# D3 Construction and maintenance of pedestrian facilities

## Contents



## Purpose

This module outlines the importance of sound construction and maintenance practices in encouraging walking.

## Introduction

The quality and standards adopted in the construction and maintenance of a pedestrian facility play a major role in the success of that facility in meeting community needs. A well-planned, well-designed and well-promoted pedestrian facility can still fail to meet expectations if appropriate attention is not paid to details of construction and maintenance.

Whole-of-life costs should be considered when planning pedestrian facilities. Ongoing maintenance requirements can be expensive, but unless facilities are constructed and maintained to an acceptable standard, there is a risk that they will become unattractive to pedestrians and use will decline, thus undermining the reason for the initial investment. It is therefore critical that the same attention paid to detail when planning the facility is paid to the construction and maintenance of the facility.

## D3.1 Construction practice

During the construction stage of a project, many decisions are made in regard to the site-specific factors influencing the works. It is important that the principles of good design practice outlined in Module D1 *Designing good quality pedestrian facilities* are not compromised during the construction phase of the project.

**Figure D3-1**
New pedestrian facilities should be provided at the same time as demand is generated

### Planning the project

Before starting site works, it is important to identify all existing or newly generated pedestrian movements within and through the area being managed. Key issues to address include:

- continuous provision of a safe, well-signed and obstacle-free facility which is well lit for both daytime (if a tunnel) and night-time (Austroads 1999)
- for new infrastructure projects such as subdivisions, it is important that pedestrian facilities are provided at the same time as road infrastructure so pedestrians do not need to use the roadway (see Figure D3-1)
- staged works to minimise the impact on pedestrians in the area
- advance warning and communication with regular users of the facility to ensure they have time to plan alternative routes if required (this is particularly important for pedestrians with any disabilities, such as visual impairment).

**Source:** ARRB (top two photos)

**Figure D3-2**
Different pavement and surfacing requirements are needed according to local conditions and intended use

### Building the design

During the construction phase of a project, many site issues require sound engineering decisions to be made in response to local factors. It is important that these issues do not result in a change to critical design elements. Key issues to consider include:

- informing project managers and quality representatives of the reasons for certain design elements to ensure that construction 'trade-offs' do not disadvantage pedestrians
- ensuring that project managers are aware of the tolerances for key design features, such as intersection ramps, and kerb and channel location of tactile indicators
- following sound engineering practice during construction to minimise future deterioration of the asset and the need for future maintenance needs
- avoiding the introduction of additional features into the area that will make the area less 'pedestrian-friendly' (e.g. traffic signal controller boxes).

### Pavement and surface construction

In broad terms, there is a trade-off between the initial costs of a facility and the expected ongoing maintenance. Experience with cycle facilities, which share many characteristics with pedestrian facilities, indicates that concrete paths require less maintenance than asphalt paths, which require less maintenance than unsealed paths. However, their construction costs are in the reverse order.

Although sophisticated models exist to predict deterioration of road assets, these are unlikely to be helpful, as pedestrian traffic loads are an insignificant factor in the deterioration of most pedestrian facilities. Different pavement and surfacing requirements are needed according to local conditions and intended use (see Figure D3-2). The amount of pedestrian activity can, however, be a significant factor in some high-use areas, such as major urban malls.

Key issues for designers and constructors include:

- the likely loading of the surface (including maintenance vehicles). Where service vehicles are required to cross or travel on the facility, a full pavement design may be necessary to ensure suitable functioning of the pavement.
- 'constructability' issues in regard to the minimum working depths of the various layers and/or pavement materials

## Case study: Gold Coast City

The Gold Coast City Council, recognising the importance of good-quality walking facilities, recently widened, made smoother and improved signage of their facilities (see Figure D3-3). Distance markers were also provided on the concrete pavement at 50 m intervals to inform pedestrians of the distance they had walked. This is an innovative example of additional functionality being incorporated into the walking pavement.

