

SAND-JACKING

A BRIEF EXPLANATION OF THE POSSIBLE MECHANICS ASSOCIATED WITH ITS OCCURANCE AND THE ATTENTION TO DETAIL NECESSARY TO PREVENT IT.

INTRODUCTION.

Sand-jacking is a term associated with the phenomenon of segmental paving distorting and losing bond for no apparent reason.

Its occurrence is rarely seen and is usually attributed to the untimely occurrence and combination of several mechanical, natural, and man made influences on the segmental paving in question.

On occasions, it will manifest itself in such a way that it would appear that the only logical explanation for its occurrence is that the paving units themselves have “grown”, thus causing the visible distortion to the laying bond.

LIKELY ELEMENTS THAT CONTRIBUTE TO THE CAUSE OF SAND-JACKING.

The likely causes of sand-jacking may be attributed to the combination of the following:

1. Paving laid in part or wholly with zero joint gaps.
2. Paving laid on hard compacted sand bed.
3. Wind-blown sands continuously blowing over the paving.
4. Insufficient edge-restraints are in place.
5. No maintenance of paving joint sand after installation.
6. Moisture changes in jointing and bedding sands.
7. Extreme changes in ambient temperatures.

POSSIBLE SEQUENCE OF EVENTS LEADING TO THE OCCURRENCE OF SAND-JACKING.

Although it is difficult to ascertain the exact cause, or the sequence of events that lead to this phenomenon occurring, the following explanation is offered for consideration:

1. The sand bedding course is partially compacted and not loosely screeded as specified.
2. Pavers are laid tightly with zero gap or joint.
3. Laid pavers are placed hard against each other, and have not been gently “dropped” into position.
4. As the bedding sand is not in an uncompacted state or loose and, as the pavers have not been gently dropped into position, initial “registration” of the pavers into the bedding sand creating the nominal joint spacing, has not been able to occur.
5. Edge-restraints have been formed, but are not sufficient to restrain the stresses that are due to build up from linear expansion of the paving units as a result of varying extremes in ambient temperature with the pavers laid with zero joint gaps.
6. Jointing sand is applied but as there are few or zero gaps between pavers, few joints are able to be filled with vital jointing sand.

At this time the pavement, whilst open to traffic and ‘complete’, is in fact in a vulnerable position as a result of incorrect installation as detailed above.

With the onset of extreme changes in ambient temperature the following mechanisms will set up the process of sand-jacking.

7. Increases in daytime ambient temperature will cause the concrete paving units to expand.
8. This linear expansion will be transferred from one paving unit to the next, and as there are few or zero joints filled with sand, this expansion will not be absorbed within the pavement.
9. The linear expansion will cause the paving units in the pavement to move as stress builds up as daytime temperatures increase.
Edge spalling of units and damage to edge restraints will now occur.
10. As night time approaches, temperatures decrease and the pavement cools down, each paving unit contracts accordingly.
11. This contraction of individual paving units results in the formation of gaps between the units, which at this time are now empty and are void of any jointing sand.
12. As night time temperatures decrease, and on-site wind changes occur, surrounding natural or construction sands are blown dry, and blown onto the newly paved area.
13. This dry wind-blown sand is blown onto and over the paving, finding its way onto the newly formed gaps between the individual paving units that have cooled down and contracted.
14. This sand is deposited into joints, and as night temperatures decrease, and humidity increases the sand in the joints becomes damp and moist.
15. The following day, temperatures again increase, the concrete pavers expand, and as they expand, they now begin to push against the moist compacted sand that now partially fills the joint.
16. Again, the paving builds up stresses as a result of linear expansion caused by temperature increases, and naturally expands in the direction of least resistance - that being in the direction of the weakest points, that is, previously damaged edge restraints and movement of the paving occurs.
17. The wind-blown sand in the partially filled joints now dries as the day time temperatures continue to rise.
18. As ambient temperatures drop as the day draws to an end, the paving units contract, allowing the dry, wind-blown sand that has been compressed tightly during the expansion process, to collapse into the void caused by the individual paving unit contracting.
19. As night approaches, the cycle repeats itself, with the night air blowing further dry sand into the now partially filled joints, in the dislodged section of pavement.
20. The next morning the process continues, with ambient temperatures rising, causing linear expansion within each paving unit to again occur.
21. Again, this expansion of the pavement follows the line of least resistance, with the pavement "jacking" itself off of these partially filled sand joints. Again movement of the paving occurs.
22. Now, the area of pavement affected by this process exhibits a visible loss of bond, and open "wide" gaps between paving units that exceed the nominated allowable joint space will exist, albeit, still only partially filled with sand.

The process of 'sand-jacking' has now begun, and will usually continue until the joints are totally filled with wind-blown sand and debris.

