of siting and designing the first freeways, not until the end of the 1960s were the factors given a more permanent status to ensure that new roads harmonized with the landscape. At the same time, work began to improve the design of road equipment.

Today careful attention is paid to all new freeway projects, four-lane highways, and expressways, with architectural aspects given high priority. Denmark also has a good tradition of collaboration among engineers, architects, landscape architects, and clients that yields visible results in the landscape.

Active and goal-oriented political will and good planning have made Danish freeways distinctive for their simple design.

A characteristic feature of Danish freeways is a careful treatment of the landscape and terrain that rarely produces stark contrasts. Signage and other equipment are kept at a minimum and the absence of billboards, art, and other distracting and defacing elements in the road's immediate vicinity emphasizes the desire for clarity and simplicity. Lighting fixtures illuminate feeder lanes and exits, but otherwise there is almost no artificial lighting in the open countryside.





There is intense contact with the surroundings on the vast network of small roads. Krogenlund, Lyngø

Bypass roads

Although the bypass road is actually not a distinctive road type, it does have a special significance for road architecture.

Formerly, we passed through cities and gained a special impression of them. Today, our impression of many cities is only a sign along the bypass road.

Bypass roads are generally laid out according to the same principles as major roads. They are expressways with broad horizontal and vertical curves and their alignment is determined by the wish to put a given distance between them and the city.

Sometimes the city and landscape are viewed from random angles that do not always accentuate their special qualities. The city's face on the world is often a series of noise screens or commercial properties along the road, with their signs, battery of flags, and products on display.

The bypass road can also be encapsulated in forest belts, which separate it from the built-up areas behind. This cuts off the town entirely from the road and leaves no impression of it on the motorist.

Greater attention in planning should be given to making a unity of the bypass road, the city, and the landscape in order to enhance our journey and the city's identity.

Main roads

Main were altered at an early stage to accommodate increasing vehicular traffic by straightening and widening them and cutting down roadside trees. Although most main roads seem standardized and lacking in distinctive aesthetic features, many of them do present a wealth of fine landscapes.

Highways

Smaller highways were originally intended for travel at slow speeds and followed the land's contours. They served as links between towns and other junctions and were firmly entrenched in the local landscape.

When these roads were laid out, their impact on the landscape was of minor importance, and roads were put where it was most practical. They thus often pass through beautiful landscapes where new roads cannot be located for environmental reasons.

Over the years, many roads have been straightened, widened, or supplemented by bicycle paths. This successive modernization of smaller roads is quite a different process from the painstaking architectural planning of a freeway. Attention to road architecture is not, however, less important for small roads. The final result must always appear as a continuous and harmonious progression. Many small highways moreover have important historical and cultural qualities that must be taken into account.

The bypass road around Skibby, Hornsherred

Assessment of the project:

Section 1

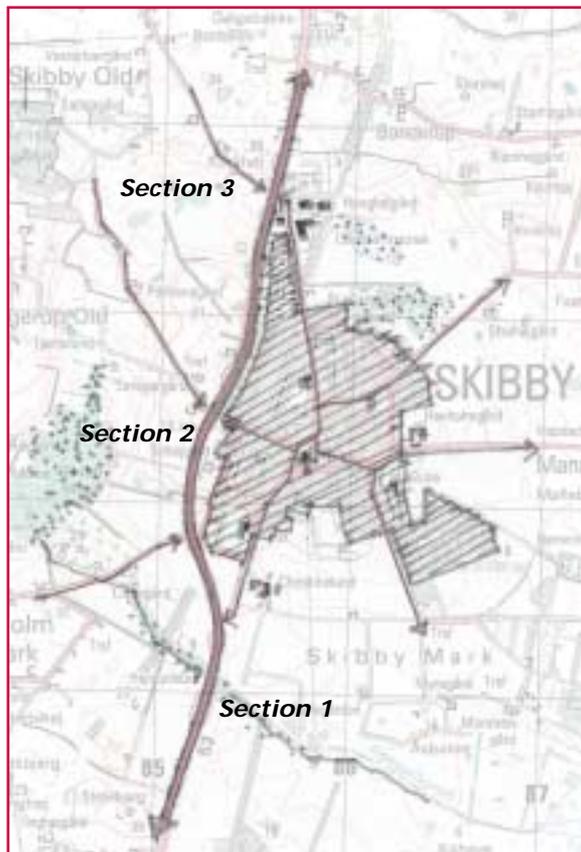
Clarified and separated from the town on the section south of it

Section 2

Close to town. Conflicts resolved by planting a forest

Section 3

Close to town. No screening was necessary in an industrial area since who would need a screen?

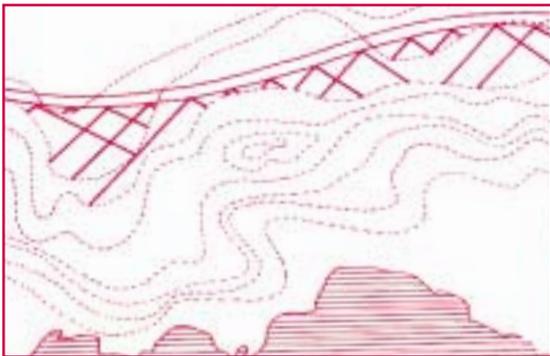




The freeway was drawn in a large arc around Albertslund Syd. The space between the road and the town is used as a recreational area, which in this case was given a special design.



The clothoid can be used on both small and large roads.



The alignment determines how we experience a road. In this case, a road in the bottom of a valley has a limited view, while a location at the top gives the best aesthetic experience.



Road geometry in the open countryside

Alignment

The road's alignment and the proportions between plane and profile are decisive for both how the road lies in the landscape and what it is like to drive on it.

Since certain combinations of curve radii can give undesirable effects, the alignment must be assessed visually to demonstrate how the motorist will experience the road. The clothoid, which has gradual transitions between different radii, provides both good driving qualities and a harmonious appearance. The clothoid's form suits the car's movements better than the shape that can be attained with circles and straight lines.

Clothoids are used extensively on freeways and other major roads, but can also be used on smaller-scale, new roads and when small roads are realigned.

Cross-sections

The road's cross-section is very important for how we experience it. Even small differences in the width of the median strip or the location of equipment provide very different prospects.

A broad cross-section through a large-scale landscape will emphasize the landscape's open character and make it easy for users to orient themselves. The broad cross-section is consequently well suited to large roads on which the landscape is viewed at fairly high speeds. Locating bicycle paths on a level with the roadway can help increase this effect.

