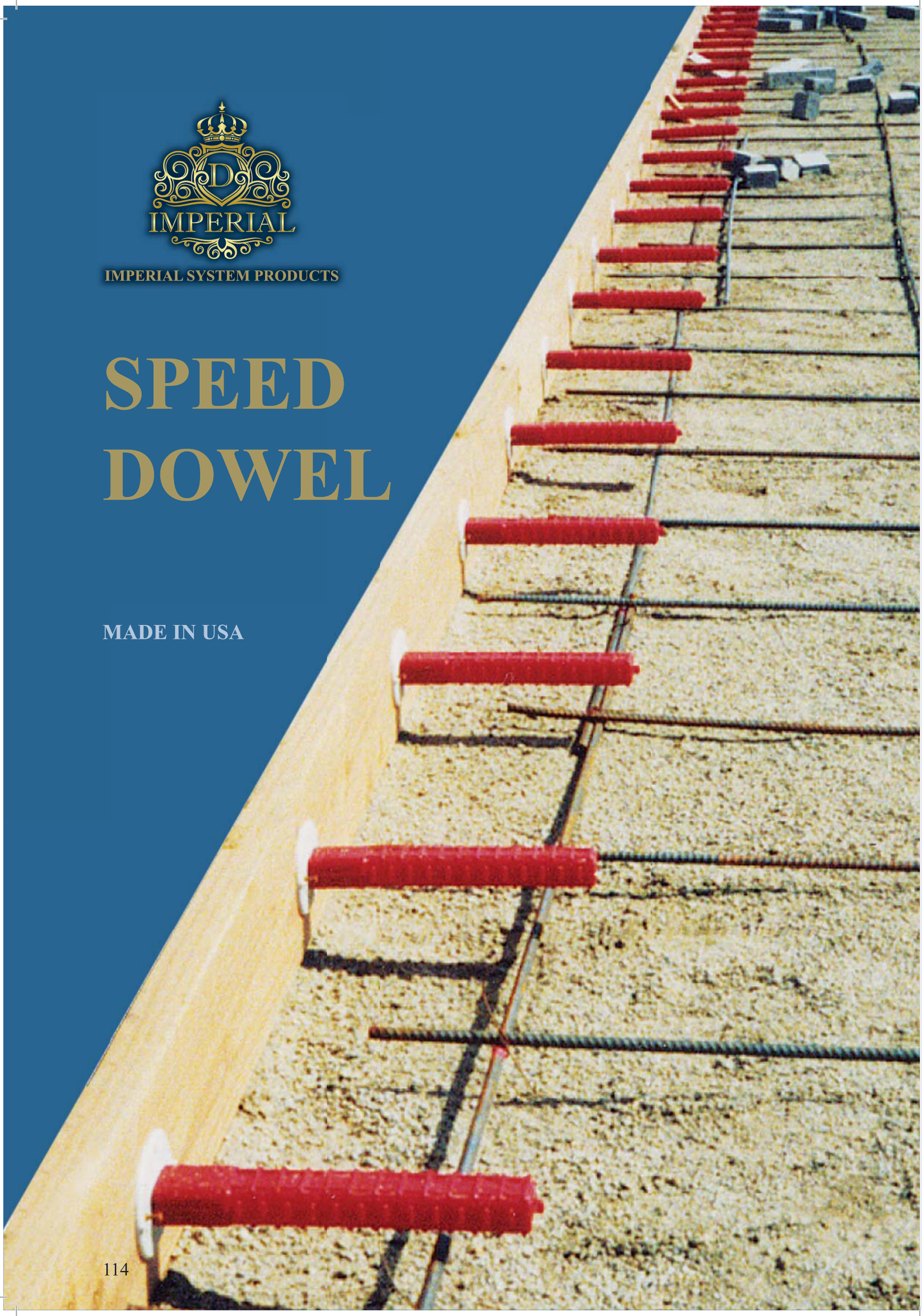
IMPERIAL

IMPERIAL SYSTEM PRODUCTS

SPEED DOWEL

MADE IN USA



SPEED DOWEL

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Speed Dowel is the pioneering slip dowel installation system that ensures proper dowel alignment for positive load transfer in slab-on-ground concrete joints.

Speed Dowel has revolutionized how the concrete industry designs and constructs joints for superior performance, while slashing the time and cost required for conventional slip dowel installations. Field-tested for over 20 years,

Speed Dowel® is the choice for round dowel installations, such as:

- Warehouse / Distribution Centers
- Big Box Stores
- Manufacturing Facilities
- Commercial / Industrial Complexes
- Entertainment Centers
- Recreational Complexes
- Parking Facilities
- Airport Runways
- Airport Parking Aprons

Dowel Bar Sleeves are used to reduce the frictional resistance present when using dowel rods to connect two or more concrete slabs.

