CONCRETE PAVEMENT GUIDE
PART 3: PRESERVATION STRATEGIES
CHAPTER 360 – JOINT AND CRACK SEALING

This chapter provides guidance on current practices for sealing or resealing transverse and longitudinal joints and cracks in JPCP, including procedures for selecting appropriate seal materials for specific applications, climatic, and traffic conditions. Some basic joint and crack preparation information is introduced, but refer to the Construction Manual or Maintenance Manual for more information.

360.1 INTRODUCTION
Transverse and longitudinal joints are designed and constructed in JPCP to allow slab expansion and contraction and prevent cracking. CRCP uses unsealed transverse cracks instead of transverse joints, and longitudinal joints which may be sealed depending on climate region. Joints are constructed by sawing to a partial depth shortly after concrete placement. Joints may be sealed using asphalt rubber, silicone, or preformed compression joint seal materials during initial construction (depending on climate region) and later resealed to improve pavement performance.

Sealing or resealing cracks requires a nonstandard special provision (nSSP) with approval from the Headquarters Division of Maintenance Pavement Program.

360.2 PURPOSE
The purpose of joint and crack sealing concrete is to reduce infiltration of moisture and incompressible materials into joints and cracks for improved pavement performance. Infiltration of water through unsealed joints and cracks is the main source of surface water into the pavement structure. Moisture in the pavement foundation can allow loss of slab support from base and subgrade erosion and pumping, which causes rigid pavement distress. Sealing also can prevent incompressible materials from entering joints or cracks. Incompressible materials lock joints or cracks open and create excessive stresses that may cause spalling, blowups, or shattering.

As concrete pavement ages, the slab is subjected to continued shrinkage, horizontal movement from expansion and contraction with temperature and moisture fluctuations, and the vertical impact of repeated traffic loads. Large tensile and compressive stresses can cause joint separation and cracking which may continue to widen with time.

360.3 APPROPRIATE USE
360.3.1 New Joints
According to HDM Index 622.5, the current policy is new JPCP and CRCP joints should not be sealed except for:
• Isolation joints
• Expansion joints
• Transverse JPCP joints in all desert and mountain climate regions

HDM Index 622.5 also recommends longitudinal construction joints be sealed in all desert and mountain climate regions, but this is currently considered unnecessary and unadvisable due to constructability issues.

Historically, standard policy has varied from not sealing any JPCP joints or cracks to sealing all joints and cracks. California has a varied climate that is typically temperate and arid and there is a long history of unsealed joints performing well in JPCP. The current joint seal policy is based on balancing the long-term benefits of sealing joints with pavement performance, installation and maintenance costs, and minimizing worker exposure to traffic.

360.3.2 Existing Joints and Cracks

Policies for existing joints have typically varied according to individual district maintenance practices. Typically, existing sealed and unsealed joints should be reviewed with the district maintenance engineer or materials engineer during planning and design of pavement preservation and rehabilitation activities to determine if joint sealing or replacement is warranted and if so, what material is recommended (see Section 360.5). Examples of good unsealed joint performance are shown in Figure 360-1.

![Figure 360-1: Unsealed joint performance](image)

There has been considerable national debate and research effort on the issues and cost effectiveness of joint and crack sealing and resealing, including need and timing (seal during initial pavement construction or as ongoing preservation and maintenance); materials, design, and application; and the relative effectiveness of such strategies. As annual automated pavement condition survey (APCS) data continues to be gathered and analyzed, it may be possible to better determine the cost effectiveness and optimal timing joint sealing for concrete pavement service life. Transverse and longitudinal joint condition is recorded for the APCS based on whether the joint is sealed or not sealed and spalled or not spalled. Joint separation is not currently reported for the APCS, but average and maximum crack width data are available in the pavement management system PaveM for individual slab data segments.

