

NCC – Resin Flooring Site Car Park Decks & Resin Floor Systems

A Summary of the Key Criteria for Selection of Car Park Deck Waterproofing Systems – A Checklist:

Important Note: This checklist is not intended to be exhaustive, and/or each of the criteria mentioned may or may not be relevant and / or necessary for each specific structure, but this is intended as a Guide and Summary of the Key Criteria that will help you to define the main requirements, environmental conditions during installation and service, as well as the levels of different types of exposure and stresses that should be considered. Once these performance requirements are defined the selection, specification and detailing of the most appropriate deck waterproofing system can be made for your car park project.

These Key Criteria include:

1. Structural / Non-Structural Cracks in the Concrete Decks:

Are there any cracks in the concrete deck? – Are they in the top surface of the deck and if access is possible, are they also visible in the bottom of the deck slabs on the soffits i.e. do the cracks go right through the deck? Are the cracks of structural significance and what has originally caused them? Are the cracks still moving due to traffic vibration or other stress and loading for example? If so by how much are they moving and do these cracks in the reinforced concrete slabs have any structural significance?

- Important structural engineering note: For any crack or situation with structural or potential structural significance, then a suitably qualified and experienced Structural Engineer must be consulted for advice. (Please also refer to the '**Thermal Movement in Parking Decks**' section below).

2. Joints in the Structural Concrete Decks:

Is there adequate joint movement capability in the Movement Joints in the deck to accommodate the anticipated levels of thermal movement, dynamic loading, and any other anticipated movement of the deck? How have all the different types of joints i.e. Daywork joints, Construction joints and Isolation joints etc., as well as any Structural Movement and Expansion Joints, been designed in the reinforced concrete decks? Have they been correctly located, dimensioned, and previously treated / sealed? Are these all securely and safely sealed for the future, or is there additional treatment and watertight sealing of the joints required now – before or after application of the resin deck waterproofing system build-up.....?

Wherever there is any concern over the capability or capacity of movement joints to accommodate the anticipate movement then a suitably qualified and experienced Structural Engineer must be consulted for advice and it is also useful for owners and

specifiers to refer to the Emseal NCC Joint Sealing approach on the 'Floor Joint Systems' pages of this website.

3. Drainage in and Around the Parking Decks:

Is there adequate provision for rainwater collection, drainage, and removal from the structure? How have the drainage details been incorporated into the deck and sealed at their junctions with any existing or proposed deck waterproofing membrane? Is there evidence of past or current 'ponding' of standing water on the deck surface? i.e. Are there adequate falls for the required drainage requirements, or must additional work be carried out to create or reinstate these falls? This deck levelling work will normally be carried out after the removal of any damaged or deteriorated existing screeds or failed traditional waterproofing materials, and any structural repairs have been completed. The deck repairs and screeding to reinstate suitable drainage falls, including resetting gullies and channels etc., should be made with suitable cementitious materials when there is time to allow full curing; however, when time is short and therefore time is likely also money, then faster setting and hardening, resin-based repair mortars and screeds are the best choice.

Note: In colder winter temperatures repairs can also be made using MMA (methyl-methacrylate resin mortars, which can be used below 0°C, though these have several limitations, including ice prevention and their surface tension, so specialist use and control is necessary.

4. Deck Waterproofing Systems - Vapour Permeability:

Is the reinforced concrete parking deck below ground level or at ground level and if so, is there a secure and intact damp-proof membrane (DPM) installed between the concrete structure and the ground?

Are there any water supply or drainage pipes in or below the basement or ground floor parking deck? If so, are these all intact, or are there any possible leaks?

If water has access into the slabs on or below the ground this means that unless full breakout and replacement is undertaken to stop this, then any deck surface waterproofing system must be designed to allow water vapour to escape through the system? Therefore any proposed new deck waterproofing and wearing system must not only be waterproof, but also water vapour permeable, to allow the water vapour from below to diffuse through the system and escape by evaporation.

As referenced earlier on this page, in these situations that can sometimes be a problem for basement and ground floor reinforced concrete car park decks, the solution is that either:

- A vapour permeable deck waterproofing and wearing surface system should be selected if this is possible e.g. in new construction and where there is limited traffic and no crack-bridging requirements, as this criteria can only be met with relatively thin-layer coating systems such as Conifloor®-570.

- Or.....

- A suitable impregnation and/or moisture barrier must be applied to the prepared concrete surface, used as an additional priming and pre-sealing surface treatment, such as Sikafloor® EpoCem®, which then enables typical resin-based, water and vapour-tight, resin-based deck waterproofing system build-up to be applied as elsewhere on the parking structure.

