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B2 Impermeable facilities

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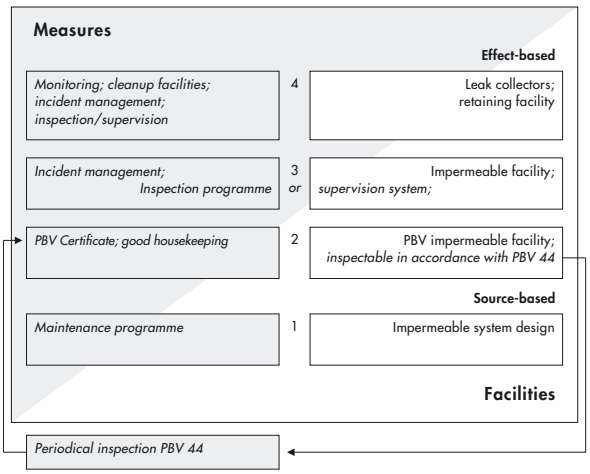
2.1 Floors, pavements and seals

Floors (indoor), pavements (outdoor) and seals can be subdivided into

1 above ground facilities
   – inspectable in conformity with CUR/PBV Recommendation 44 [67];
   – inspectable in another way;
2 underground facilities.

In the case of new construction - in the event of effect-based soil protection facilities being required - preference must be given to using containment facilities which are inspectable in conformity with CUR/PBV Recommendation 44 [67]. For such a facility a valid PBV impermeable facility certificate issued by a Qualified Inspector is required which guarantees (on an permanent basis) the necessary soil protection. An impermeable containment facility with PBV certificate is an indication of the best possible seal in accordance with the state of the art.

Many facilities can be given a KOMO process certificate. It is advisable in the case of new construction or renovation to construct facilities with a certificate. This gives greater security for the final result.



2.1.1 Impermeable floors and pavements

To be able to demonstrate that floors or pavements meet the requirements of being impermeable they will have to be inspected from time to time. A floor or pavement can only be qualified as an impermeable facility with a PBV certificate if it has a valid PBV impermeable facility certificate, obtained after approval based on an inspection in accordance with CUR/PBV Recommendation 44 [67].
If a floor or pavement cannot be inspected in accordance with this recommendation because the (temporary) removal of obstacles is impossible, then such a certificate cannot be issued. In that case the (permanent) soil protection effect of the facility has to be guaranteed by other forms of inspection.

a Material and choice of system

The choice of a suitable impermeable facility is partly determined by the specific user requirements and the construction parameters. An indication of material and suitable forms of design can be derived from § B2.4 What facilities for soil protection?
In the PBV context the Handbook on Design and Detailing of Soil Protection Facilities [17] has been drawn up. It is essential for a good design that this Handbook is consulted.

CUR/PBV Recommendation 65 [63] provides requirements and rules for designing and constructing a cement floor or a protective layer on a supporting floor of concrete. Specific requirements and rules for impermeable resin-protective layers are laid down in Recommendation 64 [41].
If the construction is being carried out under a certificate one can count on the floor or pavement being guaranteed impermeable. In such a case one can assume that when inspected with reference to Recommendation 44 [67] this will be immediately approved. The scope of the inspection can be very limited.

If an impermeable facility is opted for, a choice has to be made in a sound and systematic way of the type of soil protection facility, the construction and the material. A checklist has been drawn up by the NIBV. The correct type of facility can be determined by running through the checklist and answering the questions. The checklist is included in the aforementioned Handbook on Design and Detailing [17].

b Construction and repair

Repair measures to a (concrete) floor or pavement have to be carried out in accordance with CUR/PBV Recommendation 65 [63]. This Recommendation contains all the main requirements with regard to details such as joint constructions and for example the gradient of the floor in relation to the height of the raised edges.

