MECHANICAL REBAR SPLICING SYSTEM
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**The Use of Mechanical Coupler**

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INTRODUCTION

MOMENT MECHANICAL COUPLERS

Incorporated in 1991, Moment has since evolved into a multinational company providing both quality products as well as engineering solutions for the building industries.

Our experiences and extensive R & D knowhow has led us to the development of a comprehensive mechanical spliced system which meets and exceeds the ever demanding market standards.

In 1994, Moment couplers were used in the prestigious 88-storey Petronas Twin Towers project, marking a significant yardstick as a recognized and approved couplers supplier.

Moment BARBREAK system was invented in year 1996 and was further patented in year 2005, complying with most Codes of Practice of developed countries in the world:

- AS 3600 Australia
- ISO 15835
- JIS G3112 Japan
- MS 146 Malaysia
- DIN 1045 Germany
- BS 8110 United Kingdom
- NFA 35-020-1 France
- ACI 318-1995 United States
- ACI 349 United States
- GB 1499-91 China
- CAN 3-N 287 2/3 Canada

THE USE OF MECHANICAL COUPLERS

1. Increase tensile and compressive capacity of RC structures elements. Common in the constructions of inclined columns, long columns, long beams cantilevered structures where tensile loadings are greater than normal situation.

2. Avoid congestion of reinforcement bars in heavily reinforced structures due to laps. Reduce concrete / steel ratio and improve concrete quality by having bigger space between bars.

3. Avoid formation of voids or honey-comb in concrete element.

4. Protect expensive system formwork from being damaged by starter bars.

5. Avoid stains, corrosion and breakage of starter bars left for future extension of buildings and other structures. Promote construction of bridge in stages to ensure constant flow of traffic during construction.

6. Avoid bend and re-bend of bigger reinforcement bars in construction of diaphragm walls.

7. Where spacing between bars are insufficient to allow for laps e.g. in construction of micropiles.

8. Reduce size of concrete sections and ensure maximum usage of expensive floor space in office towers.

9. Where a full tension splice is required e.g. in connecting precast members to cast-in-situ members.

QUALITY ASSURANCE

Under Halfen Moment Quality Assurance Program, we pride ourselves for the practice of the highest levels of control and precision manufacturing.

Our product are designed, manufactured, inspected and tested to ensure that every single pieces is according to specifications. Every step of the process is being monitored by our stringent internal QC procedures.

MOMENT coupler are stamped with traceability codes, which allows the couplers to be traced back to the original lot of steel and the mill which produced it. Mill Test Certificates are archived for future use as required.
Moment Barbreak Coupler, the universally approved product, is designed to cater for almost every conceivable application for joining of reinforcing bars. The taper thread system provides easy alignment for engagement of the incoming rotating bar and develop full strength when hand tightened.

Moment Barbreak Coupler consists of a High Tensile Carbon Steel Sleeve with identical threads at opposing ends tapering towards the middle.

Bar ends shall be square cut and taper threaded accordingly for connection. Both couplers and threaded bars are supplied with protective plastic caps.

Moment Barbreak Couplers are usually located in RC Structures such as long columns, inclined columns, long beams, cantilevered structures where tensile loadings are greater than for normal situation, etc where bars are free to turn.

**UNIQUE FEATURES**

- Slimmest coupler design
- Overall diameter reduces need for additional concrete cover
- Barbreak Couplers are designed to withstand a breaking load of at least 700 N/mm²
- Works like a continuous bar when installed, no cranking required
- Taper thread connections offers easy alignment, achieves full tightness with merely 4-5 turns
- No lock nuts required
- Cross threading prevented
- No special tools for installation
- Inspection of splice made easy with torque wrench
- Also available Barbreak Reducer Coupler
- Exceeds requirements of most International Codes of Practice i.e. MS 146, BS 8110, ACI318/318R. AS 3600 (Aust), DIN 1045(Ger), CAN 3-N 287 2/3 (Can), etc
T – Coupler Insertion Depth
S – Coupler External Diameter
L – Coupler Length

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**INSTALLATION OF MOMENT BARBREAK COUPLER**

- Rebar are cut to length at the steel fabrication yard before transferring onto the threading work bench.
- Poorly sheared ends must be cut off using disc cutter prior any threading work.
- Rebar ends to be cold forged before commencing threading.
- A coupler gauge with ‘cut window’ will be use to inspect insertion and thread quality of rebar at 50 threads interval.
- Coupler will be hand tightened onto threaded bar. All exposed threaded bar shall have protective plastic cap.

