

# DESIGN CONSIDERATIONS FOR THE SPECIFICATION AND INSTALLATION OF URBANSTONE SEGMENTAL PAVING

## SURFACE DETAILING.

Good surface detailing represents an opportunity for the designer to combine visual appeal with pavement serviceability.

Surface detailing includes pavement perimeters, edge restraints, roadside gullies, surface penetrations, medians, traffic islands, connections with adjacent or other paving and sub surface drainage.

## DRAINAGE

Good surface, sub-surface and subsoil drainage is essential for satisfactory pavement performance.

Drainage needs to be considered during the design, specification and construction phases of the project.

Requirements for surface profile, location and sizes of kerb gullies and surface inlets, and the provision of sub surface and sub soil drainage, are the same as for other pavements on the same site.

During its early life, some rainwater may penetrate the pavement via the filled joints.

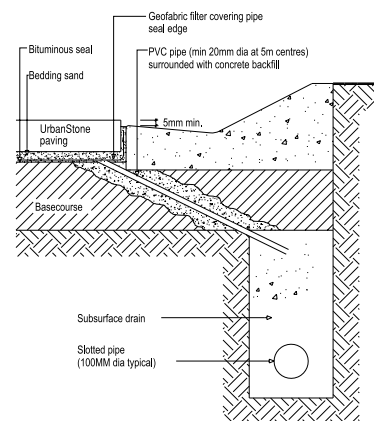
Experience indicates that as detritus is deposited in these joints, pavement permeability is substantially reduced.

However, this may take some time to take effect and the joints must be fully maintained and kept completely full until this occurs.

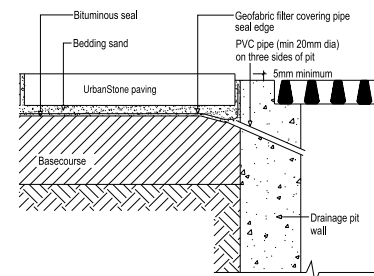
## CONSTRUCTION AROUND UTILITY PITS AND PENETRATIONS.

Most penetrations in pavements do not match the shape or squareness of the perspective laying pattern.

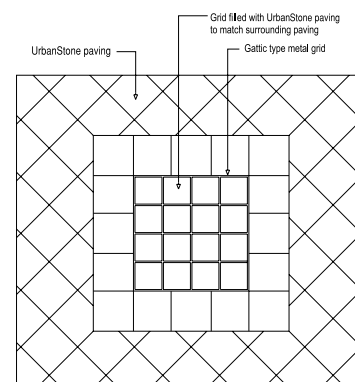
From both serviceability and appearance perspectives, this space can benefit from being infilled with the same type of paver being used in the main mass of the paving body, or it can be infilled with a purpose-designed infill unit. (Ask about UrbanStone's special infill product capabilities).



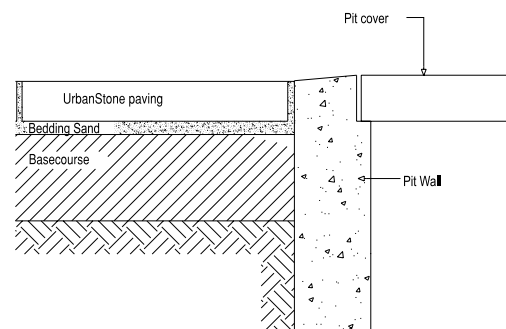
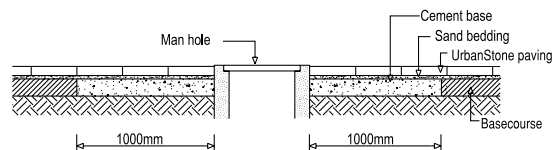
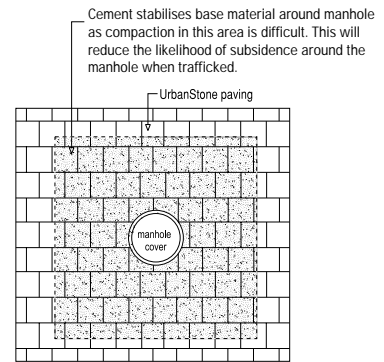
Draining directly into subsurface drain