Sealing Unsealed Joints and Cracks

Joints should be sealed as pavement ages to extend the service life, typically about 20 years after initial construction but depending on variables including material type, climate, and pavement condition (see
Figure 360-1. Regardless of pavement age, existing joints and cracks should be sealed if joint separation or crack width ≥ 1/4” in the summer or 3/8” in the winter for > 50% length.

Replacing Existing Joint and Crack Seals

Joint and crack seals should be replaced when the existing material exhibits distress, but before the adjacent pavement is severely damaged (see Figure 360-2). Failure to replace seals on a regular basis can increase pavement damage. Joint resealing will typically be needed every 10 to 15 years depending on the material type, climate, and pavement conditions. It is often performed along with other pavement preservation work, including spall repair, individual slab replacement, and grinding.

![Figure 360-2: Maintaining seals](image)

a) Seals not maintained or replaced   b) Well maintained seals

### 360.4 DESIGN

Joint seal dimensions for sealing new and existing joints are shown on Revised Standard Plan (RSP) P20. Appropriate joint sealing design and construction considerations can ensure extended joint seal performance and include:

- Material selection
- Reservoir dimensions
- Joint cleaning
- Material selection
- Seal material installation

#### 360.4.1 Reservoir Dimensions

The joint reservoir width and depth are critical to seal performance. The joint seal reservoir width must be greater than the maximum joint movement that can occur during pavement service life.

To achieve the best seal performance, the dimensions for both liquid joint sealant and preformed compression seals should be designed and constructed according to RSP P20 (see Figure 360-3). The reservoir dimensions were determined using manufacturer recommendations based on typical relationships established between the maximum allowable seal strain and extension at the widest joint opening, considering various reservoir widths and depth-to-width ratios (shape factors).
**360.5 MATERIALS**

Concrete pavement joints can be sealed using liquid sealants or preformed compression joint seal materials. Liquid sealants are either hot-applied asphalt rubber or cold-applied silicone materials used with backer rods. Preformed compression joint seals are elastomeric polychloroprene materials placed with lubricant adhesive.

Joint seal material requirements for liquid sealants and preformed compression joint seals are in Section 41.5.02 of the 2010 Revised Standard Specifications (RSS), summarized below in Table 360-1.

<table>
<thead>
<tr>
<th>Joint Seal Material*</th>
<th>Material Requirements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid sealants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphalt rubber (hot-applied)</td>
<td>ASTM D6690 Type II</td>
<td>Liquid sealant mixture of paving asphalt and min 10% rubber. Use Type 1 backer rods.</td>
</tr>
<tr>
<td>Silicone (cold-applied)</td>
<td>Authorized Material List</td>
<td>Low modulus, 1-part liquid sealant formulation.</td>
</tr>
</tbody>
</table>
| Backer rods          | ASTM D5249 (Type 1 or 3) | • Expanded, closed-cell polyethylene foam  
                        |                                      | • Diameter > 25% of reservoir cut width |
| Preformed compression joint seals | ASTM D2628 | • Polychloroprene elastomeric  
                          |                                      | • 4 cells ≤ ½” wide  
                          |                                      | • 5 or 6 cells > ½” wide |
| Lubricant adhesive   | ASTM D2835 | Polychloroprene based material |

*Other types of joint seal materials are available but are not used by the Department due to various reasons.
360.5.1 Materials Selection

Material selection for joint and crack sealing or resealing requires an understanding of the basic properties and performance characteristics of available materials and relating those properties to the suitability of the seal for various joint types and environmental conditions on the project. Selecting an appropriate seal material for a specific project application is a challenge given all of the variables involved, including the application, performance requirements, anticipated project conditions, and other criteria. When selecting a seal material, consider severe project conditions that will require more durable sealants and more frequent replacement:

- Climate: preformed compression joint seals are recommended in mountain and high desert climate regions. Backer rods required with liquid sealants contribute to premature joint seal failure where chains are used during winter storms.
- Traffic characteristics: higher vehicle and truck volumes