**PROCEDURE**

1. Set Torque Wrench at recommended torque
   - T16 & T20 - Torque 90Nm
   - T25, T32 & T40 - Torque 180Nm
2. Rotate till hand-locked. Using a marker, draw a line along the vertical axis of the bar and coupler to indicate hand lock position.
3. Proceed to tighten with the torque wrench until ‘click’ sound is registered and note the number of turns needed to achieve the recommended torque value. Add 15% to the established number of turns and the sum of it shall be used as a guide every time a monkey wrench is used for each appropriate size connection. Generally for a T32 rebar couple joint it would require approximately 1.5 turns after ‘hand locked’ to achieve the recommended torque value.
MOMENT JOINTEC COUPLER

UNIQUE FEATURES

• Breaking load of at least 700N/mm².
• Coupler sleeve constructed of High Strength Machinery Steel Grade S55C
• Fast production and installation
• No torque wrench is required for installation
• Also available in transition form to connect bars of different diameters
• Exceed requirement of most International Codes of Practices i.e. MS146, BS8110, ACI318/318R, AS3600 (Aust), DIN1045 (Ger), Can 3-N 287 2/3 (Can), etc.

MOMENT JOINTEC splicing system ensures full performance splicing joint with its proof stressed bar ends. The extended long thread provides swift installation simply by turning the coupler instead of the bar itself.

While lap splicing depend largely on the bond between concrete and steel to transfer load, MOMENT JOINTEC coupler with its unique parallel – threaded, assures positive alignment locking connection thus providing load path continuity and structural integrity. The MOMENT JOINTEC coupler behaves as continuous length reinforcement bar by promoting full strength in tension, compression and stress reversal situations.

Stringent compliance with current concrete design standards such as BS 8110, ACI 318, DIN 1045 etc. The use of MOMENT JOINTEC coupler eliminates the tedious calculations to determine the proper lap lengths. MOMENT JOINTEC COUPLER” also reduces potential design errors while eliminating wastage and unnecessary rebar cost.

MOMENT JOINTEC coupler greatly reduces congestions thus maintaining healthy balanced steel to concrete ratio. This is nearly impossible with Lap splicing because of the additional rebar in the lap zone.

MOMENT JOINTEC coupler allows the use of larger diameter rebar in smaller column member resulting in a more balanced design. Smaller columns can be designed to increase maximum floor space while reducing overall cost.

In watertight and water retaining structural designs, lap splices inevitably double the number of bars in the lap zone leading to unnecessary congestions and resulting in difficulties of concrete placement, the major causes of “voids” and “Honeycombs”. Water seepages and leakages become a nightmare.
MOMENT JOINTEC coupler reduces rebar congestion as explained earlier and significantly improves on concrete flow and compaction. The potentials of crack, “voids” and “Honeycombs” are eliminated.

MOMENT JOINTEC coupler maintains structural integrity because it works as a continuous piece of rebar.

### Installation of MOMENT JOINTEC Coupler

- Rebar are cut to length at the steel fabrication yard before transferring onto the threading work bench.
- Poorly sheared ends must be cut off using disc cutter prior any threading work.
- Rebar ends to be cold forged before commencing threading.
- A coupler gauge with ‘cut window’ will be use to inspect insertion and thread quality of rebar at 50 threads interval.
- Coupler will be hand tightened onto threaded bar. All exposed threaded bar shall have protective plastic cap.

### Procedure

In the simplest procedure, MOMENT JOINTEC coupler develop full strength upon hand tightening.
MOMENT REVERSE LOCK COUPLER

UNIQUE FEATURES

• A three (3) components product. A member of Moment BARBREAK family which is designed to withstand a breaking load of at least 700 N/mm².