Draining into drainage pit



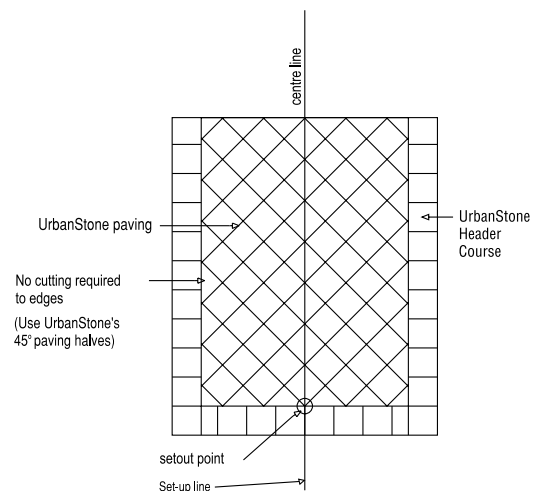
1. Compaction against drainage pits or manholes is always difficult. Thus it is recommended that the base material around these difficult areas be stabilised with 3% cement to a depth of 100mm below the finished basecourse levels, and to a width of 1 metre from the drainage outlet edge.
2. The orientation of the pit or cover is visually important. Ensure that the outside dimensions of the surround are square or rectangular, and make a smooth connection with the laying bond and pattern of the segmental paving.
3. The levels of the pit-covers should be adjusted before paving around them. It is important that water drains away from pits with lids and into surface inlet drainage structures.



### SET-UP LINES AND GRIDS.

Give consideration to incorporating into your main design, set-up lines or grids which will control the laying sequence, pattern and edge detailing.

Working from centre lines and designing paving widths to coincide with the paving, standard unit dimensions can save cutting time, laying time and give greater aesthetic appeal to the project.



### USE OF HEADER OR SOLDIER COURSES.

Use headers or soldier courses to create a neat edge against buildings, kerbs, drainage pits and so forth. Not only will this neaten up the entire project but it will also make the cutting-in against the header or soldier course a much easier task for the installer.

Variation of colour, shape and texture of such header or soldier courses from the main body of paving can be used to great aesthetic effect.

## USE OF EXPANSION JOINTS.

The use of segmental paving in walkways and roadways does not necessarily negate the use of expansion jointing in the pavement.

There are several detailing issues which need careful consideration when designing the pavement in question, and these are as follow:

### 1. What size paving unit or module is to be used?

In theory, a segmental pavement does not need any gaps to be left in the pavement to allow for expansion and contraction of the paving units themselves.

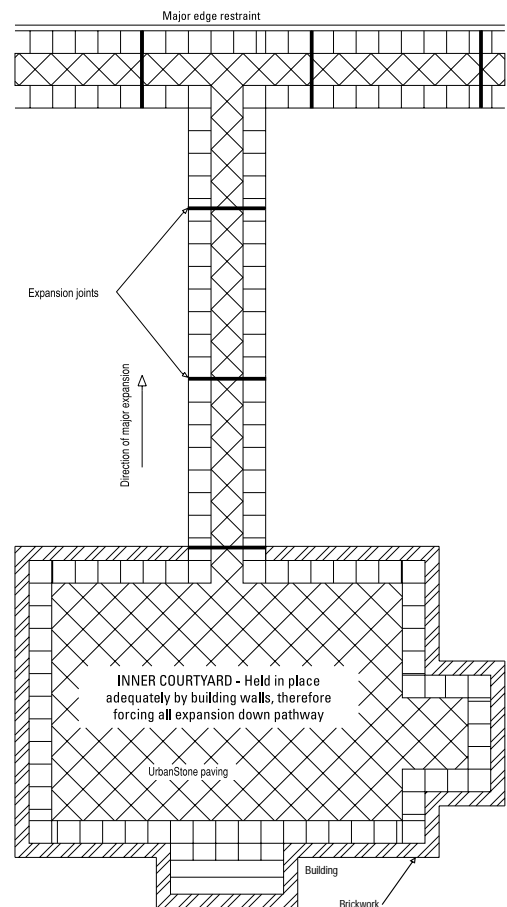
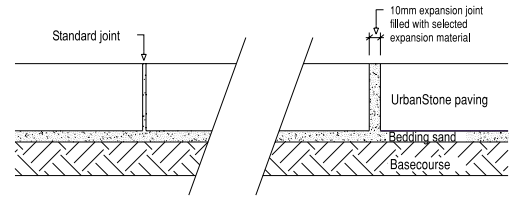
That is, any expansion and contraction that takes place due to changes in atmospheric temperature is taken up by the jointing sand in the joints between each individual paving unit. This is particularly true when dealing with individual paving units close to or of common brick dimensions and layed correctly.

However, as the unit dimension is increased, the number of joint gaps in the pavement will decrease proportionally. For this reason special attention needs to be given to this area of pavement design.