Speed Dowel provides a practical dowel alignment method for transferring loads across, and managing stresses within, concrete slab-on-ground joints, while facilitating the following recommendations of the American Concrete Institute

A: LOAD TRANSFER

"In areas subjected to wheeled traffic, heavy loads, or both, joints with load transfer devices are recommended. When positive load transfer is required, provisions should be made along the bulkhead to ensure proper alignment of the load-transfer device during construction and finishing operations." ACI 360R-10 6.1.2

B: DOWEL BARS TO BE SMOOTH

"For dowels to be effective, they should be smooth, aligned, and supported so they will remain parallel in both the horizontal and the vertical planes during the placing and finishing operation. All dowels should be sawn and not sheared. Properly aligned, smooth dowels allow the joint to open as concrete shrinks." ACI 302.1R-04 3.2.7

C: DOWEL BARS MUST BE WELL ALIGNED

"Dowels across pavement joints can provide load transfer while permitting the joints to move. When dowels are used, their correct alignment and lubrication is essential for proper joint function." ACI 330R-08 3.8.2

D: DOWEL BARS MUST NOT BE BONDED ON ONE SIDE

"The dowels should be centered on the joint. To permit horizontal movement, the dowels must not bond to the concrete on at least one side of the joint." ACI 224.3R095 (Reapproved 2008) 5.2.4.3

TIME SAVING SPEED INSTALLATION OF DOWEL SLEEVES

THREE EASY STEPS

1 Attach by screwing Speed Dowel to Form and tap sleeve onto base
2 Place first concrete pour
3 Strip formwork and insert ungreased dowel bar into embedded dowel sleeve.

AVOID TRADITIONAL METHODS

1. Drill dowel holes in lumber (edge form)
2. Insert dowel into edge form
3. Grease half of the dowel
4. Make first concrete placement
5. Hand align every dowel
6. Rotate dowel to loosen bond
7. Remove dowel Strip edge form
8. Reinsert dowel into oversized cavity
9. Realign dowels as needed

LOSS OF GUAGED WATER IN FRESH CONCRETE THROUGH EVAPORATION AND DRAIN OFF INTO THE SOIL OR GROUND

On grade concrete aprons or slabs are casted in designed panels by engineering consultants to prevent the formation of cracks because of the differential shrinkage of newly poured concrete during the curing process and the dissipation of water

The loss of the limited gauged water used in designs mixes will not only cause cracks during the curing process but it will undoubtedly reduce or lower the compressive and tensile strength of the finished member

Water losses from the wet concrete matrix occurs through evaporation from above the slab and drain off or loss to the ground or soil.

Whilst the prevention of water loss is usually through the conventional use of water wetting and the use of curing compounds on to the curing substrate to prevent evaporation from occurring.

However, little or no consideration is accorded to the loss of water to the soil or ground.

Most specifications are sufficiently lacks which allows builder to interpret and use whatever they deem fit for such deemed trivial preparation of the subbase prior to concreting.

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Most professional consultants realize that a concrete slab or apron is not only a heavily used platform but one which have to last a hundred years.

Builders on the other hand have little regard for well written specifications to follow and execute as they please to save a few cents.

Utilizing the correct PE films is an all-important aspect in the preservation of quality in concrete strength finishes.

No films manufactured with recycled polymers must be used no matter its thickness. Recycled polymers are not GREEN polymers and will break down in a couple of months and they will not support the proper functioning of an under the slab membrane or Damp proofing membrane for the next hundred years.

Malaysia is the largest collector of used plastic from the world after China. Any film that is produced is either manufactured from raw recycled PE polymers or mixed blended PE polymers. These products are cheap but should never be used under concrete slabs.

SPECIFICATIONS

All under the slab or Damp proofing membranes will conform to the below mentioned established American Standard and testing requirement

COUNTRY OF ORIGIN:	UNITED STATES OF AMERICA
PRODUCT:	RAVEN VAPORBLOCK 15
CLASSIFICATION:	ASTM E 1745 11
THICKNESS :	381 MICRONS
PERM RATING:	0.01PERMS
TEST REQUIRMENT:	BY THIRD PARTY TEST ACCREDATED TESTING LABORATORIES IN GERMANY OR THE USA