• Exceeds requirements of most international codes of practice. i.e. MS 146, BS 8110, ACI 318/318R, AS 3600 (Aust), DIN 1045 (Ger), JIS G3112 (Jpn), CAN 3-N 287 2/3 (Can), etc.

• Compact and easy to install, No special tools required.

• Available in transition form to connect bars of different diameters. Ideal for connecting and positioning bent bars or anchorages.

Moment Reverse Lock Coupler, a member of the Moment 'BARBREAK' splice family, designed for use in heavily congested structures such as columns, piers, and cantilever spans, long beams, pile cages etc. to overcome the formidable task of having to rotate heavy bars.

Ideal for connecting and positioning bent bars or anchorages.

Achieves full compression and a failure load intension of at least 150% the specified characteristic strength Fy of G460 (BS 4449) reinforcement bar.

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 INSTALLATION OF MOMENT REVERSE LOCK COUPLER

- Rebar are cut to length at the steel fabrication yard before transferring onto the threading work bench.
- Poorly sheared ends must be cut off using disc cutter prior any threading work.
- Rebar ends to be cold forged before commencing threading.

- A coupler gauge with ‘cut window’ will be use to inspect insertion and thread quality of rebar at 50 threads interval.
- Coupler will be hand tightened onto threaded bar. All exposed threaded bar shall have protective plastic cap.

**PROCEDURE**

1. Set torque wrench to the recommended torque value. Turn Part A & Part B onto both threaded bar till fully tight to the recommended torque value.

2. Lends Part C into the Part A till fully engaged.

3. Turn the big nut into the incoming threaded bend bar till fully tight to the recommended torque value.


5. Complete installation.
MOMENT POSITIONING COUPLER

UNIQUE FEATURES

- Comprises of three components.
- Taper thread connections offers easy alignment and achieves full tightness with merely 4-5 turns.
- A member of Moment BARBREAK family designed to withstand a breaking load of at least 700 N/mm².
- Inspection of splice made easy with torque wrench.
- Recommended for use in situations where it is impossible to turn the forward bar to a full connection splice.
- Exceeds requirements of most International Codes of Practice i.e. MS 146, BS 8110, ACI 318/318R, AS 3600 (Aust), DIN 1045 (Ger), CAN 3-N 287 2/3 (Can), etc.

MOMENT POSITIONING coupler is a ‘problem solving’ coupler, used in situation where neither of the bars to be connected is free to rotate. It is available in two versions:

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A – Diameter of receiving member
B – Diameter of extension stud
L1 – Receiving member
L2 – Max. internal thread length
L3 – Extension stud & jam nut
L4 – Overall length
L5 – Extendable distance
1. The main sleeve and rebar are cast in the concrete. The socket and lock nut can then be locked into the main sleeve in order to accept continuation rebar.

2. Position the continuation rebar near the extension stud.

3. Switch the extension stud and jam nut onto the continuation rebar till fully engaged.

4. Using a torque wrench to tighten the jam nut on the continuation rebar and another torque wrench to hold on continuation rebar.

5. Turn the jam nut towards the main sleeve. Using a torque wrench, tighten the jam nut to the recommended torque value.
MOMENT WELDABLE COUPLER

FEATURES

• Offers simple and fast solution for connecting reinforcement bar to structural steel elements.

• Design based on BARBREAK coupler with internal taper thread on 1 end and the other end prepared for welding.

• Constructed using High Strength Machinery Steel Grade S45C.

• For installation purpose, the weld coupler is best install welded at fabricating shops with suitable type of welding electrode to ensure the compatibility of material properties.

• Welding works shall be executed by certified welders in accordance to all necessary welding regulations.

MOMENT WELDABLE coupler is designed for connecting reinforcing bar to structural steel members such as plates, piles, beams, columns, etc. Coupler is normally arc welded to the structural steel in a fabricating yard. The load conditions at the connection must be considered and determined by the designer along with the design of the weld, the selection of electrode, and other relevant choices to be used, which must be matched to the properties of the plate and tube, and to the site conditions. Normally coupler is arc welded to the structural steel in a fabricating yard.