That is, assuming a length of segmental paving of 100 metres, and adapting an average linear coefficient of expansion of the concrete units of 0.0000108 per degree of change in temperature, and assuming a 30°C change in temperature, then the linear expansion would be in the order of  $100000\text{mm} \times 0.0000108 \times 30^\circ\text{C} = 32.4\text{mm}$ .

This expansion would need to be taken up in the pavement joints.

**Thus, there are situations where it is advisable to allow for expansion joints in the segmental pavement to accommodate the excessive movement that will not be fully taken up by the jointing sand in the joints.**

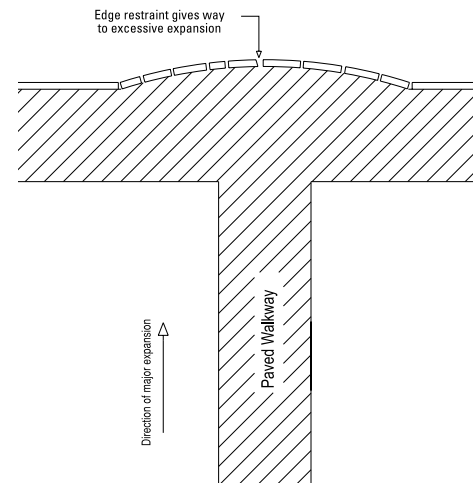


## 2. The shape of the area to be paved.

In general, a large uniform rectangular area, such as a courtyard as previously illustrated, when adequately restrained on all sides by buildings, will perform adequately with no allowance for expansion jointing in the paving.

However, where a pathway may lead away from this large mass of courtyard paving (and in particular where the pathway is extensive in length and not well restrained) consideration should be given to allowing for expansion joints within the paving along the length of the pathway.

When expansion of the paving mass occurs due to changes in ambient temperature, the extensions will always occur in the direction of least resistance. That is, the paving will always give where the weakest edge restraint is, or will break an edge restraint to release stress in the pavement.



## 3. Dimensional accuracy of the selected paving.

Most specifications of segmental paving call for high dimensional tolerances in the manufacturing process to be achieved.

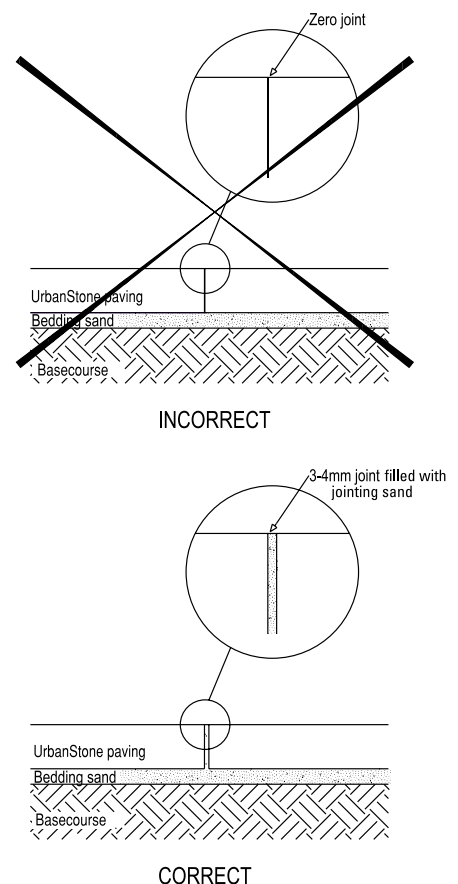
This good dimensional accuracy of individual paving units, can lead to 'tight' installation of the segmental paving.

Generally speaking, the paving installer will use the dimensional accuracy of the paving units themselves to locate and maintain the laying bond or pattern of the paving, and consequently lay the paving with little to no joint-gap.

Thus, jointing sand will not be able to be fully installed into the segmental paving joints and individual paving units will touch each other, causing chipping, spalling and in most cases, jacking of the pavement in question when expansion occurs due to changes in atmospheric temperatures.

It is believed that this 'tight' installation of the individual units can contribute to the phenomenon of sand jacking in segmental paving - (see section on sand jacking).

For this reason - **expansion jointing in the pavement design should receive serious consideration.**



#### 4. Laying technique.

##### Maintenance of joint gaps.

Because UrbanStone's paving units are manufactured with excellent dimensional accuracy, as well as near vertical sides, the maintenance of adequate joints during installation may inadvertently be overlooked.