No one material has the perfect properties suitable for all applications: key differences include physical properties, cost, and anticipated service life. The material with the longest service life suitable for the project conditions and intended use should be selected, but joint seals should not last longer than the pavement being sealed. Table 360-2 compares the anticipated service life of materials for joint sealing applications:

<table>
<thead>
<tr>
<th>Joint Seal Material*</th>
<th>Anticipated Service Life** (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid sealants</td>
<td>---</td>
</tr>
<tr>
<td>Asphalt rubber (hot-applied)</td>
<td>5–10</td>
</tr>
<tr>
<td>Silicone (cold-applied)</td>
<td>7–12</td>
</tr>
<tr>
<td>Preformed compression joint seals</td>
<td>10–20</td>
</tr>
</tbody>
</table>

*Liquid sealants can be used for crack sealing applications, but expect reduced service life  
**Modified from ACPA, 2001

Asphalt rubber sealants are initially cheaper than other seal materials but they generally have a shorter service life due to loss of elasticity and plasticity with age. Because of their low initial cost and wide range of applications, asphalt rubber sealants have been widely used in pavement joints.

In locations with temperature extremes and high truck traffic, silicone sealants or preformed compression joint seals may offer better long-term performance.

Tied joints generally move very little and the openings are relatively narrow, so materials used for longitudinal joints may not require as much extensibility as for transverse joints. Also, the same type of longitudinal joint seal material should be used on a project to maintain continuity.

Replacing Existing Joint and Crack Seals

Existing performance may indicate which type of replacement seal material should be used. If the existing joints are in good condition and the widths are consistent, preformed compression joint seals can be used for extended performance life replacements. If the existing joint or crack conditions vary, spall damage should be repaired and asphalt rubber or silicone liquid used to reseal joints and cracks. When considering the appropriate replacement material, consider these performance indicators:

- Missing or extruded seal material
- Adhesion loss: loss of bond with the joint face
• Cohesion loss: sealant tears
• Hardening/loss of flexibility
• Weed growth
• Embedded incompressible materials
• Joint spalling

360.5.2 Material Properties

Joint seal material properties critical to long-term performance include:

• **Durability:** allows the joint seal material to withstand the abrasion and damage of traffic and weather conditions, including temperature extremes, exposure to moisture, temperature and moisture fluctuations, ultraviolet light and ozone.

• **Extensibility/Modulus:** the ability of the seal material to deform without rupturing. It is related to the strain component of elastic modulus. Low modulus (soft, low stress-strain ratio) seals are generally more extensible than higher modulus (stiffer) materials, but they are more vulnerable to intrusion by incompressible materials. Low modulus joint seal materials are desirable for achieving long-term performance in cold climate locations, but may be too soft where traffic is heavy or the climate is hot.

• **Elasticity/Resilience:** measures the amount of recoverable deformation that allows the seal material return to its original size and shape after being stretched or compressed. High values of elasticity and resilience are desirable and typically indicate good resistance to intrusion of incompressible materials. For some thermoplastic sealants, high resilience and resistance to intrusion may limit extensibility, so trade-offs may be necessary to balance the desired joint seal properties.

• **Adhesiveness:** the joint seal material’s ability to adhere to joint faces is essential to liquid sealant performance. The condition and cleanliness of the joint or crack faces are critical to achieving adhesion for a successful application. Adhesiveness for preformed compression seal also depends on the lubricant adhesive.

• **Cohesiveness:** the ability of the seal material to hold together and resist internal rupture or tearing. Cohesive failures are more likely to occur in liquid sealants that have aged or stiffened.

• **Compatibility:** the ability of the seal to be compatible with other materials, such as backer rods, other sealants, and fuel or chemicals from spills.

360.5.3 Liquid Sealants

Section 41-5 of the 2010 Standard Specifications allows asphalt rubber and silicone liquid sealant materials, which are applied in liquid or semi-liquid form. Asphalt rubber is hot-applied and silicone is cold-applied. The sealants assume the shape of the reservoir and depend on long-term adhesion to the joint or crack faces for successful performance. Liquid sealants are usable over a wide range of extension and compression depending on climatic temperatures and material aging characteristics.