2.1.2 Bottom seals; non-visually inspectable facilities

Bottom seals are (underground) soil protection facilities, e.g. in the case of residue storage and industrial estates. After installation, such seals are covered with earth and/or filling materials, contaminated or otherwise.
Impermeable bottom seals can be achieved using plastic sheeting or mineral sealing layers.[1]
Bottom seals cannot usually be visually inspected. Consequently no PBV impermeable facility certificate based on CUR/PBV Recommendation 44 [67] can be issued. Sometimes automatic monitoring systems can be installed to keep a check on the impermeability of such seals.

[1] In the case of mineral sealing layers (sand bentonite, sand bentonite polymer, bentonite mats) as part of the Landfill Decree and/or the Building Materials Decree, a certain degree of permeability to liquids is permitted. The sealing layers allowed are therefore not impermeable and consequently may not be used in this form as part of the NRB.

2.2 Company sewers

The Sewer Guide has been drawn up to support local authority sewer management [51].
The Sewer Guide[2] explores the administrative and legal aspects, the design principles and operational management of public sewers. However, the Sewer Guide does not adequately cover company sewers. From the point of view of soil protection it may be necessary to set specific requirements of the quality of the sewer system. Examples that spring to mind are whether the sewer is impermeable and resistant to thermal and chemical impairment.
Company sewers are defined as :

> A facility for the discharge of company waste water on a company site to a public sewer or another facility for the collection and the transport of waste water including all the accompanying connections, drains and other facilities.

This definition has been taken from the CUR/PBV Recommendation 51 [52]. Other facilities include for example sluices, oil separators, grease separators, pipes,drains and sludge traps [54, 55].

Company waste water can be defined as waste water (a), not being domestic waste water (b)..
In addition to the discharge of company waste water, company sewers can also temporarily hold substances hazardous to the soil, which cannot immediately be disposed of, or, in the event of calamities.
Hence the main function of a sewer is to collect, transport and discharge waste water.

[2] See also 'Guide to Maintaining sound sewer use' (InfoMil W02) [61].

> a Waste water is water discharged by the holder, in association with the removal of that water.
> b Domestic waste water is waste water coming from private households or waste water coming from other sources but which in terms of its composition is comparable to waste water from private households.

The water can be transported under natural gradient or under pressure in the sewer [56, 57].
A (company) sewer can, be built free in the earth, on piles or on sleepers near the surface(in the case of soft soil underground constructions can also make use of sleepers).
There are also separate and mixed systems for the discharge of company waste water, domestic waste water from companies and/or rain water.
Hence there is a great diversity of types of sewer and equally great variation in their resistance to mechanical, chemical and thermal impact. In relation to underground pipes aboveground pipes have the advantage that leaks can be spotted rapidly. The choice of a certain type of sewer depends on many factors.

The materials and sewer parts must of course comply with the standards that have been set. These standards are referred to in CUR/PBV Recommendation 51. Certainty that the materials and products meet these standards is obtained by insisting and also checking that they are supplied under certificate.

Existing (concrete) sewers are frequently not completely impermeable. Since no emission score lower than 2 can be achieved for underground pipes - not even in combination with an effective inspection programme and a company emergency plan, to achieve an acceptable risk (category A*) – on the basis of the NRB system - there would have to be a radical system of monitoring to reduce the risk around the company sewer. For the time being such a measuring system for sewers is not considered reasonable.
If the right material is chosen and the sewer is constructed in accordance with CUR/PBV Recommendation 51 an (underground) sewer system can be made sufficiently impermeable when it is constructed and a negligible soil risk can be achieved.

The owner is responsible for maintaining the soil protection function of the company sewer. This naturally means that maintenance has to be carried out. This includes at least regular inspections. Leaks to sewers are usually not noticed immediately with the soil becoming contaminated as a result. Sound design, sound inspection and sound management/maintenance are therefore essential. 'Management and maintenance of company sewers' has therefore been drawn up CUR/PBV Report 2001-3 [64].