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APPLICATION OF HALF COUPLERS & COMPOSITE STRUCTURES
MOMENT TERMINATOR

UNIQUE FEATURES

• Constructed in High Strength Machinery Steel Grade S45C to withstand a breaking strength of at least 700 N/mm²

• Utilizing Moment Internationally proven taper thread connection for positive locking

• Compact design provides easy placement, reduces congestion and better concrete consolidation.

• Offers design flexibility

• Eliminates hooked bars preparation and placement problems.

• Meet and exceed requirements of most International Codes of Practice i.e. MS 146, BS S110, ACI 318/318R, AS 3600 (Aust), DIN 1045(Ger), JIS G112(Jpn), CAN 3-N 287 2/3

The Moment Terminator assembly is a simple quick solution to eliminate the problems of congestion and placement in heavily reinforced compact concrete structural members in the Anchorage zones, posed by Hooked rebar embedment lengths. Designed to ACI - 355 criteria based on Shear Cone Theory. The Moment Terminator assembly is recommended for use at beam to column anchorage and in column at roof connection as an enlarged coupling secured to the end of a length of reinforcing bar thereby creating an anchorage within the concrete. Developed full tension and exceeds 135% specified characteristics strength Fy of G460 (BS 4449) reinforcement bar.

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MOMENT BARGRIP COUPLER

UNIQUE FEATURES

• Coupler sleeve is constructed of High Strength Machinery Steel Grade S20C, designed to withstand a breaking strength of at least 625 N/mm².

• Exceeds requirement of most International Codes of Practice i.e. MS 146, BS 8110, ACI 318/318R, AS 3600 (Aust), DIN 1045(Ger), JIS G3112(Jpn), CAN 3-N 287 2/3 (Can), etc.

• No special bar ends preparation needed.

• Just flat cut bar ends for end bearing.

• Most commonly used for connection in columns, beams, piles, etc where ‘starters bar’ length are insufficient.

• In R.C. Structural repairs, for connecting replacement bars.

The Bargrip splice is an outright solution for connection with in-situ rebars for which otherwise would neither fulfill the requirements of a full lap splice nor allow the use of a threaded coupler joint.

A simple step by step execution of cold forged gripping the coupler sleeve against the HTD Bar by means of a hydraulic press results in a full compression splice and achieves a failure load of a minimum 125% in tension.
Note: The installation of the MOMENT BARGRIP Coupler must be done by a trained MOMENT personnel. This is to ensure that the installation of the coupler is done according to our strict specification and specialize equipment.

1. Check pressure gauge of hydraulic pump to ensure it is in normal working condition.

2. Reinforcements bars of required lengths are prepared and supplied by the contractor.

3. By means of chalk and ruler, mark outside of sleeve with chalk lines which represent the intended press lines.

4. Install half section of sleeve on upper rebar on the ground (rebar casted in).

5. Press the sleeve using hydraulic.

6. Lower incoming rebar onto the other end of sleeve.

7. Complete the splicing process by pressing the sleeve onto the incoming rebar.

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MOMENT WEDGE-LOC COUPLER

UNIQUE FEATURES

• Simple and efficient solution yet for connecting reinforcing bars.

• Product excellence developed thru technology used in Post-tensioning systems.

• Developed full compression and tension when installed, works like a continuous piece of rebar.

• No need for special bar end preparation or threading.

• No need to rotate bars for installation.

• Ideal solution for unthreaded “Stub” bars or “Starter” connections, non-complying with lap length requirement.

• Exceeds requirements of most International Codes of Practice i.e. MS 146, BS 8110, ACI 318/318R, AS 3600 (Aust), DIN 1045(Ger), JIS G3112(Jpn), CAN 3-N 287 2/3 (Can), GB 1499-91(Chn), NFA 35-020-1 (Fr), etc.

MOMENT WEDGE-LOC Coupler, developed thru technology used in Post-tensioning systems worldwide. A simple, efficient, and reliable method of splicing reinforcement bars today without the need of special bar end preparation or threading.

A three (3) component assembly comprising (i) main housing internally threaded (ii) one pair internal wedges, (iii) one pair lock wedges externally threaded to engage reinforcement bars.

Coupler assembly constructed from High Strength Machinery Steel (Carbon Steel S45) specially modified to withstand a breaking strength not less than 700N/mm² well above designed strength of most reinforcement bars.

