



To: <p style="text-align: center;">SUPERSEDED BY EB 01-010 EFFECTIVE 2/6/01</p>		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 95-053
Title: DESIGN GUIDELINES FOR THE USE OF PENETRATING AND COATING TYPE SEALERS FOR CONCRETE			
Distribution: <input checked="" type="checkbox"/> Main Office(30) <input checked="" type="checkbox"/> Consultants (34) <input type="checkbox"/> Local Gov.(31) <input checked="" type="checkbox"/> Contractors/AGC(39) <input checked="" type="checkbox"/> Regions(32) <input type="checkbox"/> _____ ()	Approved: <div style="text-align: center;">  James O'Connell Acting Deputy Chief Engineer, Structures Division </div> <div style="text-align: right;"> 12-11-95 Date </div>		

This Engineering Instruction supersedes EI 82-073.

EFFECTIVE DATE. This instruction is effective on Department contracts let on or after March 21, 1996.

PURPOSE. This instruction provides the designer guidelines for the use of concrete penetrating and coating type sealers.

BACKGROUND. Studies show that sealers are an effective means of protecting concrete from the ingress of water and chlorides, while having minimal effect on the concrete's ability to breathe (transfer water vapor). These sealers are relatively new and have been increasingly used over the last several years. Several Regions have developed their own specifications, and as a result their use of sealers has been inconsistent and in some cases, improper. These design guidelines will result in more uniform and cost effective use of concrete sealers.

There are two types of sealers: coating and penetrating types. Coating type should only be used when uniform appearance is a concern, as is the case when making partial "patch" repairs. Coating type sealers, when applied to the entire structure, hide the patch work appearance while providing protection to the entire structure. If cosmetics are not a concern, a penetrating type sealer should be selected; penetrating sealers are more effective in blocking the ingress of water and chlorides.

Sealers are cost effective in protecting existing structural concrete from corrosion related distress, when unprotected reinforcing steel is subjected to chlorides and resultant corrosion. They are also cost effective in protecting new "green" concrete, less than sixty (60) days old, from scaling distress that results when unprotected concrete is exposed to deicing chemicals early in its life.

Sealers are not considered a cost effective means of inhibiting corrosion when applied to concrete of standard quality that utilizes other means of corrosion protection, such as, epoxy coated steel, speciality overlays, etc..

When penetrating sealers are applied to a concrete surface they penetrate below the surface where they chemically bond to the concrete, and prevent water and chlorides from entering the concrete. Because the sealers bond below, not on the surface, they can not be abraded away easily. Good surface preparation, prior to applying the sealer, is essential to achieve the desired maximum penetration. Contaminants must be totally removed and the surface allowed to dry. When the surface is properly prepared a five (5) year service life is achieved.

The Bridge Deck Task Force recommends that a penetrating sealer be applied to all new and concrete overlaid bridge decks, to protect the concrete surface from scaling due to the potential for early exposure to deicing chemicals. This recommendation was made because the majority of bridge deck and overlay placements occur late in the construction season thereby making them prone to early exposure to deicing chemicals, and secondly, because the concrete, regardless of age, will receive some benefit from the application of a sealer.

When applying a penetrating sealer to new, "green," concrete bridge decks, the concrete needs only first year protection, until the concrete matures and is capable of protecting itself. Since the full 5 year service life is not needed in protecting new "green" concrete, less extensive surface preparation is identified in Items 18559.1896 and 18559.1896 M than is required of Items 18559.1696, 18559.1696 M, 18559.1796 and 18559.1796 M.

Sealing an existing structure, for the purpose of providing protection against the corrosion of reinforcing steel, requires the sealer to achieve its full 5 year service life.

These guidelines have been established to aide design personnel in knowing how, when and where sealers should be used. These guidelines explain the types of situations where concrete sealers can provide additional service life to structures, and where sealers may not be effective. These guidelines are intended to help the Department use concrete sealers in the most efficient and economical manner possible.

USAGE GUIDELINES. The proper use of concrete sealers is important to provide the most cost effective treatment while properly protecting both new and existing concrete. Properly applied sealers provide protection from the ingress of water and chlorides for a period of five (5) years. Applying sealers to new concrete protects the concrete while it matures and becomes less permeable.

New Bridge Decks: To protect new, "green," concrete from scaling, that results from early exposure of deicing chemicals, a penetrating type sealer (one which does not contain an aqueous solvent/carrier) shall be applied to the top surface of all newly constructed bridge decks, bridge deck rehabilitations, and concrete approach slabs, according to Item 18559.1896, or Item 18559.1896 M. Sealers are not to be applied to properly constructed sidewalks, safetywalks, parapets or barriers on new bridge decks.

Existing Bridge Decks: The application of sealers to the top surface of existing bridge decks shall be in accordance with Item 18559.1796, or Item 18559.1796 M.

In general, existing decks with good quality concrete and epoxy coated reinforcing steel should not be considered for sealer application. Existing bridge decks, with such protection are usually only sealed as a remediation for construction, material, or other problems, such as, hairline cracks or an open surface. The use of sealers in these situations should be decided on a case by case basis. Sealers are not a viable alternative for protecting improperly air entrained concrete. The Regional Materials Engineer should be consulted in these situations.

Sealers may be used on existing decks with uncoated steel reinforcing bars or less than three inches of cover to slow down any existing corrosion, in order to postpone more costly repairs. Sealers do not stop corrosion, however by reducing the intrusion of water and chlorides, the corrosion process is slowed.

Other Existing and Rehabilitated Concrete Elements: All other concrete elements containing uncoated steel reinforcement bars or less than three (3) inches of concrete cover, which are subjected to chlorides or chloride over-spray should be sealed in accordance with Item 18559.1696 or Item 18559.1696 M. These elements could include, but are not limited to median barriers, concrete pier protection, columns, piers, wingwalls or retaining walls located adjacent to travel lanes, and substructure elements under deck joint systems. The application of concrete sealers is important in marine environments and along coastal waters where salt spray is prevalent.

Coating type sealers should **only** be called for if cosmetic improvements are desired; i.e. to provide uniform appearance of partial repairs. If cosmetics is not a concern, a penetrating type sealer should be selected; penetrating sealers are more effective in blocking the ingress of water and chlorides. Concrete sealers should **not** be used for below grade applications.

COST IMPACT. The cost of sealing a new bridge deck is expected to be three percent (3%) of the cost of the bridge deck concrete item. Many Regions, however, already require sealing of all bridge decks placed late in the construction season, and include the price of sealing in the cost of the bridge deck concrete. In these cases there is no cost increase, it is only identified under a separate pay item.

COMPANION REFERENCES. This instruction has been written as a companion to EI 95-054 - PENETRATING AND COATING TYPE SEALERS FOR STRUCTURAL CONCRETE which transmits relevant specifications. The terms concrete sealers, and sealers, as used in this Engineering Instruction, refer to materials covered under Department specifications 717-03 - PENETRATING TYPE PROTECTIVE SEALERS, and 717-04 - COATING TYPE PROTECTIVE SEALERS.

The information transmitted in this instruction will be incorporated into the "Standard Specifications and Details for Highway Bridges."

CONTACT PERSON. Any questions regarding the use of concrete sealers, or the superseded instruction should be directed to the Materials Bureau, Field Engineering 1 Section at (518) 457-5956.