**Figure D3-3**
Cavill Avenue, Surfer Paradise

- underlying soil conditions
- rainfall and associated drainage requirements, with provision of subsoil drainage if required. Care should be taken in the placement and construction of drainage facilities to ensure that they do not create an obstacle or hazard for any users of the facility.
- selection and control of bordering vegetation, or location of the facility relative to existing vegetation. This will play a major role in determining the condition of the facility in the long term, with impacts on maintenance costs and/or potentially on safety for users of the facility.
- strict control on material quality and placement to avoid future maintenance issues.

See the recommendations in the box 'Pavements', and the case studies relating to surface selection ('Cairns Esplanade' and 'Gold Coast City').

## Case study: Cairns Esplanade

Opened in March 2003, the Cairns Esplanade was jointly funded by the Cairns City Council and the Queensland Government (see Figure D3-4). The aim was to design the space 'for the active and passive recreation of the residents and to meet the expectations of international travellers' (RoadNote 67 May 2004). Key construction and pavement initiatives included:

- colour added/selected for the various surfacing materials to reduce sun glare, and exposed aggregates used to limit reflectivity
- joints designed to meet various aesthetic needs, while controlling cracking
- concrete surface steel-trowelled with a light broom finish to ensure slip resistance.

**Source:** www.cairnsesplanade.com

**Figure D3-4**
Cairns Esplanade. The top photograph shows a surface selected to reduce glare. The bottom photograph shows joints designed to minimise cracking.

## Pavements

### Concrete construction practice

RoadNote 67 (May 2004) provides a summary of research results from the University of Queensland on the non-structural cracking of concrete. Recommended construction practices for concrete pavements include:

- preparation of the subgrade
- adequate compaction to reduce voids and increase strength
- protection against the risk of plastic shrinkage
- early and adequate curing to reduce tensile stresses and improve tensile strength
- timely saw cutting.

### Sealed and unsealed pavement practice

For pedestrian pavements carrying some vehicular traffic, the *Sealed local roads manual* (Giummarra 1995) and the *Unsealed local roads manual* (Giummarra 2000) developed by ARRB Transport Research provide relevant guidance on the design, construction and maintenance of low-volume roads.

**Source:** ARRB

**Figure D3-5**
Overhead cages protect passing vehicles (and other users) from the risk of projectiles being thrown from the overpass

### Bridge construction and maintenance

Design, construction and maintenance of bridges are specialised tasks requiring experienced engineers and construction personnel. Relevant standards, guidelines and issues to consider include:

- AS 2156.2 Walking Tracks, Part 2: Infrastructure Design, which outlines the 'design and construction requirements for non-habitable outdoor structures [such as bridges] intended to protect the environment and to be used as recreational facilities'
- Main Roads (2000) *Bridge inspection manual*
- the Australian Bridge Design Code (HB 77) (1999), which provides relevant bridge design, construction and maintenance advice
- *Bridge management systems – the state of the art* (Austroads 2002), which provides useful guidance on the establishment of bridge asset management systems and appropriate maintenance regimes
- Main Roads' guideline document for state-controlled roads in relation to the potential for objects being thrown from overhead structures, which may be of interest to other authorities (see Figure D3-5).

## D3.2 Maintenance practice

Proactive, planned maintenance is required to ensure that pedestrian facilities continue to perform their intended purpose. Authorities should consider:

- the need for maintenance regimes and why they are important (from an organisational, liability and user needs perspective)
- cost-efficient maintenance practices and coordination with other programs, projects and maintenance activities
- the different maintenance needs of different facilities (e.g. crossings, paths, malls)
- maintenance of the different infrastructure elements (such as the pavement surface, signage, furniture, foliage)
- the role of local community groups in caring for, maintaining and monitoring the facility.

### Maintenance plan development

The key objective of a strategy for pedestrian facility maintenance is to meet the statutory requirements of council, while being responsive to the needs of the community and providing good levels of sustainability and serviceability. The maintenance plan should include the following elements.