**Backer Rod**

Backer rod or joint filler material are needed to ensure long-term liquid sealant performance. Backer rods must be placed before installing liquid joint sealant except for isolation joints, which require joint filler material (see RSP P18). Backer rods are used with liquid sealants to:

• Limit the sealant depth, conserving material and defining the reservoir dimensions
• Facilitate tooling and shaping of the sealant material
• Limit sealant displacement from traffic and fluid pressure

360-6
• Provide a bond breaker, preventing the sealant from bonding to the bottom of the joint.

Section 41-5 of the 2010 Revised Standard Specifications specifies that backer rods:

• Comply with ASTM D5249:
  o Type 1 for asphalt rubber joint sealant
  o Type 1 or Type 3 for silicone joint sealant
• Be expanded, closed-cell polyethylene foam
• Have a diameter > 25% of the saw cut reservoir width
• Be installed on a dry surface when the ambient air temperature is above 40°F and the dew point.

Backer rods must be a flexible, non-absorptive material that is compatible with the liquid sealant material to be installed. It should compress within itself so sealant is not forced out as the joint closes, and it should recover as the joint opens. Care must be taken to use the correct backer rod diameter and installation depth so that the backer rod is compressed approximately 50%. Typically, the backer rod diameter should be about 25% larger than the joint width (see RSP P20 and Figure 360-3).

Asphalt Rubber

Asphalt rubber sealants are hot-applied liquid sealants that should be placed when the pavement surface temperature is at least 50°F. Section 41-5 of the 2010 RSS specifies that asphalt rubber sealant must:

• Consist of paving asphalt mixed with not less than 10% ground rubber by weight. Ground rubber is vulcanized or a combination of vulcanized and devulcanized materials passing a no. 8 sieve.
• Comply with ASTM D6690 for Type II.
• Be capable of melting at a temperature below 400 °F and applied to joints.

Asphalt rubber sealant should be uniformly installed by filling the joint reservoir from the bottom up without overfilling and by pulling the nozzle toward the installer to avoid trapping any air bubbles. RSP P20 shows the surface of the sealant should be recessed from 1/4” to 3/8” below the finished pavement surface to allow room for expansion during hot weather and avoid contact with traffic tires.

Properly installed asphalt rubber sealants are typically expected to have service life of 5 years, but field evaluations indicate they may achieve longer service life depending on climatic conditions and traffic loading.

Silicone

Silicone sealants are cold-applied liquid sealants. The Standard Specifications require the silicone joint sealant used be on the Authorized Material List, available on the METS internet site: http://www.dot.ca.gov/hq/esc/approved_products_list/pdf/silicone_joint_sealant.pdf.

Silicone sealants should be installed in the same manner as hot-applied asphalt rubber sealants, from the bottom to the top of the joint and pulling the nozzle toward the installer. Minimum placement depth is ¼” (see required dimensions on RSP P20). Properly installed silicone sealants are typically expected to have a service life of 7 to 12 years, but field evaluations indicate they may perform beyond 10 years depending on climatic conditions and traffic loading.

When installing both silicone and asphalt rubber sealants on a pavement section, the special provisions should specify silicone be installed first to reduce the potential for contamination of the transverse joint during the longitudinal joint sealing operations. The recommended practice is to install cold-applied sealants first, regardless of the joint orientation.
360.5.4  **Preformed Compression Joint Seals**

Preformed compression joint seals are comprised of compartmentalized cross-sectional cells extruded from elastomeric polychloroprene compounds. They consist of 4 to 6-cell configurations that exert lateral pressure against the joint faces and provide long-term compression recovery for successful sealing (see Figure 360-4).

To ensure effective sealing, sufficient contact pressure must be maintained at the joint face. The seal must always be in compression, which requires resistance to compression set. When joints expand, the seal should recover its original size and shape. Preformed compression joint seals perform well over a compression range of 20 to 50%.