CUR/PBV Recommendation 44 [67] will be extended on the basis of the CUR/PBV Report and Recommendation 51 so that a valid PBV impermeable facility certificate can be issued for underground sewers.

2.2.1 Oil separators and sludge traps

The durability of the material of the separator or the trap has to be guaranteed. Waste products in the oil separator must not penetrate through cracks in the wall of the separator or trap.
Specific standards have been drawn up for many types of separators and traps.
In practice these facilities are supplied under certificate. It is important that the buyer insists on this. This ensures that the product supplied meets the standards.

In principle, the same requirements apply to concrete oil separators and sludge traps as to separators and traps made of other material. However, requirements relating to the material have been formulated as a supplement. A study was recently carried out as part of the Soil Protection Facilities Programme into the durability of concrete and the transport mechanisms within concrete relating to waste materials and other materials. The result of this study has been recorded in CUR/PBV report 98-7 'Concrete oil separators and sludge traps' [62].

2.3 Quality of impermeable containment facilities

An impermeable facility with PBV certificate stands for the best possible soil protection in accordance with the state of the art.
To be certain that a PBV certificate can be issued for an impermeable facility it has to be agreed or prescribed that the facility is constructed or repaired in accordance with the valid standards and recommendations. Next a check has to be carried out to see indeed whether the facility has been supplied or constructed in accordance with the set requirements. That means that there has to be supervision that the prescribed quality controls and tests have actually been implemented.

In the case of impermeable facilities with PBV certificate(s) a valid PBV impermeable facility certificate must be present.

2.3.1 PBV Impermeable Facility Certificate

A valid PBV impermeable facility certificate is the only method of testing which guarantees that an impermeable facility is indeed impermeable. To this end the facility has to be visually inspectable.
Such a certificate is valid up to the end of the period given in the certificate. A Qualified Inspector decides on the period on the basis of criteria such as :

- the period for which the floor or pavement has already been used;
- the current and intended use;
- the observed liquid penetration at the time of the inspection;
- the condition of the floor at the time of the inspection.

Once the period has elapsed the floor has to be inspected again.

CUR/PBV Recommendation 44 [67] contains requirements and rules for assessing whether a floor or pavement can be regarded as being impermeable. This Recommendation describes the procedure for inspection with unambiguous performance requirements, determination methods and inspection criteria.
The Recommendation also states that the inspection has to be carried out by an accredited Qualified Inspector.

a Inspection by Qualified Inspector

Only a Qualified Inspector can issue a PBV impermeable facility certificate. The Qualified Inspector or the company by which he is employed has to be accredited for this purpose by a body accredited by the Council for Accreditation. This occurs on the strength of Kiwa/PBV BRL 1151 [65].[3]

The Qualified Inspector begins by making an inventory of the actual data on the floor or pavement and the possible liquid load. This is followed by a so-called visual inspection during which the inspector looks at defects that could affect the impermeability.
If after the visual inspection doubts arise as to whether the facility is impermeable, the inspector carries out a further investigation. This investigation comprises actual tests in which it is determined how deep defects in the floor or pavements are present.
All parts of the inspection are described in the aforementioned CUR/PBV Recommendation 44 [67].

After the inspection the inspector draws up an inspection report. This indicates whether the floor is impermeable or not:

- If a facility is regarded as being impermeable the inspector issues a PBV impermeable facility certificate including a period of time for which it is valid.
- If a facility is not regarded as being impermeable the inspector issues an 'Instructional Recommendation' indicating what repairs have to be conducted.[4]

After this has been done an inspection has to be carried out again. If the facility is approved the PBV impermeable facility certificate is then issued and a validity period given.

b Internal company inspection and enforcement inspection

Possession of a valid PBV impermeable facility certificate does not absolve the owner or user of an impermeable facility from his responsibility for the environment. It is consequently important that the user of the floor or pavement regularly checks for himself and keeps track of findings/actions in a logbook. This logbook has to be carefully kept (see also part A4.2.2b1).
Enforcement inspection of impermeable facilities can then be confined to checking the presence of a valid PBV Certificate and the implementation of actions from the logbook.