Installation made easy, by inserting properly cut rebar ends into coupler, one at a time, and tightening the lock wedge using a Wrench until full tightness is achieved or verified by the specified torque values.

Recommended for use in column bars, inclined structures as well as lateral structural members and slabs. Standard size range: 16 thru 50mm. Also available in composite Wedge-Lok & Threaded connection.
1. Loosen the locking midway of the wedge and place the coupler over the rebar.

2. Ensure the rebar reaches the coupler locking wedge and tighten the locking.

3. Loosen the other end of the locking wedge and ensure the coupler locking wedge reaches the rebar of and tighten it.

4. Installation complete.

**INSTALLATION OF MOMENT BARGRIP COUPLER**

<table>
<thead>
<tr>
<th>Size</th>
<th>T16</th>
<th>T20</th>
<th>T25</th>
<th>T32</th>
<th>T40</th>
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<tr>
<td>S1</td>
<td>30</td>
<td>36</td>
<td>50</td>
<td>60</td>
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<tr>
<td>S2</td>
<td>36</td>
<td>45</td>
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<tr>
<td>L1</td>
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<td>L2</td>
<td>62</td>
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<td>160</td>
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<tr>
<td>T</td>
<td>23</td>
<td>25</td>
<td>33</td>
<td>47</td>
<td>57</td>
</tr>
</tbody>
</table>

S1 – Diameter of lock stud
S2 – Diameter of receiving member
L1 – Overall length
L2 – Receiving member length
T – Bar insertion length
MOMENT COUPLER USED IN CONSTRUCTION OF COLUMNS
MOMENT COUPLER USED IN CONSTRUCTION OF COLUMNS
MOMENT ‘BARBREAK’
MECHANICAL SPlicing SYSTEM

Foreword

In recent years, the demand for efficient splicing systems have become increasingly important as a result of increased construction complexities, design requirements, escalating costs and limitations to traditional lap splicing methods, the need for alternatives that provide both structural reliability and cost effectiveness has never been more apparent.

In the shadows of Earthquakes and man-made blasts - How safe are we?

Load transfer mechanism of lap splice is dependent on the surrounding concrete causing significant forces to occur within the concrete that may require additional transverse reinforcement in the lap zone to prevent excessive cracking. Free ends of splice bars act as crack inducers across the tension zone causing transverse cracks which in turn triggers splitting cracks in the concrete.

Ever since the Dec 26 (2004) earthquakes that struck Acheh, Malaysia has been exposed to the stark reality that we can no longer be considered immune to such disasters of catastrophic proportions in term of lives lost, property destruction and even economy collapse. Malaysia may not be directly in any demarcated seismic zones, but the harsh awakening of “ripples effect” from tremors at close proximity indeed signifies earthquake risks could no longer be ignored.

The government and regulatory bodies have since taken serious steps in reviewing current building regulations and codes, so too must structural engineers and constructors take immediate necessary precautions to ensure the safety of their design as they are liable if anything happened to the buildings. (see STAR press release 17/2/05 on page 8)

### Don: Need to consider quake impact

KUALA LUMPUR: Experts including structural engineers, need to consider the impact of earthquakes when designing buildings as Malaysia can no longer be considered immune to such disasters. Universiti Teknologi Malaysia (UTM) vice-chancellor Dr. Mohd Zukifli Mohd Chatib said earthquake risks could no longer be ignored as residents in high-rise buildings in Selangor and Perak felt the tremors from the Dec 26 earthquake in India.

“The residents felt the tremors but did not realise that the effects of the earthquake had reached their buildings,” he said after opening the regional seminar on Geodynamics – Mega-Tsunami Earthquake Induced Tsunami Awareness.

He said there was currently no consideration given to the effects of earthquakes in the designing of buildings, especially high-rise ones. Dr Mohd Zukifli said structural engineers should ensure that buildings were safe as there were liable if anything happened to the buildings.

He said that several years ago UTM had set up a Structural Engineering Research Team which worked with several organisations, including the Public Works Department, to form an earthquake emergency committee. However, he held few illusions because the people were sceptical then as they had never experienced anything like the Dec 26 earthquake, he said.