![Installation](image)

**Figure 360–4: Preformed compression joint seals**

Preformed compression joint seals are effective over a wide range of temperatures in almost all applications. Seals may be used individually as shown in RSP P20, or as components for modular systems. The expected service life of preformed compression joint seals is approximately 10 to 20 years, but performance > 15 years may be achieved depending on the seals resistance to compression set, climatic conditions, and traffic loading. Failure is typically due to compression set or loss of elasticity so the seal no longer pushes against the joint faces. Compression > 50% may cause compression set if the cells stick together.

### 360.6 SPECIAL CONSIDERATIONS

#### 360.6.1  **Preformed Compression Seal Applications**

Preformed compression seals can be used to seal both longitudinal and transverse joints for both new and replacement seals. When used to seal both longitudinal and transverse joints at the same location, the longitudinal seals must be installed before transverse seals. Longitudinal seals must be continuous, except splicing is allowed at intersections with transverse seals. Likewise, transverse seals must be continuous for the entire width of concrete pavement except splices are allowed for widening and staged construction. The longitudinal seal must relax enough to properly install the transverse seal, or be trimmed to form a tight seal between the joints.

Splicing of compression seals should be avoided whenever feasible, as this can create discontinuities. When splicing is authorized, it must comply with the manufacturer's instructions.
360.6.2 Replacing Joint Seals

- **Project Timing**: The optimum time of the year to replace joint seals is in the spring or the fall, when installation temperatures are moderate and cracks are likely to be near the middle of their expected range for expansion and contraction. This reduces the potential for the seal material to be extended or compressed too much when temperatures increase or decrease after installation.

- **Isolation Joints**: When replacing isolation joints, the seal material above the preformed expansion joint filler is removed. The filler should be left in place and tape placed as a bond breaker to separate the new seal from any existing sealant that may have been absorbed by the filler.

- **Contraction Joints Near Isolation Joints**: Contraction joints located within 100’ of existing isolation joints present some special issues. When the expansion joint closes, it allows neighboring contraction joints to open wider than similar joints located farther away. These wider contraction joints may require more extensible sealant, and it may be necessary to use wider backer rods or wider preformed compression joint seals to ensure adequate sealing.

- **Existing Lane/Shoulder Joints**: Up to 80% of surface water that enters the pavement structure infiltrates through the lane/shoulder joint, so proper sealing is critical to long-term pavement performance. When both the traffic lane and the shoulder are concrete, the joint between them is a typical longitudinal joint so sealing presents no special issues.

Joints between concrete pavement lanes and AC shoulders can present major sealant performance problems. The differences between concrete and AC thermal and structural properties tend to cause differential vertical movement, which may manifest as settlement or shoulder heaving. Vertical movement may be larger than horizontal movement. Reservoir widths should be \( \geq 1” \), and the depth should be equal to the width. Asphalt rubber and specially formulated silicone sealants are highly extensible liquid sealants that can adhere well to both concrete and AC for this application. Cracks and other defects on the flexible shoulder should be repaired before placing sealant. Refer to [Caltrans Maintenance Manual Section B.09](#) for additional information.

360.6.3 Crack Sealing or Resealing

Concrete pavement crack sealing or resealing requires an nSSP. The process follows the same basic steps as joint sealing: refacing, removal of old sealant, cleaning, backer rod installation, and sealant installation. The first step is to reface the crack to the desired width. However, the orientation of most cracks in concrete pavements makes it difficult to create a uniform sealant reservoir directly along the crack. Small diameter, diamond-bladed saws can be used to form reservoirs. The cutting blades for these saws are typically about 7 to 8 inches in diameter and ¼- to ½-inch wide. The width of the saw cut usually yields an appropriate shape factor for the expected crack movement. Smaller blade diameters and some lightweight two- or three-wheel unit designs allow crack saws to pivot and follow irregular crack profiles. Although the saws are not generally as maneuverable as routers, they reduce potential for spalling the crack faces.