A checklist for a internal company check is included in the CUR/PBV Recommendation 44 [67]. The Qualified Inspector indicates how often and how thoroughly the user must check and he will use the logbook in establishing the next inspection period.

The internal company check serves as a warning. If defects are observed in an internal company check it is advisable to consult a Qualified Inspector. Defects in the floor can always arise, such as cracks or profiles which have been destroyed through driving, before the inspection period expires. The inspector will judge on the basis of the notification whether the facility can be repaired or whether a new inspection is necessary.

And if more major incidents have occurred at the relevant PBV facility and/or major changes occur in the industrial operations, a Qualified Inspector will have to re-assess whether the facility is impermeable.

2.3.2 CUR/PBV Recommendations and Kiwa/PBV Assessment guidelines

The CUR/PBV Recommendation contains technical criteria for the design, realisation or inspection of impermeable facilities. They are drawn up in consultation between all the parties involved and are consequently a reflection of the state of the art supported by all parties.
These Recommendations take the form of a standard, but have a private law status. The parties have to agree on their application, for example in specifications, a technical description of the work or if need be in permit conditions.

The Assessment guideline (BRL) is the basis for certification. The BRL describes the requirements set of the quality system of the certificate holder and the requirements to be met by the certified product or process.

An Assessment guideline has not been drawn up with the aim of the products or processes having to meet the requirement of the BRL being prescribed in the environmental permit. If all that is prescribed is that a product or process must comply with the BRL in question, the check that is carried out by the certifying body is lacking. In that case the company itself has to have prescribed checks carried out and this includes the operation of the quality system and the product requirements.
Hence it is better to refer to the use of certified products or services. In that case the necessary check also takes place by the certifying body. Normally speaking the technical requirements of a BRL are based on a standard or a recommendation. In practice therefore it is sufficient to prescribe that the product or process is deemed to comply with the relevant standard or CUR/PBV Recommendation.

[3] See also the section on 'mutual recognition' in the Readers guide.

[4] It is in the context of the checklist not always necessary for a facility to be impermeable to achieve a negligible soil risk seal; see also part A3.3.

2.3.3 Certification

Certification is a system which involves a producer or provider of services working in accordance with an established quality system which is supervised by a certifying body.
The quality system represents an organised, scrupulous way of working in which the producers or the providers of services carry out checks themselves to guarantee that the product or service complies with the requirements. The certifying body verifies that this self-control is indeed being carried out and carries out random checks to see whether the product or process complies with the technical requirements. The producers or the providers of the service remain responsible for the quality and execution of the product and/or service.

The basis for product and process certification is always a national Assessment guideline (BRL, see § B2.3.2). An overview of the relevant assessment guidelines in this context is obtainable from the Kiwa certification body or can be taken from the PBV internet site (www.bodembescherming.nl).

The Stichting Bouwkwaliteit (SBK), an organisation which promotes the quality of building, looks at the content and structure of the assessment guidelines that are used in the construction industry. SKB is the manager of the KOMO certification mark used in the construction industry.
Diverse types of soil protection facilities can be constructed under certificate on the basis of PBV publications.

Irrespective of the certification of products and/or the construction process a valid PBV impermeable facility certificate is compulsory for impermeable facilities. In practice therefore it is sufficient to prescribe in the environmental permit that the product or process is deemed to comply with the relevant standard or CUR/PBV Recommendation.
But the construction of PBV facilities under certificate has a number of advantages. There is a greater certainty about the final result and there is less chance of supplementary repair work being needed to obtain the PBV impermeable facility certificate.
If a facility has been constructed under the KOMO process certificate, it is easier for the Qualified Inspector to appraise the quality of the facility then when this is not the case. Since the material that has been used has been documented and how those materials have been applied, it suffices for the Qualified Inspector to carry out a (simpler) 'desk-top check' in order to issue a PBV impermeable facility certificate.