In his speech, Ambassador of the European Commission Delegation to Malaysia, Thierry Rommel, said there needed to be an effective 24-hour communication line to relate information about earthquakes and tsunamis to the people.

“One way to reduce public overreaction and false alarms is to inform and assure them that there is a reliable warning system out there,” he said.

### ‘Barbreak’ Mechanical Connection Versus Lap Splice.

To understand the structural advantages of a mechanical connection over lap splices, it is imperative that we study the load transfer mechanism and its capabilities. Figures 1 & 2 show the load transverse mechanism of the lap splice and its dependence on the bond to the surrounding concrete. Performance of lap splice is only defined up to the yield point of the reinforcing bar, beyond this point, the lap splice do not exhibit a consistent ductile pattern.
Moment Patented ‘Barbreak’ Connection

Moment Patented ‘Barbreak’ mechanical connections conform fully with applicable codes include BS 8110 and ACI 318/318R Section 21.2.6. for both types ‘Non-Barbreak’ & ‘Barbreak’ Mechanical Splices. Barbreak Mechanical Connections actually provide defined ductile behaviour and performs like continuous piece of bar Fig 3. Moment Patented ‘Barbreak Mechanical Connection’ performs in excess of 150% beyond the yield point of the bars. Moment Barbreak mechanical connections perform beyond the yield point of the bar whereas Lap Splices are only defined in the plastic area. This indicates that the Moment ‘Barbreak’ connection which work as a continuous bars provides additional strength and safety all round z independent of the quality of the surrounding concrete.

DESIGN CODES AND SPECIFICATIONS

In reinforced concrete design, the Structural Engineer is faced with the task of determining where and how reinforcing bars must be spliced in a structure. This he must do because of his familiarity with the particular requirements of the structure combined with statutory regulations. Due to the minimum connection strength required, it is generally assumed in design that the occurrence of a mechanical connection of two reinforcing bars does not result in a reduction of the anticipated structural strength as well as the longitudinal stiffness and longitudinal ductility of the reinforcing steel, which the reinforced concrete member would have had with a continuous unspliced bar. That is, it is assumed that the use of a mechanical connection does not introduce a structural weakness that could jeopardize the overall structural performance. Design requirements of the applicable codes as in ACI318, 349 or AASHTO and BS 8110 or BS5400 Pt 4 – Code of practice for design of concrete bridges, generally specify a minimum connection strength e.g. Clause 5.8.6.6 States;

a) When a test is made on a representative gauge length assembly comprising reinforcement of the size, grade and profile to be used and a coupler of the precise type to be used, the permanent elongation after loading to 0.6 fy should not exceed 0.1mm, and

b) The design ultimate strength of the coupled bar should exceed the specified characteristic strength by the percentage specified in Clause 11 of BS 4449:1997, so that yielding will tend to occur at the reinforcement bar adjacent to the mechanical connection before failure in the mechanical connection (defined as ‘Barbreak’).

Moment Patented ‘Barbreak’ Mechanical Connection and Seismic Design

In a structure undergoing inelastic deformations during an earthquake the tensile stresses in reinforcements may approach the tensile strength of the reinforcements. The requirements for ‘Barbreak’ mechanical splices are intended to avoid a splice failure when the reinforcement is subjected to expected stress levels in the yielding regions. ‘Non-Barbreak’ mechanical splices are not required to satisfy the more stringent requirements for ‘Barbreak’ and may not be capable of resisting the stress levels expected in yielding regions. The locations of ‘Non-Barbreak’ splices are restricted. However ‘Barbreak’ mechanical splices shall be permitted to be used at any location (ACI 318/318R-2000 chapter 21-Special provisions for Seismic Design clause 21.2.6)
Why Use Moment ‘Barbreak’ Connection?

There are numerous situations that require or make the use of Patented ‘Barbreak’ Mechanical connections feasible or more practical. Most common conditions are:

1. Where 32mm diameter and above sized bars are used. This occurs most common in columns, raft mat foundations and other heavily reinforced structures. Codes do not permit #14 and #18 bars to be lap spliced, except in compression only with #11 and smaller bars.