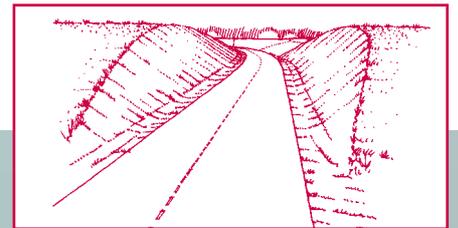
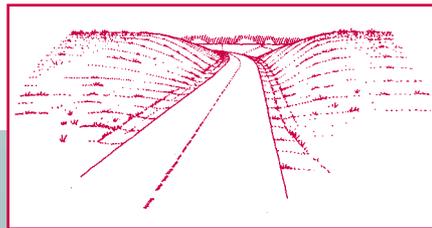
A narrow and more closed cross-section will give the impression of a corridor, permitting a limited range of vision. It can, however, be integrated better into varied landscapes on a smaller scale and is consequently most suitable for local roads with low speed limits.

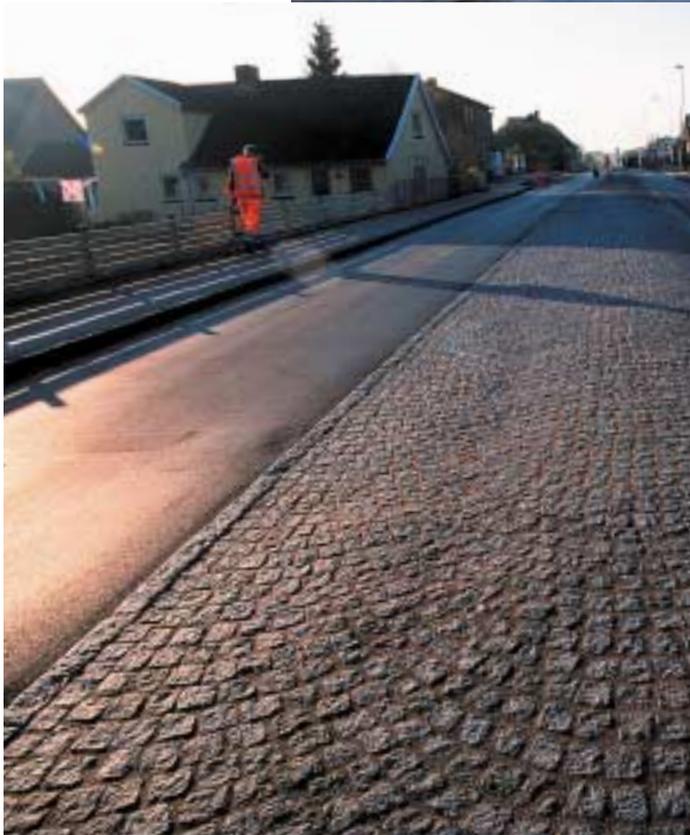
The design of slopes has a major influence on how the road is experienced. Gentle slopes are preferable to steep ones.

Steep slopes make the roadway very conspicuous both from the road and from its surroundings, whether they are planted or not. A gradient of 1:4 and

1:3 can give a good transition. If the road is bordered by farmland, a ratio of 1:10 should be used, so that the land can be cultivated without steep drops in the terrain. Rounding the top edge of the slope is important in harmonizing the road with the surrounding land. A broader shoulder both at embankments and at ditches helps soften the road and integrates it better with the landscape.

A gentle slope harmonizes best with the landscape while a steep slope clashes with it. Illustration from Hela vägen, Swedish National Road Administration





Three small towns – Svenstrup, Voldby, and Lading – are not far apart and their roads were designed along the same lines.

Roads in new urban areas

The planned town

New urban areas have neither the natural attractions of the open countryside nor the historical environment of the old city.

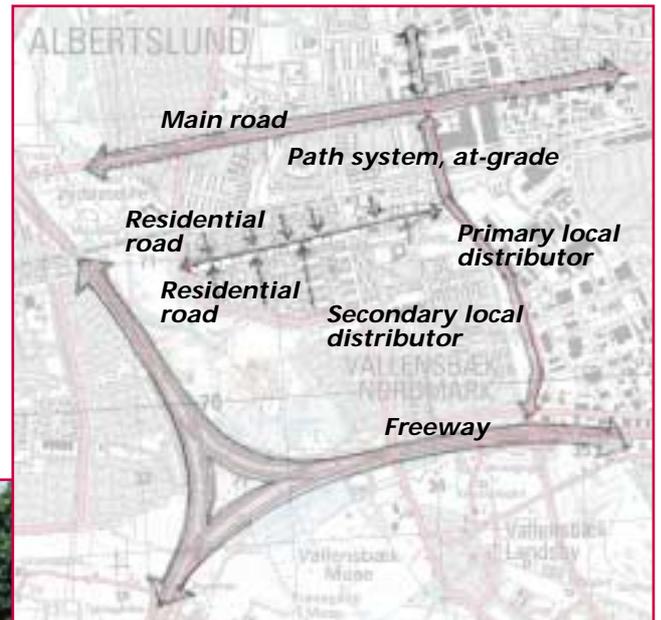
They are planned, industrialized, functional residential and work environments and they have many fine qualities, providing public services, a variety of activities, and proximity to green areas.

The traffic system is an integrated part of the planned town. It must be possible to get from one place to another quickly, preferably without any problems or unnecessary delay. In many new urban areas, the different types of traffic are separated. These planned traffic systems function quite well in most cases. Traffic flows without conflicts among motorists, bicyclists, and pedestrians; there is sufficient space for traffic; and a great deal is done to ensure greenery around the roads.

There are also many dull housing developments, however. Separating traffic scatters what little urban life there is and rational planning patterns create monotony.

The suburban milieu is still an area where architecture and landscape architecture –

including road design – will have exciting and challenging work to do. Roads are an important element in this process. Improving the roads' environs with plantings, increasing density, and ensuring greater contact with the surrounding areas can help create variety and improve the developments' identity.



Albertslund Syd is the archetype of the planned town.

Lersø Park Allé provides a uniform aesthetic experience through urban quarters of quite varied quality.

The approach road accommodates both local and through traffic and the milieu is very heterogeneous. This road (Roskildevej) is like an open wound cut through the quarter.



Approach roads

The role of approach roads in the road system is a complicated one. Their main purpose is to transport motorists through the suburbs to the city center and simultaneously serve as access and feeder roads.

These roads might be big, facadeless traffic arteries that are visually separated from the surrounding city because no one wishes to have cars and noise just outside their door. They might also be older roads – often old highways – that

were gradually expanded to the limits. In such cases they also serve as residential roads. The houses along them are often bordered by the sidewalk, with no room left for a front yard or trees that could contribute aesthetically to the road environment.