SLEEVE DESCRIPTION	ROUND DOWEL SIZE	SLEEVE LENGTH	CORRESPONDING BASE
PSD09/#4TX	15.875 mm Smooth or #4 Rebar X 457.2 mm	228.6 mm	PSD/#4BX
PSD12/#4TX	15.875 mm Smooth or #4 Rebar X 609.6 mm	304.8 mm	
PSD09/#5TX	19.05 mm Smooth or #5 Rebar X 457.2 mm	228.6 mm	PSD/#5BX
PSD12/#5TX	19.05 mm Smooth or #5 Rebar X 609.6 mm	304.8 mm	
PSD09/#6TX	22.225 mm Smooth or #6 Rebar X 457.2 mm	228.6 mm	PSD/#6BX
PSD12/#6TX	22.225 mm Smooth or #6 Rebar X 609.6 mm	304.8 mm	
PSD09/#7TX	25.4 mm Smooth or #7 Rebar X 457.2 mm	228.6 mm	PSD/#7BX
PSD12/#7TX	25.4 mm Smooth or #7 Rebar X 609.6 mm	304.8 mm	
PSD09/#9TX	31.5 mm Smooth or #9 Rebar X 457.2 mm	228.6 mm	PSD/#9BX
PSD12/#9TX	31.5 mm Smooth or #9 Rebar X 609.6 mm	304.8 mm	
PSDEPX09/#9TX*	31.5 mm Smooth or #9 Rebar X 457.2 mm	228.6 mm	PSDEPX/#9BX
PSDEPX12/#9TX*	31.5 mm Smooth or #9 Rebar X 609.6 mm	304.8 mm	
PSD10/#11TX	37.5 mm Smooth or #11 Rebar X 508 mm	228.6 mm	PSD/#11BX

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PHYSICAL PROPERTIES, CHARACTERISTICS, & SPECIFICATIONS

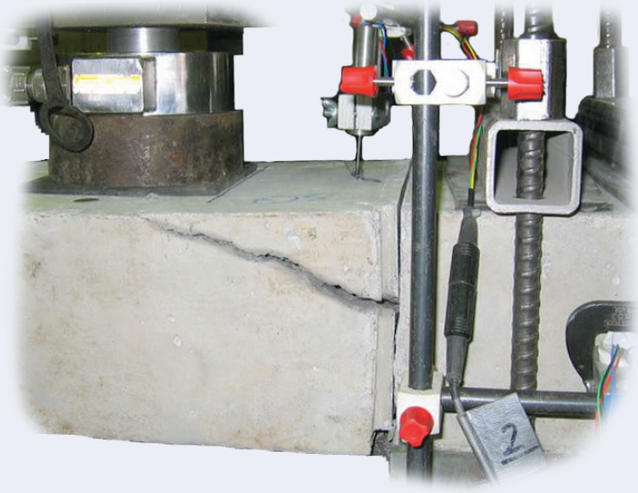
Suggested Proprietary Short Form Guide Specification Section 03252

Provide Speed Dowel® System to accept

___ diameter x ___long slip dowels (fill in appropriate slip dowel dimensions)

Material Composition	100% polypropylene
Compressibility ASTM D695	5500-8000 psi
Thickness (Nominal) **Speed Dowel Sleeve** **Speed Load Sleeve†**	 0.125” 0.075”
Density	0.88-0.92 g/cc
Fatigue Resistance	Excellent
Impact/Stiffness Balance	Excellent

TESTING & RESEARCH



Typical “pop-out” failure of tested dowel system.

Technical Engineering Department has dedicated countless laboratory hours and research funds to investigate load transfer systems. Independent tests were conducted to provide an unbiased evaluation of the current doweling methods available, including round, flat plate, square, and tapered plate. The test procedure utilized a modified version of the AASHTO T253 test for load transfer devices and was designed to determine the following:

- Total joint deflection under load
- Bearing stresses imparted to the concrete at the joint face
- Failure mode of each doweling system

CONCLUSIONS

- Tests of ALL DOWEL SYSTEMS resulted in a tensile “pop-out” failure of the concrete.
- All dowel types provided deflections well less than the typically accepted value of 0.010” when loaded to 1500 lb per dowel (typical load for 10 000 lb axle load on a 6” slab with dowel spacing at 24” on center). Deflections greater than 0.010” can lead to joint failure due to impacts from wheeled traffic. MINIMIZING DEFLECTIONS is key to insuring the durability of the joint.
- Dowels with rectangular cross sections and larger widths are effective in reducing bearing stresses on concrete.