After the reservoir is created, the crack faces should be cleaned by sandblasting, as with joints. Then the crack is blown with compressed air and the backer rod (if specified) and liquid sealant material are installed. Use of epoxy or glue in working cracks is not generally recommended, as it often contributes to subsequent adjacent cracking.

After installation, the sealant should be visually inspected to assure there are no gaps or obvious defects. Adhesion to the joint faces can be spot-checked with a simple knife test.
360.6.4 Seal Performance

The longevity of any joint seal is a function of:

- Joint design (location, material selection, reservoir dimensions, and spacing)
- Seal material properties and performance characteristics
- Construction quality (joint preparation, cleaning, and material installation)
- Climatic and traffic conditions

Joint or crack sealing and resealing are labor intensive operations, so contractor workmanship during construction is as critical to successful performance as selecting the correct material for the application. Quality control requirements are specified in Section 41-5 of the 2010 Revised Standard Specifications. The location and design of the joint itself may also cause seal problems. For instance, the shape of the joint reservoir and the type and amount of movement occurring at the joint will affect seal behavior.

Joint Seal Failures

Typical joint seal failures can be avoided with good construction practices:

- Sawing or forming the joint to the uniform dimensions required by RSP P20 at locations shown on the project plans.
- Aligning the joint with any connecting joints to avoid blockage to free movement.
- Correctly positioning and anchoring or supporting dowels.
- Removing any temporary material or filler used to form the sealant reservoir by raking out or cutting to the specified depth.
- Keeping curing compound from contaminating joint faces and reapply displaced compound

Effective removal of the existing seal material and backer rods and re-facing the joint reservoir provides clean surfaces for bonding. The contractor can select any of the following removal methods but cannot damage the joint reservoir:

- Sawing with diamond blades combines existing seal removal and joint re-facing into a single operation. Sawing is effective for removing older, hardened liquid sealants.
- Using rectangular joint plows.
- Cutting and removing the sealant using a knife blade.

Traffic should not be allowed over the newly sealed joints until liquid joint sealant is set, tack free, and firm enough to avoid tracking of the sealant or embedment of roadway debris in the sealant. This usually takes about 30 minutes to 1 hour after sealant placement depending on in-place curing conditions. Curing time for silicone sealants is usually about 1 hour but the manufacturer’s instructions may provide additional information regarding opening to traffic.

360.7 Plans, Specifications, and Estimating

360.7.1 Plans

The location of new and replacement concrete pavement joint seals should be listed in the roadway quantities shown on the project plans. For new concrete pavement, isolation joint seals should also be listed separately in the quantities where required by RSP P18.

Except for isolation joints, joint seal design details are shown in RSP P20. The joint seal dimensions in the revised standard plan are based on the joint width being sealed and the type of joint seal material indicated by the bid item and the quantity estimate. According RSP P15 (JPCP) and RSP P16 (CRCP), new contraction joints should be sawcut to 1/8” widths, so the minimum reservoir width is 1/4”. For
replacing joint seals at existing concrete pavement joints, the widths will vary by location. Sealing longitudinal construction joints is no longer recommended in most climates due to constructability issues.

Isolation joints are constructed to ½" widths with no backer rod as shown on RSP P18. The joint filler material is placed during concrete pavement construction and is not included in the sealing work or pay items.

360.7.2 Specifications
Joint and crack sealing or resealing specifications are provided in Section 41-5 of the 2010 Revised Standard Specifications (RSS). Additional or special requirements may be included in the project special provisions, such as specifying all cracks and joints must be sealed prior to winterization. Nonstandard special provisions (nSSPs), such as for crack sealing, require approval of the HQ Division of Maintenance Pavement Program. For more information or to submit an approval request, contact the Office of Concrete Pavement at nSSP Submittals@DOT.

360.7.3 Estimating
Joint and crack sealing or resealing are measured in linear feet along the joints or cracks to be sealed, paid at the contract unit price, including full compensation for all aspects of sealing materials, labor, tools, equipment and incidentals required to complete the work. The pay items for Section 41-5 of the 2010 RSS are shown in Table 360-3 for new joint seals or replacing existing joint seals.