Since approach roads provide both the first and the last impression a visitor gets of a large town, they are also important targets for architectural efforts, as part of the overall work to improve our cities and suburbs. Some of this work means making housing areas near roads more attractive. For older roads, special attention must be paid to paving, equipment, and plantings, since space is often so limited. For modern, larger roads, innovation is needed to transform disjointed sections into a beautiful road progression. Each section must be analyzed and planned, taking its distinctive features into account while creating an architecturally unified concept from the open countryside to the center of town.

This is a difficult task, among other things because approach roads, adjacent areas, and feeder roads are the province of different public authorities.



Thomas B. Thriges Gade is the final stretch of the approach road through Odense Syd. The street has been improved with new plantings, new lighting, new road equipment, and new buildings.

Commercial complexes can present a fine appearance along the road if buildings and their grounds are taken into account in road planning. Lautrupgård, Ballerup. Road Prize, 1996



Roads in industrial and commercial areas

Roads in industrial areas typically present a confused picture, with anonymous buildings, parking lots, and storage facilities. In many cases, companies moreover exploit their location close to the road to advertise and post signs and billboards that are out of proportion to the milieu.

Service facilities and businesses along roads are both natural and necessary. Road users are the companies' potential customers and consumers. The visual messages in the companies' advertisements, however, often compete for the users' attention. Signs and flags overshadow any visual qualities an area might have.

The Road Directorate's report on commercial areas along freeways and major arteries (1999) emphasizes that many companies themselves want more stringent and well-defined standards for the architectural environment, for example with regard to plantings, signage, and advertisements.

There are business parks today that are planned, spacious, and green, reflecting the high priority given to the design of the road and its surroundings. The buildings' architecture was given equal attention, and these companies make a very fine impression from the road.

Restrictions on the location of parking, storage facilities, signage, etc. ensure a harmonious and clear overall impression. These industrial parks are among Denmark's most attractive commercial districts.

Roads in housing developments

Suburban housing developments were largely designed so that buildings face common recreational areas set back from the road, which is separated from the buildings' own recreational areas by plantings. This design had a major impact on the road's architectural uniformity, the facadeless roads transforming the look of housing developments. Many developments nonetheless have exciting and well-designed recreational areas that provide a framework for beautiful roads with both variety and interesting features.

These roads are often among the greenest our cities have to offer.



The open recreational areas in housing developments form a green unity in interplay with the roadside milieu.



A residential road.



A residential road with open front yards and green adjacent areas.

Residential roads

There are often good, well-planned, green road environments on the suburb's smallest urban scale.

The road system in single-family housing quarters is often divided into local distributors and residential roads, and gardens are rimmed by hedges or fences, in the Scandinavian tradition. Variations among the quarters are consequently due primarily to the road profiles, with different parking systems, planting principles, and path arrangements providing variety.

Dense/low-rise housing developments were planned and built at a time when legislation on traffic calming and speed reduction, such as quiet roads and pedestrian-priority streets, was taking effect. Residential roads are often architecturally integrated into the development as a result. Narrow road profiles, paving stones, plantings, etc. call for low speeds on the vulnerable user's premises.

Road geometry in the planned town

Developments affect the road milieu

Roads in new urban quarters were all fundamentally designed to give the motorist sufficient space and enable him to drive at high speeds. Access and comfort, abundant parking, and often very wide areas for future road expansions were provided.

Major roads were laid out on a grand scale. They have wide cross-sections and an alignment with vertical curves similar to those used for freeways. The town is often hidden behind wide green belts and baffles. The separation of traffic in

certain quarters means that pedestrians, bicyclists, and other urban life cannot be seen from the road.

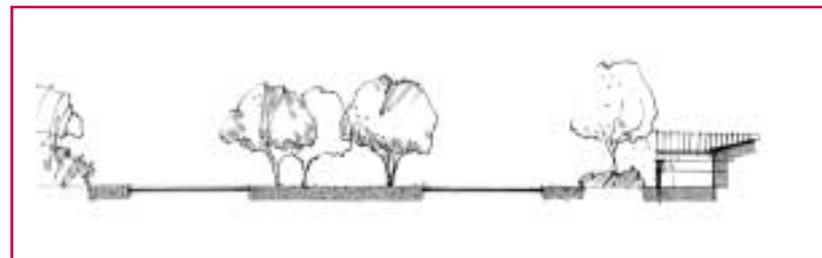
Lower-category roads also have wide profiles, but are furnished with sidewalks, bicycle paths, and parking areas. The closer we come to residential areas, the more the city and man become part of the road milieu.

The broad cross-sections of local distributors and residential roads make high speeds seem natural, which is why traffic-calming measures have been carried out on many roads over the years. Efforts are made to reduce speed with humps, chokers, plantings, and other means.

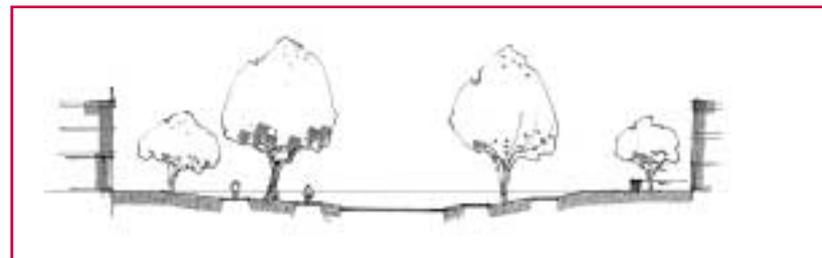
Traffic types have been mixed when new roads are laid out. The urban milieu has become tenser, the road profile narrower, and residential roads have been integrated into housing developments.



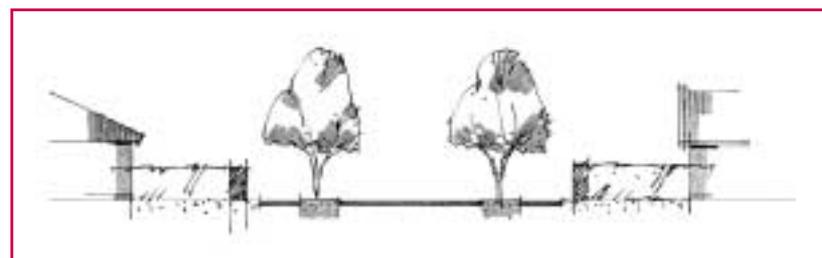
The original and very harmonious road profile is fragmented by the chokers and humps used in traffic-calming measures.