Only at this time will the process cease, as the mechanism of dry compacted jointing sand rushing into the space left by the linear contraction of the units cannot continue because the joint is now full.

HOW TO AVOID SAND-JACKING.

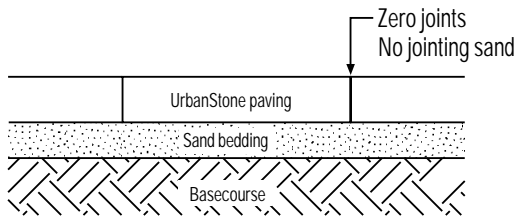
In simple terms, sand-jacking can be avoided by following good design and laying techniques, and by utilising quality materials in the pavement construction that comply with the materials and laying specification (see section on Design Considerations and Guide for Installation & Laying of UrbanStone Segmental Paving Units).

In addition, a qualified professional should be consulted to advise on and, if necessary, design adequate edge restraints and expansion joints if required.

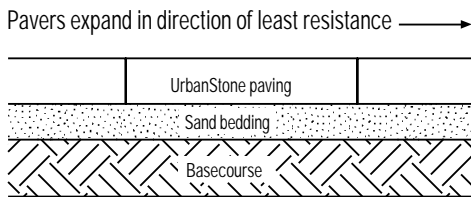
It must be noted that each site or project must be viewed on its own merits, and the above explanation in no way replaces the experience that can be obtained by engaging the services of a professional consultant.

A DIAGRAMMATIC REPRESENTATION OF THE SAND-JACKING PROCESS

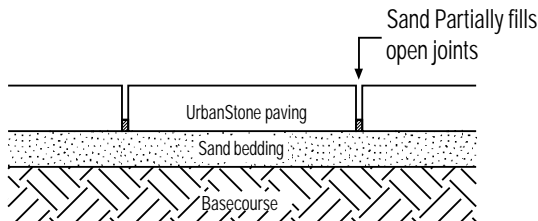
TO BE READ IN CONJUNCTION WITH 'SAND JACKING - A BRIEF EXPLANATION OF THE POSSIBLE MECHANICS ASSOCIATED WITH ITS OCCURENCE AND THE ATTENTION TO DETAIL NECESSARY TO PREVENT IT'.



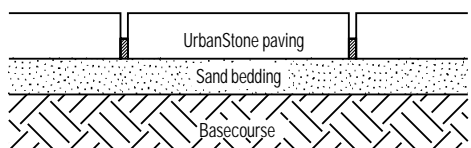
1. Tight laying



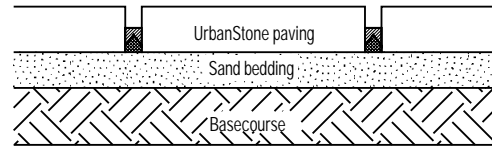
2. Day - Ambient temperature increases
- pavers expand in direction of least resistance



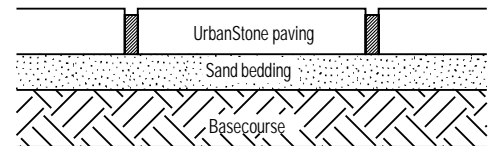
3. Night - Ambient temperatures fall
- pavers contract
- wind blows sand to partially fill open joints
- Early morning dew assists in compacting sand in joints



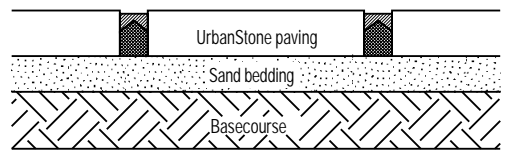
4. Day - Ambient temperatures increase
- pavers expand 'pushing off' damp compacted sand in partially filled joint
- joint gap widens
- day temps dry out jointing sand



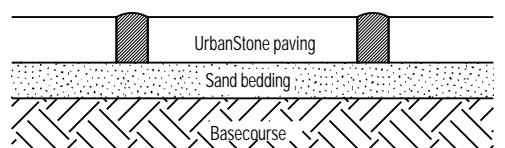
5. Night - Ambient temperatures fall
- pavers contract allowing dry jointing sand to collapse
- Partially open joints continue to take in wind-blown sand overnight
- Early morning dew assists in compacting sand in joints



6. Day - Ambient temperatures increase
- paver expands 'pushing off' damp compacted sand in partially filled joint
- joint gap widens
- day temps dry out jointing sand



7. Night - Ambient temperatures fall
- paver contracts allowing dry jointing sand to collapse
- Wide open joints finally fill up with wind blown sand overnight
- Early morning dew compacts jointing sand



8. Day - Ambient temperatures increase
- paver expands pushing against full jointing sand gap
- Expansion to pavers is taken up by the jointing sand which fills the joint gap