5. Parking Deck Surface Profile – Existing and Required:

What is the condition and surface profile of the existing or new concrete deck surface? If the slab is yet to be placed, then what is the specified concrete finish and profile, plus how is this going to be achieved, as some surface treatments such as wax-based curing agents must be avoided?

Is the concrete surface dry, clean and suitable to accept a new resin waterproofing and wearing surface system, or will it / does it require additional surface preparation to achieve an open textured, sandpaper-like concrete profile that is ideal for the application of resin materials? If additional surface preparation is necessary, as it is for almost ALL new and existing parking deck slabs, then professional vacuum blast cleaning is usually the best method to achieve this and should always be specified for new power float finished concrete decks, as this also removes any surface weakness known as laitance. For more information please refer to the '**Surface Preparation**' page of this website.

Note: On existing parking decks without a suitably designed deck waterproofing system, frequent vehicular traffic causes mechanical wear and abrasion of the surface over time. Therefore, when the owner realises that a deck surfacing system is necessary to protect their facility and investment for the long-term, the surface preparation will need to be harsher and more aggressive in these areas, leading to increased consumption of the deck waterproofing system's priming and levelling components of the system build-up, the costs will also increase correspondingly, proving once again that it is always best to do these things properly and get it right first time – Another reason that the Free advice from NCC's resin flooring experts will always save you both time and money!

6. Deck Condition and Surface Contamination:

On existing parking decks, and before commencing installation of the deck waterproofing system on new concrete slabs, it is important to check if there has been any oil or liquid chemical exposure, or other spillages on the decks that could adversely affect the adhesion and/or performance of the new resin waterproofing and wearing surface system i.e. check for spillages of automotive fluids including fuels – petrol and diesel, other engine oils and grease, brake and other hydraulic fluids, coolants and ant-freeze solutions, de-icing salts and anything else that people may have helpfully emptied out of their cars and abandoned on your car park decks rather than using appropriate waste disposal....?!

As a result of any such leaks and spillages, accidental or otherwise, is any additional surface pre-cleaning required prior to the vacuum blast cleaning or any other mechanical surface preparation of the concrete.....?

Note: Thorough surface cleaning of existing parking decks is always essential prior to their surface preparation by vacuum blast cleaning. This is important and is to ensure that any adverse material spillages are removed and not further distributed across the surface during the works.

7. Concrete Deck Slab Moisture Content:

In both new and existing concrete decks the moisture content must be at an acceptable level, which is generally defined as not more than 4% parts by weight (pbw), before a new resin surfacing system can be applied. This could be from residual water after hydration in the concrete, water ingress from the ground or water penetration after rainfall; whatever the source, the water must be allowed to evaporate, and the concrete must dry out before the deck coating system is applied. Alternatively an effective moisture barrier, such as Sikafloor® EpoCem®, should be used to allow the moisture to evaporate over time as water vapour, or a surfacing system that is vapour permeable should be installed.

8. Future Use – Traffic Type and Level:

This is obviously one of the key factors for the deck waterproofing system selection as the degree of exposure to loading and additional stress determines most other performance demands, including what is the intended future type, activity, and level of such traffic in each area and within each deck of the car park? This can effectively be evaluated and summarised for different areas to relate this more easily to developing the necessary deck waterproofing system performance requirements for each areas requirements, levels of loading, exposure, and performance requirements – ***Such as the following:***

- Pedestrian traffic area only = **Low**
- Main Vehicle Aisles and Car Parking Bays = **Medium**
- Access Ramps and Turning Circles = **High**
- Heavy Delivery Vehicle Parking / Turning & Unloading Areas = **Very High**

The deck waterproofing and wearing surface system selected must also have an appropriate skid resistance and abrasion resistance that is suitable for the exposure in each of these different areas and that is suitable for maintaining this performance in both wet and dry conditions – according to the anticipated exposure in each are of each deck.

9. Future Thermal Exposure – i.e. External or Internally Exposed:

Externally exposed parking decks are subject to much greater thermal movement than lower decks due to their wider surface temperature exposure range; from -15 °C up to +40°C is now not uncommon over the full year throughout the UK. This degree of thermal expansion and the resulting thermal movement in the exposed parking decks, means that the deck waterproofing systems for exposed surfaces must be designed to be not just flexible, but also sufficiently flexible to be elastic and crack-bridging to accommodate the flexing and movement of the deck surfaces, in addition to the movement accommodated in the defined expansion movement joints.