*The wide road profile of trees planted in the broad median strip.
Kongsholm Allé, Albertslund*



*The road becomes part of the surrounding park.
Lersø Parkallé, Emdrup*



*The road becomes an integrated part of the houses' gardens thanks to roadside trees and green shoulders.
Residential road, Ikast*



City streets

The street systems in many large and small Danish towns were laid out long before the automobile began to have an impact on urban planning. Today, the historic quarters that were built before the First World War are the object of considerable attention. After the explosive urban growth and building of the 1960s, there is renewed interest in preserving the streets' historic values.

Traffic is an important part of city life. Roads and streets must accommodate traffic and they dominate the cityscape, for better or worse.

The work to renovate and redesign streets and squares in recent years has helped raise the quality of the urban environment. Conditions are still difficult because pressure from traffic, parking problems, and many conflicts of interest limit the potential for beautification. Some of the urban-renewal projects of the future will consequently consist of renovating entire street sections, so that the city once again forms a beautiful and unified milieu.



The city streets must accommodate many activities.

The planning of Odense city center

The reorganization of traffic in Odense center illustrates that planning large urban quarters can solve both aesthetic and traffic problems in the city as a whole. It also shows that beautiful streets involve much more than plantings; they also encompass spatial relationships, buildings, neighboring areas, and equipment, in one and the same space.

Urban renewal here was based on traffic reorganization and should be seen in the context of work done to renew housing, business, and commercial interests in the center of town. The city's quality was to be accentuated. It was to be a pleasant place to live and shop in, easy to reach and leave. This would give visitors time to take a walk, especially if there were enough space and attractions on the way.



Big streets

In large cities, broad streets and boulevards often carry far more traffic than they were intended for. Safety and accessibility requirements have in many cases changed the cross-section and added a growing number of signs, markings, etc. It is a balancing act to preserve the original quality and beauty of these streets to keep them from being reduced to transport corridors, ignoring aesthetic aspects and the surroundings.

Main streets and shopping streets

Main streets and shopping streets often have the city's most expensive addresses and most important historical and cultural environments.

This is why a great deal of money is spent on creating beautiful street milieux with attractive and expensive paving, plantings, art, and newly designed lighting fixtures. Many main streets have been transformed into exciting urban spaces where traffic is a secondary element.

Renovating less important streets and squares and renewing plantings can provide a synergetic effect in many quarters, making this form of urban renewal an important part of municipal urban and road planning.

Ordinary streets

Ordinary streets that have no shops, historical environment, or special architecture are the most common in both large and small towns.

Ordinary streets might have a mixture of buildings of different ages and with different building styles, some with gardens, others used for commercial purposes. No special care has been taken with the street scene and it is rarely given any attention by planners.



Nonetheless, these streets might be beautiful, among other things because many gardens with older vegetation can make them seem very green and lush.

Planting along the streets themselves, in public squares, and on corners can imbue them with good architectural qualities. New lighting can also make an important contribution to such improvements.





Road geometry in the city

A detailed cross-section

The cross-section has a major influence on road architecture in urban areas, where even small differences in level are clearly felt. Indifferent treatment of the terrain along sidewalks and buildings fragments the street's unity.

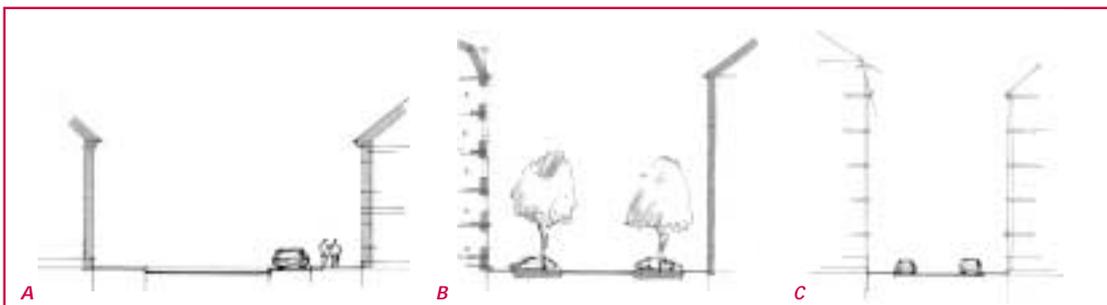
The cross-section reflects traffic patterns that prevailed at the time the roads were built, but very few streets are used today as they were originally conceived.

Vehicular traffic has become far heavier and requires better space for both the roadway and parking. Bicycle paths need their share of the sidewalk, and sidewalks have in fact become so narrow in many cities that there is no room for pedestrians, trees, shop displays, or other street life and equipment.

One challenge for road architecture is to design the street's cross-section so that it is beautiful, durable yet can still accommodate traffic.



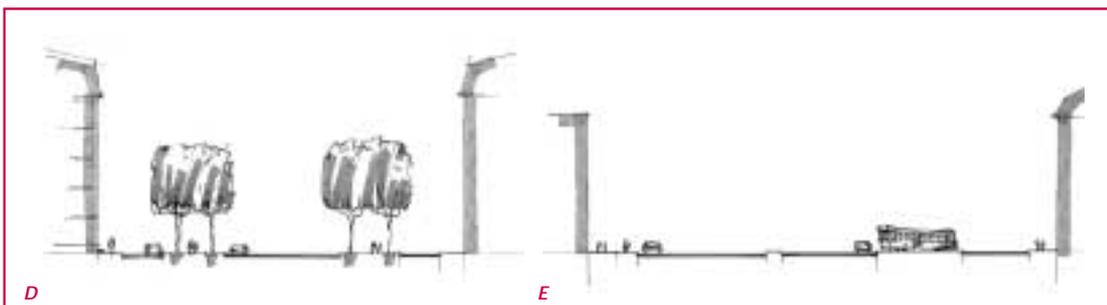
Skibby



A: Låsbygade, Kolding. A treeless medieval street with parking on alternate sides

B: Willemoesgade, Copenhagen. A street just outside the center of town whose profile has been narrowed with trees and transverse parking

C: Oehlenschlägersgade, Copenhagen. A one-way street just outside the center of town with two rows of parking along the street



D: Frederiksberg Allé, Copenhagen. A boulevard with 4 rows of trees, a promenade sidewalk, and parallel streets with parking on both sides

E: H. C. Andersens Boulevard, Copenhagen. An urban expressway with no trees or parallel streets





The importance of design

Design emphasizes the road's structure and creates identity and distinctiveness. In traffic areas, design can help optimally limit, simplify, and explain signals and information.

In freeway construction, the roadway, bridges, buildings, auxiliary facilities, and equipment are often individual design tasks.

Freeways and other large roads often seem simple and pleasant to the user, who is not bothered by extraneous furnishings. This simplicity reflects a deliberate approach to design.

The architecture of small roads has not been given the same attention as that of freeways, which dominate the landscape.