#### Category of facility

The category usually relates to the function the facility performs. The terminology may link closely to the council's network hierarchy plan, and be integrated with the provision and maintenance of cycling facilities. Categories may include:

- pedestrian hub – mall, entertainment venue, high-volume recreational space
- primary collector/commuter – on-road, road-side, off-road
- urban access/collector – on-road, road-side, off-road
- local access/collector – on-road, road-side, off-road
- urban recreational
- rural recreational
- pedestrian trails.

#### Maintaining an appropriate level of service

The desired levels of service to be provided by the various facilities need to be identified. Factors in determining levels may include cleanliness, condition of the surface, debris, signage, line marking, vegetation control, and monitoring of the condition and position of street furniture and signs.

**Note:** There may be a separate level of service allocation for network priorities determined by factors such as continuity of networks, width and other capital investment needs (see D5.1 *Audit tools and guidelines*).

#### Risk management

To ensure the successful operation of any type of network, a risk assessment process can appropriately direct resources within councils. A risk assessment may include the following considerations:

- user-related (type of pedestrians e.g. children, seniors, people with physical impairments)
- location and network importance
- deterioration-related (e.g. soil types, tree density, road grime for signs).

#### Desired maintenance standards

The risk assessment results can be used to influence and determine the desired maintenance levels for various sections of the network. For example, there may be a lower tolerance of potential tripping hazards or debris on a path frequented by pedestrians with mobility or vision impairments.

Councils should identify the required intervention triggers and response times for the various maintenance issues and ensure that their responses meet the organisational, legal and user needs (see Figures D3-6 and D3-7).

Inspection and monitoring processes are described further in Module D5 *Monitoring and evaluating pedestrian facilities*.

**Source:** ARRB

**Figure D3-6**
Poor drainage design and/or maintenance, resulting in standing water, can adversely impact the continuity and safety of a walking route

**Source:** ARRB

**Figure D3-7**
Maintenance intervention standards may vary on the basis of risk. Councils need to assess the level of risk posed by conditions such as this cracked pavement

#### Life-cycle costing

Contributing to the most economical management of the facility, life-cycle costing can help identify the appropriate time and scale of interventions (from maintenance to rehabilitation and reconstruction). The collection and management of condition and inspection data are critical inputs into these models and should be managed in an appropriate way.

### Maintenance types

Maintenance activities for pedestrian facilities can be divided into three main types:

- responsive and/or emergency, which may result from inspections, from complaints or in response to events
- routine maintenance completed in a planned, scheduled or predetermined manner (e.g. weed control, grass cutting, litter collection, sign cleaning)
- programmed maintenance, such as upgrading, reconstruction, rehabilitation and resurfacing of facilities.

## References


Austroads 1995, 'Part 13: Pedestrians', *Guide to traffic engineering practice*, Austroads, Sydney.

Austroads 2002, AP-R198/02 *Bridge management systems – the state of the art*, Austroads, Sydney.

Giummarra, G (ed.) 1995, *Sealed local roads manual*, ARRB Transport Research, Melbourne, Victoria.

Giummarra, G (ed.) 2000, *Unsealed roads manual*, ARRB Transport Research, Melbourne, Victoria.

Main Roads, *Technical guidelines for the treatment of overhead structures*, Queensland Department of Main Roads, Brisbane.

Main Roads 2000, *Bridge inspection manual*, Queensland Department of Main Roads, Brisbane, <www.mainroads.qld.gov.au>.

Main Roads 2002, *Asset maintenance guidelines*, Queensland Department of Main Roads, Brisbane, Australia.

Main Roads 2004, *Standard drawings roads manual*, last amended July 2004, Queensland Department of Main Roads, Brisbane, viewed 22 October 2004, <www.mainroads.qld.gov.au>.

RoadNote 67 May, 2004, *Cairns Esplanade*, Cement and Concrete Association of Australia, St Leonards, NSW.

Standards Australia 1996, HB 77 Australian Bridge Design Code, Standards Australia, Sydney.

Standards Australia 2001, AS Walking Tracks, Part 2: Infrastructure Design, Standards Australia, Sydney.