2. Where spacing of the reinforcing bars is insufficient to permit lapping of the bars. This generally occurs in situations, requiring large amount of reinforcements and the use of larger bars as in heavily loaded columns. See Pics

3. When requirements in current codes and specifications for tension lap splices result in long lap splice lengths. Lap splices may thus be less practical than mechanical connections.

4. In shear walls, diaphragm walls and water retaining structures to eliminate congestions and the need to bending and rebending of larger bars. Others like core walls in high rises to eliminate the unnecessary time consuming costly preparation and damages to modern system formworks used.

5. In cable stayed bridge pylons, micropiles, Highway bridge piers, decks and cantilevered spans to improve concrete consolidation and where ‘Barbreak’ connections exhibits superior cyclic performance. See Pics

The Journal of Structural Engineering paper presents the test results of three moment-resisting connections between precast beam-column elements designed for regions of moderate to high seismicity. The specimens are subjected to cyclic lateral load reversals that are progressively amplified until the structures fail to interstory drifts (ratio of lateral story displacement to story height exceeding 9%). Two of the test specimens represented exterior connections (BME, BMR), and the third represents an interior connection (BMC). The connections include: BME—tongue, BNR—tongued notches; BNR—threaded rebar with tapered-threaded couplings. The plastic hinge is forced to develop within the connection region in all three specimens. The specimens exhibit ductility and energy dissipation characteristics similar to those of ordinary reinforced concrete elements as the connection regions are designed to accommodate ordinary reinforced concrete in a precise system. The threaded rebar connections with tapered-threaded splices represent the most favorable solution in terms of performance, fabrication and economy.

‘Barbreak’ connections allow the steel to concrete ratio to be maximized by eliminating unnecessary rebars whilst achieving an ideal balance of steel and concrete and providing greater structural integrity without unnecessarily increasing column dimensions thus promoting more design flexibility, reduced costs and optimum use of floor space.
6. In temporary openings and when the location of construction joints and provision for future construction dictates use of mechanical connections to provide tensile continuity.

7. In seismic consideration:

i Moment Patented ‘Barbreak’ connections promote full compression capabilities and offer in tension more than 150% of the specified yield strength $f_y$ of the concrete reinforcing bars ensuring that rupture will only occur in the reinforcing bar before failure in the mechanical connection where inelastic straining are anticipated as in the yielding zone of seismic structures.

ii Moment Patented ‘Barbreak’ connections are manufactured to the exact standards to withstand a breaking strength of not less than 700N/mm$^2$ thereby promoting adequate strength and ductility so that failure initiates in the concrete rather than the steel reinforcements in the event potential inelastic straining may occur during seismic excitation.

Moment Patented ‘Barbreak’ mechanical connections, proven internationally as a top quality product of Malaysian engineering excellence has through continuing research & development and quality management been accorded the BS EN ISO 9001:2000 accreditation. The significant contributions of Moment ‘Barbreak’ systems can be identified with numerous landmark projects in many countries e.g.

8. For overall economy. As opposed to the 80’s when most mechanical rebar couplers were imported prime products, charge to the customers at exorbitant rates, Moment ‘Barbreak’ connection, an entirely ‘Made in Malaysia’ product of international quality and standard offers distinctive savings, versatility and reliability even over the cost of traditional Lap Splice method today.

**Conclusion**

Moment Patented ‘Barbreak’ connection offers many advantages to the designer and constructor to help improve design and reduce construction time and cost while providing versatility and can help to solve many construction problems today. As Malaysia progresses in nation building, federal governance, regulations and codes for construction in the post Aceh incidence regarding seismic frame construction become more stringent, Moment Patented ‘Barbreak’ connections, the proven mechanical splice method provides you with the ability to design and build concrete structures to withstand the test of time.

Ref:

5. AASHTO - Standard specification for Highway Bridges.
MOMENT PROJECT REFERENCES

Marina Bay Sands, Singapore  
Burj Al Arab (Dubai)  
IB Tower (Kuala Lumpur)  

Dubai Marina Development  
Petronas Twin Tower (Malaysia)  

Penang Bridge (Malaysia)  
MRT (Singapore)  

Delhi Metro MRT (India)  
Belle Grande Casino, Philippines
**TEST REPORT**

<table>
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<th>PAGE: 1 OF 2</th>
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**Applicant:**
HALFEN MOMENT SDN. BHD.
28, Jalan Anggerik Mokara 31/59, Kota Kemuning, Seksyen 31, 40460 Shah Alam Selangor.