Note: The use of light-coloured deck waterproofing and wearing surfaces for the externally exposed decks, can significantly **reduce 'heat island effects'** on the whole parking structure. This innovative, but simple approach, also greatly reduces the upper limits / highest surface temperatures reached on the decks in the summer months, which again contributes to less stress and reduced thermal movements, as well as much better customer comfort for users.

10. Future Chemical Exposure (Water & De-icing salts, Auto fluids etc.):

Car park deck waterproofing and wearing courses, must have a good level of chemical resistance. To determine the level of resistance required for each project, it is useful to check and confirm if each parking deck will be subject to direct exposure to water and de-icing salts, and therefore the potential for freeze-thaw damage and if so to what degree of protection is necessary for the lower vertical surfaces as well as the decks themselves. Whenever cars and other motor vehicles are parked for long periods there is always the possibility for leaks and spillages of their different automotive fluids including fuel – petrol and diesel, engine oils, coolant, and screen wash, etc., plus what is probably the most aggressive chemicals to synthetic resins and coatings – hydraulic oils such as brake fluid. Resistance to these liquids is therefore necessary and the level of resistance to these automotive fluids and any other possible spillages is dependent on the anticipated levels of spillages e.g. this maybe more important for longer term storage areas where seals may fail, and leaks could occur over longer periods without detection and before being cleaned-up etc.

The correct detailing of the waterproofing system around any surface penetrations such as joints and holding down bolts for barriers or equipment is also critical for maintaining this chemical resistance over the entire surface, and to ensure the required system durability with a long service life.

11. Behaviour in Fire – Fire Resistance Requirements:

There are currently no specific fire resistance or behaviour in fire regulations for car park deck coating systems, but in accordance with normal UK Building Regulations, the applied resin-based, deck waterproofing systems should have a good resistance to the 'surface spread of flame'. In enclosed or underground car parks, there may be additional Building Regulations applied, such as restrictions made on requirements for preventing / restricting any possible fire decomposition products, including the quantities of any toxic fumes that could be released from the systems in the event of fire. Therefore it is always important to check and assess what Building Regulations should be applied for the deck waterproofing systems behaviour in fire, in each of the different areas of each deck, on every project – New and refurbishment, especially when the parking decks are over, adjacent to, or below occupied residential and/or commercial / retail premises.

12. Colour and Design:

Is there a modern environmental deck colour design scheme in place or can you create one to help establish improved ambience on the parking decks, and to help upgrade and increase levels of light and thereby also security in the car park?

Note: These improvements are usually undertaken in conjunction with lighting upgrades and other user improvements in the parking facility that NCC's specialist team can also advise and support you with including concrete repairs and resurfacing, wall coatings, soffit coatings, improved signage, and area / zone demarcation e.g. for pedestrians or other areas of restricted / exclusive access etc.

13. Parking Deck Service Life - Durability - Maintenance:

What is the desired service life and durability of the structure and the deck surfacing to first maintenance? How easy is it to close or restrict access to each area for maintenance purposes and possible re-waterproofing in the future? The durability required, plus the options and possibilities of future closure and maintenance, together with their associated costs are probably the biggest decisions for the car park owner.

14. Parking Deck Waterproofing System Sustainability:

Sustainability is quite rightly also now becoming an important issue for car park surfacing materials; basically this involves the assessment and reduction of the environmental impact of the systems including their raw materials source, their processing, installation, service life expectancy and their eventual recycling possibility. Sustainability also relates to waste reduction of materials used on site, together with the recycling versus disposal of their packaging.

15. Waterproofing Penetrations through Car Park Decks:

Any penetrations through the reinforced concrete decks, such as holding down bolts or brackets for barriers and equipment, handrails, plus connections around drainage details, etc. must also be assessed, correctly detailed, and securely sealed to prevent water ingress.

NCC – Resin Floor Site - Checklist for a Deck Waterproofing System Selection:

This checklist is not intended to be exhaustive, and/or each of the criteria mentioned may or may not be relevant and / or necessary for each specific structure, but this is intended as a Guide and Summary of the Key Criteria that will help you to define the main requirements, environmental conditions during installation and service, as well as the levels of different types of exposure and stresses that should be considered. Once these performance requirements are defined the selection, specification and detailing of the most appropriate deck waterproofing system can be made for your car park project.

©NCC - Resin Flooring Site

January 2021