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>414200</td>
<td>Joint Seal (Asphalt Rubber)</td>
<td>LF</td>
<td>For sealing new pavement joints. Item includes reservoir cutting and cleaning; furnishing and installing the backer rod (if shown) and seal material. Initial sawcut included with concrete pavement item.</td>
</tr>
<tr>
<td>414201</td>
<td>Joint Seal (Silicone)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414202</td>
<td>Joint Seal (Preformed Compression)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414220</td>
<td>Replace Joint Seal (Asphalt Rubber)</td>
<td>LF</td>
<td>Includes removing existing sealant and backer rod; joint re-facing; cleaning the reservoir; furnishing and installing the backer rod (for liquid sealants) and seal material</td>
</tr>
<tr>
<td>414221</td>
<td>Replace Joint Seal (Silicone)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414222</td>
<td>Replace Joint Seal (Preformed Compression, 7/16&quot; to 13/16&quot;)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414223</td>
<td>Replace Joint Seal (Preformed Compression, 1&quot; to 1-¼&quot;)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414224</td>
<td>Replace Joint Seal (Preformed Compression, 1-5/8&quot; to 2&quot;)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414240</td>
<td>Isolation Joint Seal (Asphalt Rubber)</td>
<td>LF</td>
<td>Includes reservoir cutting and cleaning; furnishing and installing the seal material. Joint filler material included with concrete pavement item.</td>
</tr>
<tr>
<td>414241</td>
<td>Isolation Joint Seal (Silicone)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414242</td>
<td>Isolation Joint Seal (Preformed Compression)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>Nonstandard*</td>
<td>Seal Cracks</td>
<td>LF</td>
<td>Requires use of an nSSP and nonstandard pay item. Contact the HQ Division of Maintenance Pavement Program</td>
</tr>
</tbody>
</table>

Initial costs can be estimated using historical contract cost data for all contracted bid items and other information available on the Division of Design cost estimating website at http://www.dot.ca.gov/hq/oppd/costest/costest.htm. Current standard bid items are based on the application and type of joint seal material, but unit cost data may be limited. Previous item codes are listed in Table 360-3.
360-4. If historical cost data for a material is limited or not reasonable for the project conditions, adjust the unit cost estimate for differences in available data.

### Table 360-4: Previous Joint Seal Bid Items

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>413117</td>
<td>Seal Concrete Pavement Joint (Silicone)</td>
<td>LF</td>
<td>Previously, sealing new joints was included in the concrete pavement item</td>
</tr>
<tr>
<td>413118</td>
<td>Seal Pavement Joint (Asphalt Rubber)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414119</td>
<td>Replace Concrete Pavement Joint (Silicone)</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>414120</td>
<td>Replace Concrete Pavement Joint (Asphalt Rubber)</td>
<td>LF</td>
<td></td>
</tr>
</tbody>
</table>

When including work for spall repair at damaged joints, a cost estimate for replacing the entire seal along the joint repair is also required. Replacing joint seals will reduce future spalls by preventing intrusion of incompressible materials and surface water. Both longitudinal and transverse repair joints must be resealed using asphalt rubber, silicone, or preformed compression seal material. Use the bid item for the appropriate seal material for the project location and application. On projects bid prior to 2014, the joint seal replacement cost may have been included in the spall repair bid item or paid separately but limited to damage along the spall repair area.

**REFERENCES**

2. ACI Committee 504, *Guide to Sealing Joints in Concrete Structures*, American Concrete Institute, ACI 504R-90, 1997.
3. ACPA, 1993, *Joint and Crack Sealing and Repair for Concrete Pavements*, American Concrete
13. PCC Center, Concrete Paving Workforce Reference No. 3 - Concrete Pavement Joint Sawing, Cleaning and Sealing, Iowa State University, November 2004.