The geometry of small roads is often frozen, for better or worse. It is important to pay attention to details in the existing profile of these roads. Changes in plantings, adjacent areas, or signage

should make the motorist's drive more pleasant and integrate the road better into its surroundings.

Functional qualities rather than architectural features characterize roads in new developments. New serially manufactured standard products were introduced when large-scale housing developments were built in the 1960s and 1970s.

Some of these products are still standard road equipment. In some cases they have a good, sturdy, and timeless design. In many others, equipment has unfortunately not been replaced because it requires a major effort to develop new furnishings.

The streets of the inner city are a special type because the pace of traffic is slower here, enabling us to take in all the details. Gutters, paving, fences, decorations, and street furniture consequently take on far more importance for architecture.



The basis for bridge design is often simplification, so that the observer sees the elements that are important.



Noise screens can also be made of willow hedges planted around a sound-absorbing center.



Randers Ringboulevard is a unity, with the noise screens part of the overall design.

Architectural tasks

Buildings and service facilities

There are many good individual designs for the roads' different elements, but harmonizing them with the whole and coordinating them with one another is of decisive importance.

Bridges play a key role in road architecture. The bridge's form is dictated primarily by its construction. A design that makes the construction clear to the observer gives an idea of how forces are distributed and absorbed. The goal is simplification, to permit the observer to see the elements that are important.

The bridge's role in the road system should be emphasized, but minor roads should not be exaggerated with spectacularly designed bridges.

The architecture of buildings along freeways should be given high priority. Many gas stations, restaurants, and cafeterias are designed by architects, but their commercial message often triumphs over the overall architectural picture.

The rest stop has evolved over the years from a green lawn with tables and benches to large expanses with a variety of facilities, for example playgrounds, refuse sorting, tourist information, and perhaps kiosks and cafeterias. All these facilities must be coordinated to produce an architectural whole and to harmonize them with the landscape.

The design of retaining ponds, baffles, and other earthworks is determined by their function. The result can be poorly integrated facilities whose form is dictated by property borders, without any unity with the landscape.

Noise control

Noise screens are increasingly being erected in places where growing traffic has created a clash with the road's surroundings. The need for noise control in cities is especially great along approach and ring roads, making noise screens a central factor in how we experience roads and the cityscape.

As an architectural element, a noise screen is generally undesirable since it can have a negative aesthetic effect on both motorists and residents. The noise screen cuts the road off from the city and provides a completely different framework for the architecture of both city and road.

The noise screen is so conspicuous that its location must be carefully chosen, at best making it a pleasant element for both neighbors and motorists. The screen's two different facades must fulfill two completely different functions. Since the side facing the road is generally seen at high speeds, great emphasis should be placed on its horizontal overall effect. From the city or residential area, the noise screen is passed at low speeds. It could be part of a housing complex's recreational area and more emphasis could be placed on details and individual adaptation to different environments.

Architecturally, the choice should be a simple, uniform scheme with a carefully conceived design, good materials, and the emphasis on discretion. Artistic touches, colors, etc. have a tendency to seem like a decoration that is out of proportion with the element's size.

The Danish Road Directorate has issued a report (1999) that presents general experiences with and advice on noise screens, supplemented by information on specific noise screens and comments on their architectural aspects.



MILEWIDE won the Danish Road Directorate's 1995 design competition for noise screens and road equipment.

The winning entry was designed and later developed by Knud Holscher Industrial Design in collaboration with the Danish Road Directorate.

MILEWIDE is a comprehensive range of road equipment and street furniture. It covers everything from expressway and road signage, mast systems, lighting fixtures, and bus shelters to street signals.

All the components in MILEWIDE's range are homogeneous parts that make up an aesthetic whole.



Design tasks

Road equipment

There is a firm tradition in Denmark of limiting the use of roadside equipment and the equipment used is standardized and simplified as far as possible. With design aimed at simple systematization and good readability, Danish road signs present clearly understandable messages.

One special problem in the open countryside is the demand for readability at great distances and high speeds. Information signs are consequently often quite dominating and special attention must be paid to where the signs are placed. It is important for how we experience the landscape, the road, or a building that signs be located appropriately in relation to them. We rarely associate suburban roads with design, but they usually do have standardized equipment such as bus stops, benches, fences, lighting fixtures, and bicycle racks.

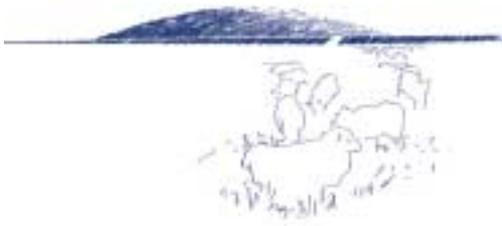
Although Denmark traditionally makes use of good design, an overall approach too often seems lacking when signs and other furnishings are erected. Denmark has produced some well-designed equipment in recent years, and work is still being done to develop products that meet the more stringent requirements set for the suburban road milieu.

A number of municipalities have drawn up design manuals in their efforts to beautify the city center. Plans for signage and lighting have also made an important contribution to urban beautification.

M I L E W I D E ®



Large-scale terrain sculptures can be part of the road architecture. The project for an earth sculpture at Østre Kjersing, where surplus soil was shaped into a domed, flat hill and a linear embankment, was created by Sten Høyer, landscape architect, and Eva Koch, sculptor.



Art

Works of art are not commonly found along Danish roads and freeways. There are, however, some good examples of land art and large-scale landscape sculptures that integrate surplus soil, baffles, rainwater facilities, or plantings into the landscape's scale and make our experience of the road more interesting.

Most important of all is for a work of art to be created as an integral part of the environment and not as a random addition to an impoverished road milieu, something that would make art as disconsolate as the shopping center's battery of flags.



Paving

Nyvej in Glostrup is part of a project to renew the streets and squares in the town center. In addition to plantings and lighting, it also includes paving. On Nyvej, pedestrian areas are covered with black Alta slate.



Paving

The city's floors

The city's "floors" might be paved with asphalt, granite, concrete, gravel, or grass. Pattern and material can help clarify the street space and make it comprehensible, beautiful, and interesting.

Paving can also emphasize or clarify traffic functions and separations with the use of changes in paving or level. A calm surface provides a good background for the city's often highly detailed buildings. Too many types of paving and changes from one to another, in contrast, attract attention and can make the street space seem confusing or chaotic.



Lighting

Principles for lighting

Lighting has an important architectural function. Even its physical expression – type of fixture, type and height of mast, location, and spacing – is part of the street scene and how we experience it.

Dimensions must be harmonized with the surrounding scale and the type of fixture must illuminate what it is intended to. There should be minimal illumination of the surroundings, and attention should be paid to the night sky, the risk of glare, good light color, etc.

