CCMJ Milled Joint System

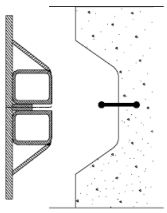
**(European Patent 2732101 validated in: France, Germany, Italy and UK
US Patent 9371623)**

The CCMJ System is a versatile New Solution for delivering Diaphragm Wall & Pile Joint Integrity. In particular the system:

- **Increases the effective depth range of Diaphragm Walls (especially walls excavated by grab) and Secant Walls**
- **Removes the requirement for Stop-ends**
- **Allows for a Water Bar to be installed across the joint**
- **Permits Continuous Reinforcement across the joint**
- **Optimises Reinforcement Density and hence Concrete Flow**
- **Facilitates joints at corners eliminating the need for "L" shaped cages and reducing single pour concrete volumes and slurry storage capacity requirements.**
- **Enables the construction of smaller-dimension square and circular deep shafts than is possible with current methods.**

To depths of 30metres, the standard steel "peel off" joint former has provided great service over the years. However, increasing depth and important innovations such as the grab rotator - combined with real-time positional monitoring - has meant that diaphragm wall grabs can now excavate to far greater depths of 50-60m, and more.

Where this involves digging through fine-grained materials, the grab provides a huge cost saving over reverse-circulation mills.



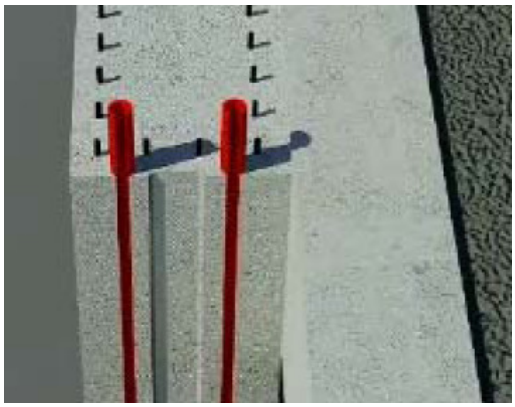
Conventional steel "peel off" stop-end profile

The use of steel "peel off" joint formers, to these depths frequently leads to difficulties with their removal. Despite best efforts, some of them will take hours or even days to remove; or worse the formers may break or deform, requiring further action to permit recovery. Such problems can result in:

- **Safety & Environmental Concerns**
- **Programme Disruption**
- **Remedial Issues**

The solution is the CCMJ Milled Joint. A simple system providing Certainty at Depth, comprising two main components:

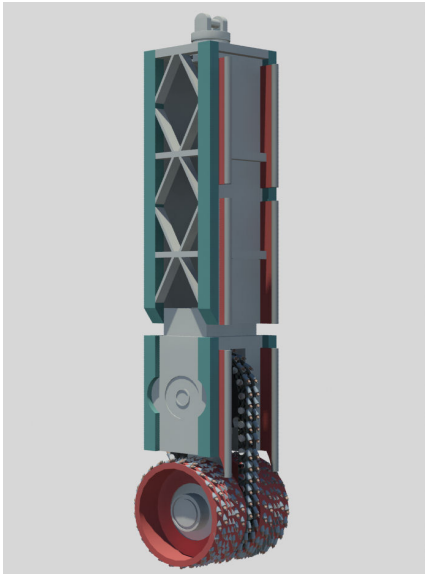
1. **The CCMJ Guide Track**



The guide track system ensures full-width contact between jointed elements

The basic CCMJ guide track is made up of GRP pipes supported and restrained by brackets built into the reinforcement cage. The CCMJ+ guide track - to allow continuous reinforcement - is formed from either GRP or steel pipe with a GRP sacrificial cover

2. **The principle of the CCMJ Mill – a Joint Trimmer**



The trimmer planes the surface of the concrete plus any over- break, and profiles the joint

CCMJ Milled Joint System

**(European Patent 2732101 validated in: France, Germany, Italy and UK
US Patent 9371623)**

Imagine a road planer taking off the surface of a road. The CCMJ mill or Trimmer planes the concrete from the end of a diaphragm wall panel or the side of a bored pile in a similar way – to form a profiled joint. Guides attached to the body of the trimmer run in the guide track – maintaining the vertical alignment of the milling wheel relative to the guide track – and ensuring that the trimmer cannot move away from the concrete surface.