This is again a result of the installer using the dimensional accuracy of the paving units to maintain the laying bond, as well as using the vertical sides of each paving unit to slide the adjacent unit accurately and neatly into position.

Thus, each unit is accurately placed into position instead of being gently dropped into position, as described in, "Developing the Laying Face", section 2 of, "A guide for the installation and laying of UrbanStone segmental paving units in a flexible pavement application".

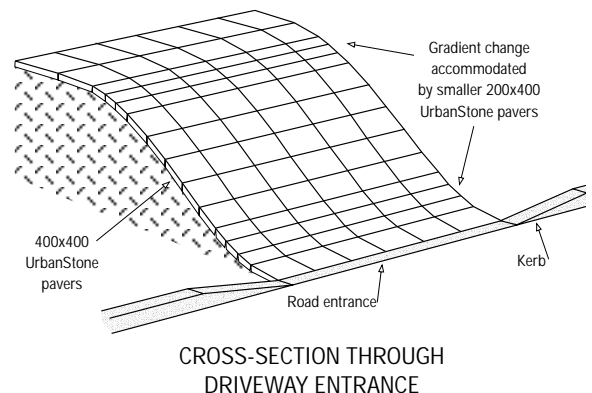
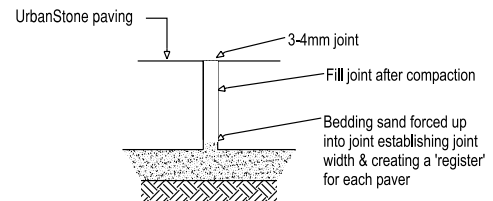
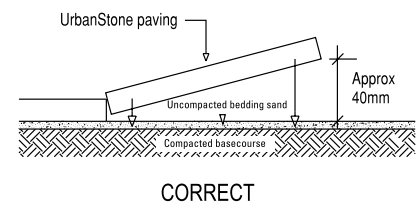
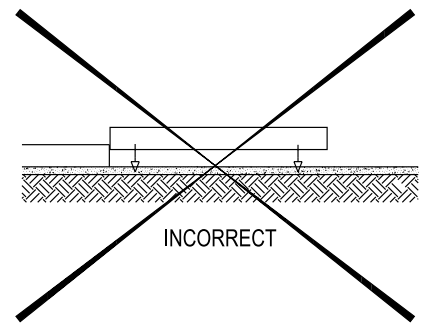
Again, a zero joint gap may occur giving rise to the possible problems as described above. For this reason, the installation of expansion joints may need to be considered.

##### ACCOMMODATING RAPID CHANGES IN GRADE

Rapid changes in gradients are always difficult, particularly when utilising a large dimensional paving unit.

To accommodate these changes in grade and ensure that the finished project is aesthetically pleasing with zero 'lippings' of paver edges, the paver unit dimension requires altering.

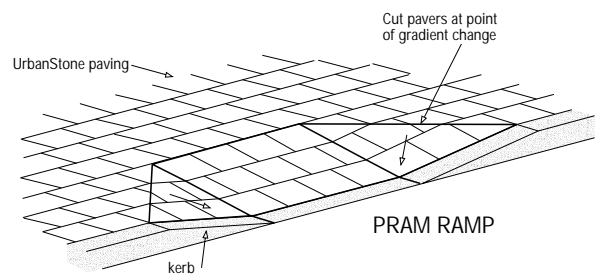
This may be achieved by simply specifying a smaller paver size in the area of gradient change. Incorporating this smaller unit size in the overall layout and design of the project will create a pleasing featuring that will enhance the overall appearance of the pavescape.



Alternatively, creating a 'cut line' at the point of gradient change within the paving body will accommodate the deflection required to eliminate unnecessary 'lipping' of paver edges.

When the paving is laid on 45° bond, this 'cut line' at the point of gradient change may be accomplished by installing UrbanStone 45° paving halves - thus avoiding unnecessary cutting residue, waste and cost.

A typical example of an area requiring the installation of a gradient change line would be at the pavement pram-ramp entry and exit as demonstrated in the adjacent illustration.



### **ACCOMMODATING THE SPECIAL NEEDS OF OUR COMMUNITY.**

Give consideration to the special needs of the community who will frequent or use the facility you are designing.

Ramps should be provided for wheelchair access. Use UrbanStone's specialty tactile pavers to assist the visually impaired, not only as a hazard warning but for directional guidance.

Use contrasting colours to delineate walk ways, edge hazards and so forth to aid the visually impaired.

Install UrbanStone's special dual colour bullnose stair treads that have been designed with the public's safety in mind.