Roads in the open countryside are rarely lit in Denmark. Apart from economic aspects, this reflects the view that lighting should only be used where there is clearly a risk of conflicts. Lighting is consequently used only on bridges and at intersections, especially intersections that involve cars, bicycles, and pedestrians.

Lighting for smaller roads largely follows these principles, though greater use is made of covered fixtures and shorter masts that reduce the road's scale and make it more urban.

Park fixtures are used in residential areas. The surroundings are more attractive when a development has uniform lighting fixtures that harmoniously emphasize its scale.

Most Danish town centers consist of buildings with two or three stories. Although the buildings are fairly low, their density makes it possible to use special lighting since the buildings act as supplementary reflectors. This can create an urban space with great light intensity yet limit the number of lighting fixtures.

Two distinctive Danish types of urban fixtures are lights mounted on walls and lights suspended between buildings. The right to use the facades of private buildings to attach public lighting keeps the city's floor free for traffic and the city's architecture from being defaced by fixtures on masts.

The city's squares present different conditions, where the wish to accommodate special activities can be emphasized with spectacular or specially directed lighting.



Road standards for lighting

New road standards for lighting (1999) place great emphasis on its architectural qualities, something that should also have an impact on lighting roads in the open countryside. The standards recommend that the road system and accessory paths be viewed as a unity.

Road authorities are expected to draw up master plans for road lighting that include guidelines for its visual design and harmonization with the surroundings.

The new standards for road lighting reflect a desire to soften the visual impression by reducing the height of the light source and support lighted areas with plantings.

New fixtures should provide good contrast and color reproduction; fixtures with high-pressure sodium lamps should be replaced by ones with better color reproduction.

Uniform fixtures and masts should be used in continuous road progressions and attention paid to important attractions by locating fixtures only opposite them. The standards discourage suspending fixtures across open spaces. Road lighting in the open countryside should be limited by dimming it at night and choosing a low lighting classification.

The only binding regulation calls for lighting for traffic circles and intersections regulated by traffic lights. Nonetheless, since there is a tradition for following guidelines in this area, they can have a major influence on efforts to create more beautiful roads.

The Danish Road Directorate's handbook on lighting (1999) gives a thorough review of lighting technology and the architectural aspects of lighting.





Plantings

Roadside plantings play a dominant role in the road's architectural expression. They can also have a major impact on their landscapes, emphasizing or concealing structures and elements in their surroundings.



Road plantings comprise all forms of vegetation set out along roads: avenues, roadside trees, forests, groves, hedgerows, hedges, bushes, grass, and flowers. The use of plantings in the road environment should be based on the overall architectural design and the landscape or cityscape of which the road is a part. In both urban and rural planning, plantings should also be seen in the context of other aspects of road planning, for example safety.



Growing conditions and ecology

Apart from their aesthetic perspectives, plantings are very important for flora/fauna, the environment, climate, and user orientation. New plantings generate new flora and fauna along the road and consequently new habitats that can help unify the landscape's ecosystem. Since plantings are the road's living element, it is important to give them good growing conditions.

Growing conditions for trees along the roads and streets in a modern milieu are often so poor that the trees stop growing before they reach their intended size and appearance.

Designing with plantings

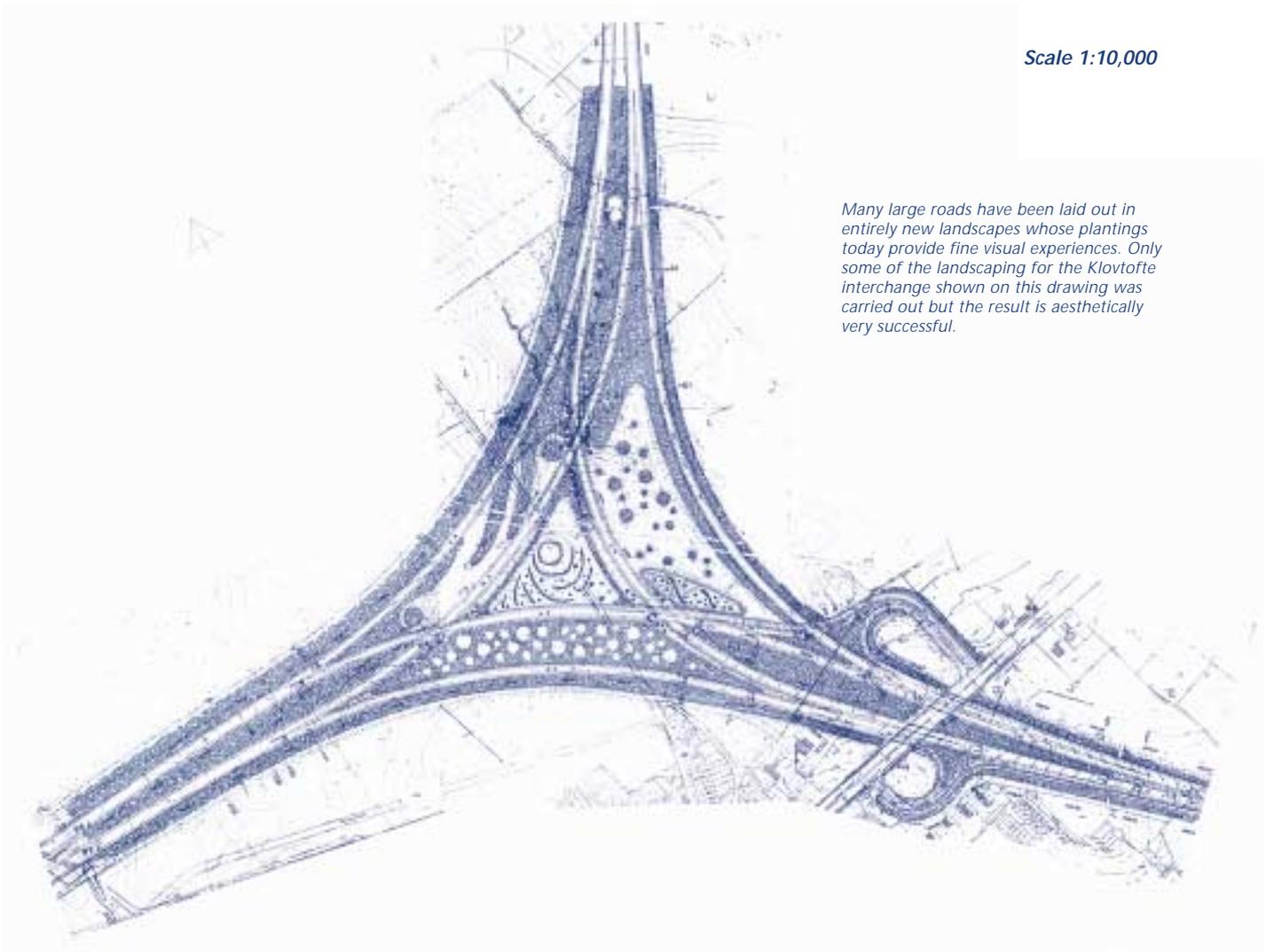
There are three overall concepts that dictate how plantings can be used along roads.