For most applications, the guide track will have a typical concrete cover of 50mm – so the anticipated output of the mill is expected to be similar to the road planer i.e. 50m plus of joint per hour. The trimmer wheel can have a raised centre section to form a shear key, or can be concave if milling a bored pile.

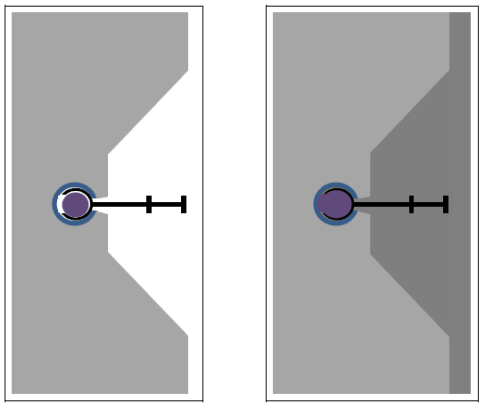
The Trimmer will have a weight of approximately 15 tonnes and will be developed by Trevi Spa.

The CCMJ System is currently in development through an EU-funded H2020 Project incorporating Trevi, Arup and CCMJ Systems (September 2016 to September 2018). Arup is responsible for formal validation of the system.

Water Bars

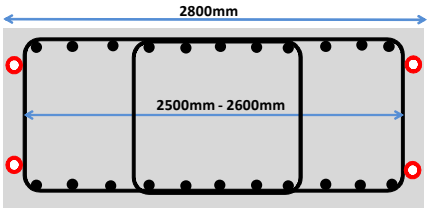
Milled joints typically do not contain water bars – and there is no necessity to incorporate a water bar in the CCMJ milled joint.

However, a water bar can be provided with the system. – incorporating a profiled water bar with hydrophilic cord which expands to seal the joint.



The joint immediately prior to concreting the adjacent panel (left), and the expansion of the hydrophilic cord to seal the joint (right)

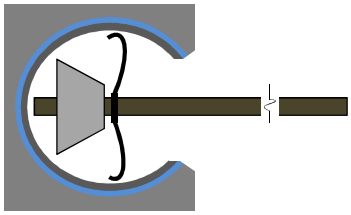
Optimised Steel Density – CCMJ Starter Panel



Over 90% of the length of the panel can be reinforced compared to less than 70% if joint formers and water bars are to accommodated

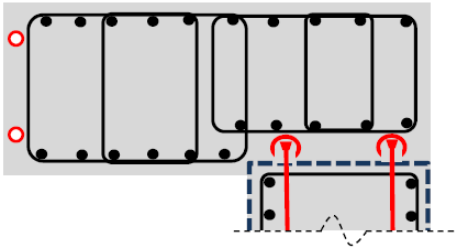
Continuous Reinforcement across the Joint

The CCMJ+ guide track system provides a significant tension or shear capability across the joint. Reinforcement anchor bars fixed to the reinforcement cage of the secondary panel or pile are located in the guide way and then concreted in position – reinforcing across the joint.



Anchor arrangement - providing tension or shear capacity across the joint

Corner Panels



CCMJ guide track system allows single-bite corner panels. The construction joint can be strengthened with continuous reinforcement across the joint.

In addition to the technical innovations, the CCMJ system brings a clear cost benefit which can be demonstrated for many projects.

If you would like to discuss how the CCMJ Milled Joint can benefit your Business or Project - please contact:

julian.crawley@ccmjsystems.com

CCMJ Systems Ltd provides support for retaining wall contractors wishing to benefit from the advantages of the CCMJ Milled Joint System. Offices in Scotland and SE England.