  Adding sleeves to dowels of all types also reduces the bearing stress on the surrounding concrete. Speed Plate® provides the lowest stress on the surrounding concrete of all Dowel Systems. Bearing stress alone, however, does not predict ultimate dowel loads. All dowel systems tested failed at a wide range of bearing stress but at similar applied loads.
- Flat plates, or square dowels with sleeves that allow movement in the direction of the joint, are effective in eliminating lateral restraint between concrete sections. The Speed Plate® sleeve incorporates an integral, custom insert that provides lateral movement capability between concrete sections.
- It is critical to use internal vibration to consolidate the concrete around ALL plate dowel systems.

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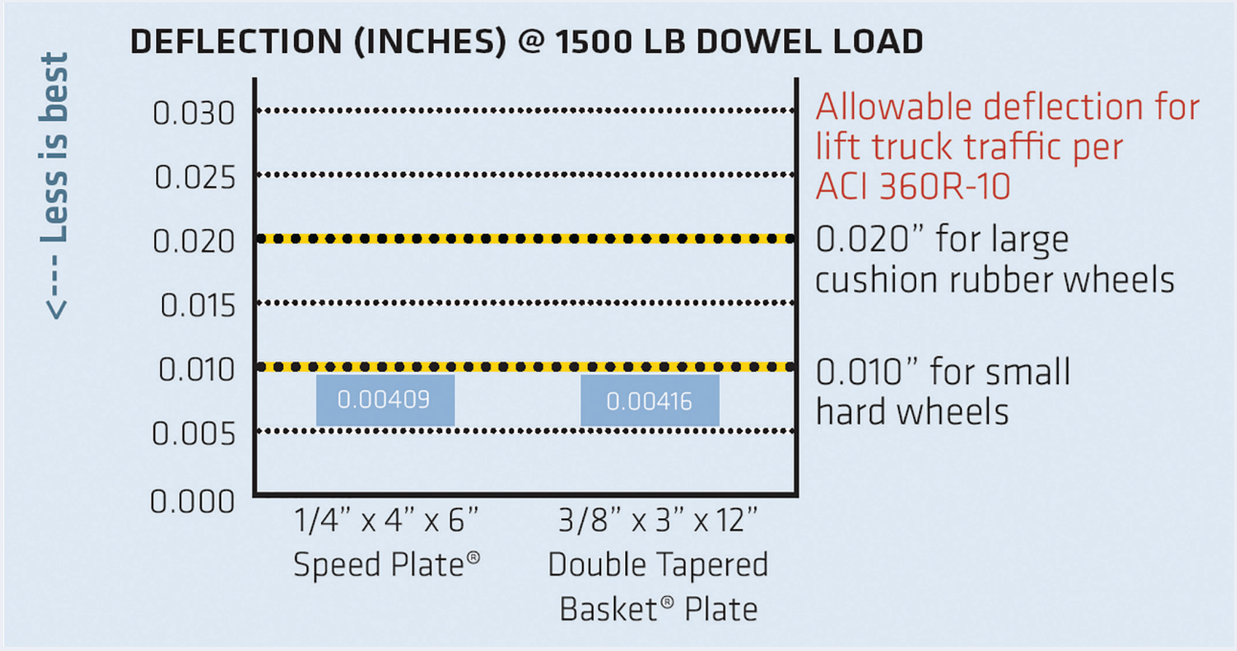