The first is to harmonize them with existing vegetation. New projects affect forests, hedgerows, wetlands, shrubs, and individual trees. The road can be integrated into the landscape with the aid of new plantings and by rounding out existing elements.

Secondly, plantings can lend intrinsic value to the road, the way old road plantings do. Although they were originally planted to protect against wind and weather, and not for aesthetic reasons, they provide a natural source of inspiration for today's planners and designers.

Finally, plantings can be used to create an entirely new landscape where a distinctive look was previously lacking.

Scale 1:10,000



Many large roads have been laid out in entirely new landscapes whose plantings today provide fine visual experiences. Only some of the landscaping for the Klovtofte interchange shown on this drawing was carried out but the result is aesthetically very successful.





Good growing conditions ensure a verdant road milieu.



Types of plantings

Avenues:

The avenue is a precise architectural element that encloses a road or path, its trees planted symmetrically across from one another and so densely that they form a closed space. Avenues are usually found at Baroque manors and palaces.

Roadside trees:

Roadside trees are planted either individually or in rows. They might be staggered on either side of the road or line only one side. These trees can accentuate and provide information (optic guidance) on the course of a road in a landscape.

Groups of trees:

A small planting of trees in groups can have a sculptural effect or facilitate orientation in the landscape. Like individual trees, groups can emphasize or indicate special points along the road.

Groves:

The grove is a small planting of trees whose crowns form a continuous progression. The grove is typically used for shelter around farms, gardens, and waterholes, but also in more urban settings in parks or to provide a roof over a parking lot, etc. The grove is a characteristic planting form that can be used in road projects with sufficiently large adjacent areas.

Forests:

The forest is a composite, natural planting consisting of trees, bushes, and herbs. The forest appears as a distinctive volume in the landscape.

Hedgerows:

The hedgerow is a dense, linear planting of trees and bushes. It denotes field boundaries and provides shelter in sandy soils. The hedgerow is a distinctive element in the cultural landscape.

Bushes:

Bushes can be planted together to create different impressions, from a garden atmosphere to a natural look. They can be used not only in hedges and hedgerows, but also individually, in boscajes, as ground cover, and as accessible shrubs.

Hedges:

The hedge is a linear, trimmed or untrimmed planting of one species. The hedge can form spaces and delimit elements.

Grass:

Grass is typically found in flowering meadows or fields. Grass as a motif adapts itself to its landscape.

Flowers:

Flower plantings can consist of a single species or a combination of different species to give the impression of everything from a garden to a natural environment. Flowers and flowering herbs can be used effectively as a colorful decoration along the road.



Beech hedges and plane trees provide a distinctive identity here.

Trees in the city

Conditions for tree growth in the city are different from conditions in the open countryside. If trees are to be used in the city, care must be taken to create optimal growing conditions. The soil in cities is often so compressed that tree roots cannot develop. Trees are moreover subject to pressure from paving and buildings, high temperatures, dark shadows, and pollution from soil and air, for example from the use of salt on roads during the winter.

Road standards

The proposal for standards for plantings in the open countryside (2002) is intended to support work with designing these plantings along rural roads. The standards are intended to help road directorates create attractive progressions in the landscape, viewing flora/fauna, traffic safety, road architecture, and plant care as a whole. The standards set down precise requirements for spacing and provide guidelines for choosing plants, planting types, etc.



After compressed soil is excavated, structural soil (a mix of rocks and soil) is added, ensuring pavement stability and tree growth.



Trees are effectively protected against salt during the winter.

Maintenance



Sturdy designs in solid materials give the best guarantee that quality can be upheld for many years. Good materials stand up to wear and weather. The goal should be simple designs with a few paving types that clearly reflect the function of the different traffic spaces.

The road's green elements develop over the course of many years and must be maintained regularly in order to become healthy plantings. Solid materials, in contrast, wear down and deteriorate in time and must be regularly repaired. Materials and care must moreover be suited to the road's current use and safety requirements. This provides an opportunity to evaluate the road's architectural expression from an overall viewpoint. New signs, etc. might have had unfortunate aesthetic results and perhaps even impaired safety.

Local road-maintenance manuals describe goals for both daily road maintenance and longer-term improvements and measures. In order to achieve the desired look and quality level, it is important to keep these goals constantly in mind. Various maintenance tools/systems have been developed that aim to keep the road functional at all times. The systems describe both routine measures and ones that regularly require a qualitative on-the-spot assessment. In most systems, both practical and aesthetic aspects must be evaluated collectively at regular intervals. Most maintenance tools are continually being improved.

Corresponding systems have been developed for roadside-planting manuals. These systems work both with the aesthetic dimension – requirements regarding the visual impression – and with the practical side – descriptions of the concrete measures that must be taken in order to achieve or maintain the desired look.

Urban roads and their environs

Dense urban traffic is hard on the road's materials, while the load on an ordinary residential street is limited. This is why it is often wisest to use sturdy materials, ones that can stand up to hard physical loads and torsion, both summer and winter. Road materials must moreover meet safety and accessibility requirements for different user groups.

Many things must be taken into account in maintaining plantings along urban roads: growing conditions, special care during the initial stage, pruning, etc. It is also important to protect both the trunks and the roots of existing plants when roads are built or repaired.

In many cases, suburban roads are bordered by fairly large green areas. This is why it is important to define road area and recreational area and determine the level of care needed for each. Many roadside areas have narrow median sections where bushes are used extensively. They are generally expensive to maintain and may be of dubious value for the road's architecture.

Rural roads and their environs

The rural road is fairly simple to maintain. Drainage must be good, worn areas must be repaired, and markings should be plainly visible.



Worn surfaces pose a traffic hazard.



Roadside maintenance varies greatly from one municipality and county to the next.

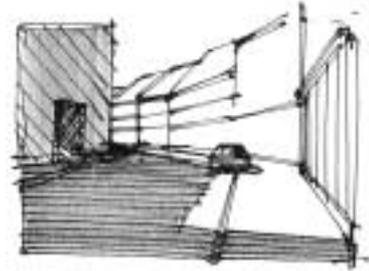
Since rather little maintenance is done on green areas along municipal roads and major state roads, it is important for the choice of planting and its character to suit the environment's climate and extensive form of plant care.