a Certificate types

There are different systems of certification and their rating is different. The main types are:

- *Product certificate*
  Product certificates entail a check to see whether a certain product meets the specifications as laid down in the relevant assessment guideline (BRL). The basis for this BRL is frequently a standard or another technical criterion. This means that the specification does not depend on the project or the circumstances, but is established for all cases. The BRL is also part of the agreement between the certificate holder and the certifying institute;
- *Process certificate*
  Process certificates involve verification of the way of working in accordance with the specification as laid down in the BRL. This method is used when the quality of the product cannot be completely assessed on the basis of the final result. The quality must be capable of being determined by describing the method adopted during manufacture. Otherwise the same properties apply as in the case of the product certificate. Here too the BRL is part of the agreement between the certificate holder and the certifying institute;
- *Quality system certificate*
  In the case of quality system certificates the quality system of a producer is verified on the basis of one of the standards of the ISO-9000 series. In this case the organisation is checked or in other words the way in which the business organises its affairs.
  This type of certificate says nothing about whether a product or service meets certain specific technical requirements. The ISO-9000 standards can in principle be used for every type of business. This means that they are phrased in very general terms and it is for this reason that they are not used in PBV products.

As part of PBV, in order to achieve impermeable pavements, use is made of a combination of product and process certificates. In a combination of this kind a floor is laid with a process certificate using products which are supplied with a product certificate. Impermeable inspections on the basis of the CUR/PBV Recommendation 44 [67] are carried out by a Qualified Inspector who has been accredited on the basis of Kiwa/PBV BRL 1151 [65].

2.3.4 Guarantee, liability and insurance of facilities

Despite every care the risk of soil contamination even after the creation of a soil protection facility is never zero. Should the soil protection facility fail, damage can arise for the operator himself, but also for third parties. In the latter case the operator may actually be held liable.
Guarantee of the facility is frequently viewed by the operators as an insurance policy that covers all risks. However, a clear distinction has to be made between liability and guarantee. It is important here how the parties involved have agreed things with each other. Generally speaking the New Netherlands Civil Code regulates liability, but parties can agree all kinds of supplementary matters with each other. There are many variants, the most common are:

- *Implementation in conformity with the U.A.V. 1989, no supplementary clauses.*
  If the agreement has been drawn up in conformity with the 'Uniforme Administratieve Voorwaarden voor de uitvoering van werken' [Uniform Administrative Conditions for the implementation of works] the contract states that the contractor during the maintenance period and a period subsequent to this can be held liable for damage arising as a result of concealed defects [29].
  If damage occurs recourse must be possible on the basis of this agreement though that is not always easy, certainly if the contractor no longer exists.

  For contractors, their liability insurance will offer cover. It is important to note here that damage to the actual products supplied is excluded in most policies. We are dealing here therefore with damage arising as a result of a defective product, not the product itself;

- *Implementation in conformity with conditions, supplemented by a business guarantee*
  In the case of damage, as in the first instance based on agreed conditions, recourse must be possible. The supplementary business guarantee possibly offers an extension to this because the guarantee usually relates to the product itself.
  But here again this fallback ceases to apply if the contractor no longer exists.
  The standard liability insurance, as already stated, offers no cover for damage to the product itself, so the business guarantee does not normally come under this;

- *Implementation in conformity with conditions supplemented by an insured guarantee*
  In this instance the same applies as described above, but with one major difference. There is insurance cover for the guarantee on the product itself. This offers the certainty that the guarantee commitments during the agreed period will be complied with, even if the contractor no longer exists, or even if they exceed his financial resources. In short, more certainty for the operator, but also for the contractor. The exact details of what is guaranteed and for which period are normally laid down in a guarantee certificate with conditions. A usual guarantee period is five years, but a period of ten years may occur in specific cases.

2.4 What facilities for soil protection?

See Handbook on Design and Detailing of Soil protection Facilities [17].