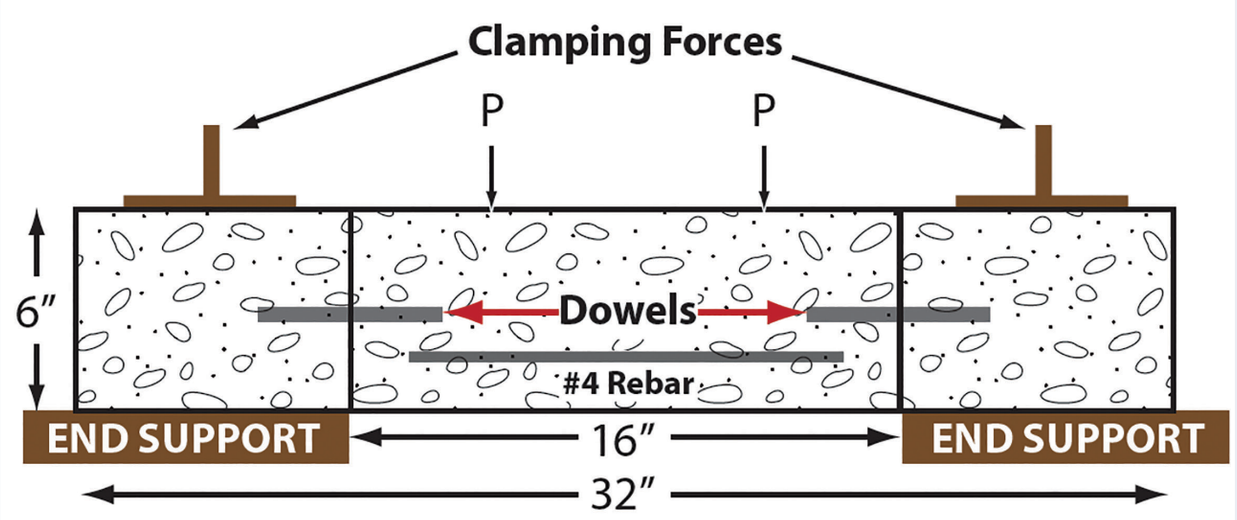

Modified AASHTO T253 Test Diagram

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Dowel bars are commonly used in jointed plain concrete pavements (JPCP) as a load transfer device across joints for concrete slabs in:

a. warehousing facilities
b. pavements
c. aircraft runways
d. aircraft parking aprons

which are designed to carry heavy dead loads and heavy wheel loads from vehicle traffic.

The principal advantage of dowel bars is to transfer load without restricting horizontal joint movements due to temperature and moisture expansion and contraction in the concrete slabs.

Dowel bars play a role in maintaining the vertical and the horizontal alignment of slabs.

The load transfer efficiency depends on a number of dowel-joint parameters, including modulus of dowel support, dowel bar diameter, dowel length, dowel bar spacing, dowel looseness, joint opening width, and subgrade strength.

OVERVIEW OF DOWEL BAR APPLICATION

The primary load transfer mechanism of a dowel bar is through transferring shear stress, especially for joint openings less than 6.4 mm (0.25 in), and bending moment transfer is considered as negligible.

In general, the total shear load transferred by dowel bars is less than 50% of the applied wheel load.

The magnitude of transferred shear load is a function of the dowel bar diameter, dowel bar length, dowel bar spacing, stiffness of the base layer, and slab dimension including thickness, length, and width.

Dowel diameter and cross-section area are critical factors that affect the behavior and performance of the dowel-pavement system.

The peak bearing stresses and deflections at a joint can be reduced by increasing the dowel stiffness.

Dowel diameter may be either increased or decreased depending upon the dowel spacing, dowel bar properties including modulus of material elasticity and dowel bar shapes (e.g., round or non-round dowel).

Load test to determine the requirement of the length of dowel embedment for maximizing the load transfer efficiency.

The results indicated that dowels could be embedded about 8 times of the dowel diameter for 19 mm (0.75 in) diameter dowels, while 25 mm (1 in) and 32 mm (1.25 in) dowels require only 6 times of the diameter (i.e., 152 mm (6 in) and 191 mm (7.5 in), respectively.

It is recommended that the total length of dowel is 457 mm (18 in) to achieve good pavement joint performance.

WHAT ARE DOWEL BARS?

Dowel bars are short steel bars that are installed in concrete slabs to provide a mechanical connection that doesn't restrict horizontal joint movement. They are designed to reduce joint deflection and stress in the approach and leave slab by increasing load transfer efficiency. Typically, dowel bars are used in concrete pavements.

DOWEL BAR PLACEMENT

Dowel bars are placed at the traverse and longitudinal joints of concrete aprons or pavement and must always be parallel to the centerline. Half of the bar is inserted into preformed well defined regulated channels formed with Speed Dowel Sleeves before having the second half embedded in concrete during the second pour of concrete for the adjacent slab. Dowel bars are usually inserted at mid-slab depth.

DOWEL BARS AND TIE BARS

On the face of it, dowel bars and tie bars can appear very similar but they play different roles in concrete reinforcement. They both significantly improve performance of pavement joints and reduce life cycle cost.

Tie bars, however, are deformed rebar's that are designed to hold faces of rigid slabs in contact to maintain aggregate interlock. Significantly, tie bars are not used as load transferring devices.

Dowel bars are placed across traverse joints, whereas tie bars are installed across longitudinal joints. Dowel bars transfer load from one slab to another and tie bars prevent lanes from separation and differential deflection. Dowel bars are commonly round, smooth, epoxy-coated steel bars and tie bars are deformed epoxy-coated steel. Dowel bars reduce joint faults and corner cracking and tie bars reduce traverse cracking.

DOWEL BAR CONCRETE ACCESSORIES

SPEED DOWEL BAR SLEEVES is specifically designed for use with dowel bars.

SPEED DOWEL BAR SLEEVES is easily installed on formwork to prevent concrete bonding to one side of the dowel bars and is equipped with an expansion joint void to allow the expansion or extension of bars to take place.