Roadside trees in the countryside also need maintenance.

The Checklist System

Project type: Urban-zone road



Project type: Urban-zone intersection



Project type: Rural-zone road



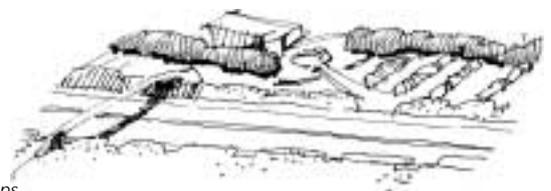
Project type: Rural-zone intersection



Project type: Dedicated bicycle path



Project type: Service facilities and rest stops



The checklist system can be found on the Danish Road Directorate's homepage:

www.vd.dk

The checklists are available in the most common file formats and can be downloaded and used without restriction.

Systematization

The checklists are suitable for common county or municipal road-planning processes.

The checklist system is based upon the average sequence in a typical construction project and represents a number of decision-making steps, posing increasingly more detailed questions about the decision-making process and project content.

The following steps were chosen for the checklist system:

Step 0 Programming

Step 1 Sketch plan and preliminary project

Step 2 Main project

Step 3 Startup

Step 4 Maintenance and supervision

There are many ways of carrying out a project, depending on place, tradition, political conditions, etc. In every case, a number of general considerations form the basis for working out the details of the project to ensure its completion and future maintenance. The division into stages must be adapted to the individual sequence.

Decision making at all stages

The checklists contain a number of questions that are considered relevant for the detailing level at each particular stage. If decisions are made in the course of the project that have an impact on previous decisions, planners must consider whether it is still possible to maintain the overall concept. This is why this question is posed as an introduction to steps 1 to 4.

Step 0

Programming

Step 0 is the programming stage when the project is defined and roles are divided between the client and planners.

The project – a new road or road improvements – is most often based on the following conditions:

Change in capacity

Traffic load, different traffic patterns

Service

Better service to the public on the road, in its vicinity, and in the district

Noise control

Moving traffic, limiting speeds, erecting noise barriers

Improving traffic safety

Reducing speeds, accommodating other users, especially vulnerable users, pointing out "black spots"

Urban development and/or renewal

Including overall aesthetic considerations

Step 1

Sketch plan and preliminary project

The road project's overall geometry is established in the sketch plan and preliminary project. A high degree of client/user participation must be expected at this stage.

The potential to assess the project's architectural value depends largely on visual presentation. Documentation in the form of digital visualizations, sketches, photographs, cross-sections, elevations, etc. and good written formulation are essential at this stage.

Step 2

Main project

The main project deals with the construction/civil-engineering aspects that will ensure that intentions are carried out. The design of paving, building structures, and equipment is described in detail.

For planted areas, it is important to ensure the best possible growing conditions to allow the vegetation to develop into a distinctive and verdant element.

Step 3

Startup

When the project is completed, formal responsibility is handed over from the contractor to the user/client. In order to ensure the best possible basis for maintenance, the user/client is provided with "as-built plans" and a completion report, which describe the project and any changes that might have been made during construction.

If the project requires maintenance that differs from the normal routines, its goals and intentions must be described in detail to those in charge of maintenance. Routine maintenance should be reviewed in conjunction with the handover.

Tendered projects often comprise not only a one-year inspection and five-year guarantee, but also extra care of plantings during the first years, in their establishment period. This ensures the plants a good start, and responsibility for their care during this critical period is unequivocally placed with the contractor.

Step 4

Maintenance and supervision

The road is in use and maintenance started. Materials deteriorate over time and must be repaired or replaced, while the road's green elements develop into a unity over a period of many years. Adjustments must moreover be expected if the current use changes in the future.

A maintenance manual is intended for everyday use. It ensures that maintenance, repairs, and new measures harmonize with the architectural intentions for the project as set down in the description of goals.

In addition to routine maintenance, the project is inspected and followed up at regular intervals, when future maintenance routines and any measures that might be taken to improve the project may also be decided.

It is important at this stage to adhere to the project's architectural goals, to keep the aesthetic quality from deteriorating.

The checklists can be used for these inspections.

The alignment of Danish freeways harmonizes with the Danish landscape.



Project types

The checklists review project types that are representative of the tasks involved in a planning and maintenance sequence. The project types describe work situations in rural and urban settings. Although not all questions might be relevant in a given situation, they were chosen to cover a project situation as well as possible.

The following types of projects are dealt with:

Urban-zone road

Constructing or renovating a section of road in an urban zone

Urban-zone intersection

Constructing or renovating an intersection in an urban zone

Rural-zone road

Constructing or renovating a section of road in a rural zone

Rural-zone intersection

Constructing or renovating an intersection in a rural zone

Dedicated bicycle path

Constructing a dedicated bicycle path, especially in a rural zone

Service facilities and rest stops

Parking or rest stops adjacent to the road. The project could also be a coordinating or an intermodal project involving several forms of transportation (park and ride).

The checklists as a planning tool

The client

The client can use the checklists as a tool at the programming stage to clarify and specify political requirements regarding architectural quality. Later, he can use them to review contracts together with the consultant.

Questions about goals, architecture, and economy must be answered at a very early stage of the planning process. It is in the interest of all parties for the client to be fully informed and aware of his requirements and wishes.

The checklists are a useful tool in the overall process, giving the client an opportunity to follow it and ensure that the project progresses as desired.

Project management

As the client's closest advisor, it is the project management's task to ensure that the right decisions are made, notified to others, and carried out at the right time. The different steps in the checklist system help provide an overview.

Planners

A number of different professional groups are generally involved in road-planning projects. Engineers, architects, and landscape architects often make up the planning group that must realize visions. The handbook and checklists can be used by these planners to assess all aspects of a project.

The checklists give those involved in the project the opportunity to voice clear opposition when architectural aspects might conflict with other factors, such as safety, legislation, technical requirements, etc. It also makes it possible at an early stage to form some idea of the amount of surplus or toxic soil, related projects, etc. and incorporate them aesthetically and economically into the project.

Maintenance authorities

The goal of maintenance is to preserve and develop the road's qualities. The green part of the project will display its finest features only after several years of growth, in contrast to the project's structures and equipment, which in principle have their peak quality upon completion.

Maintenance is an absolute prerequisite for the proper development of trees and other plants. During the programming stage, however, the client must decide whether he is able to carry out the necessary maintenance. In principle, a maintenance agreement should be drawn up in advance that requires road management and maintenance personnel to carry out the prescribed work.

The checklists moreover presuppose that maintenance manuals be drawn up for all the different parts of the project.

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