**Manufacturer:**
HALFEN MOMENT SDN. BHD.

**Product:**
Moment Barbreak Coupler

**Reference Standard/Method of test:**
BS 8110: Part 1: 1997 Code of Practice for Structural Use of Concrete
Clause 3.12.8.16.2: Bars in Tension.

**Description of sample:**
One sample of Moment Barbreak Coupler was received for testing.

**Brand:**
Moment

**Model:**
Barbreak T32

**Serial No.:**
0065

**Date received:**
22\textsuperscript{nd} March 2013

**Job No./Ref. No.:**
J20131431744 / SQAS/CCST/T.REC/MSL/12

**Issued date:**
08 APR 2013

**Approved Signatories**

<table>
<thead>
<tr>
<th>(MOHAMAD RAZIQI SHA'DUN)</th>
<th>(DALHA RAHMAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Executive</td>
<td>Group Leader</td>
</tr>
<tr>
<td></td>
<td>Civil &amp; Construction Section Testing Services Department</td>
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</table>
TEST REPORT

REPORT NO: 2013CB1744
PAGE: 2 OF 2

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TEST RESULTS : PERMANENT ELONGATION & TENSILE TEST

Clause 3.12.8.16.2: Bars in Tension

The only acceptable form of full strength butt joint for a bar in tension comprises a mechanical coupler satisfying the following criteria.

a - When a test is made of a representation gauge length assembly comprising reinforcement of the size grade and profile to be used and a coupler of the precise type to be used, the permanent elongation after loading to 0.6fy should not exceed 0.1 mm.

b - The tensile strength of the coupled bar should exceed 287.5 N/mm² for Grade 250, 483 N/mm² for Grade 460A and 497 N/mm² for Grade 460B.

<table>
<thead>
<tr>
<th>SAMPLE REFERENCE</th>
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</thead>
<tbody>
<tr>
<td>CROSS SECTIONAL AREA, So (mm²) *</td>
<td>804.2</td>
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<tr>
<td>0.6 Fy (kN)</td>
<td>221.96</td>
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<tr>
<td>PERMANENT ELONGATION AFTER LOADING TO 0.6 Fy (mm)</td>
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<tr>
<td>MAXIMUM LOAD, Fm (kN)</td>
<td>502.27</td>
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<td>TENSILE STRENGTH, Rm (N/mm²)</td>
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<tr>
<td>MODE OF FAILURE</td>
<td>Bar Break</td>
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</table>

Note: * The cross sectional area of the bar were based on the respective nominal diameter as per Table 2 of MS 146: 2000.
# TEST REPORT

**REPORT NO:** 2012CB6178  
**PAGE:** 1 OF 2

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**Applicant:**  
HALFEN MOMENT SDN. BHD.  
28, Jalan Anggerik Mokara 31/59,  
Kota Kemuning, Seksyen 31,  
40460 Shah Alam Selangor.

**Manufacturer:**  
HALFEN MOMENT SDN. BHD.

**Product:**  
Barbreak Coupler

**Reference Standard/Method of test:**  
BS 8110: Part 1: 1997 Code of Practice for Structural Use of Concrete  
Clause 3.12.8.16.2: Bars in Tension.

**Description of sample:**  
Two samples of Barbreak Coupler were received for testing.  
Brand: Moment  
Model: T25 & T32  
Project Title: Auto Taper Machine

**Date received:**  
04th October 2012

**Job No./Ref. No.:**  
J20121266178 / SQAS/CCST/T.REC/MSL/12

**Issued date:**  
11 OCT 2012

Approved Signatories

(MOHAMAD RAZIQI SHA'DUN)  
Technical Executive

(DALHA RAHMAT)  
Group Leader  
Civil & Construction Section  
Testing Services Department
TEST RESULTS : PERMANENT ELONGATION TEST

Clause 3.12.8.16.2: Bars in Tension

The only acceptable form of full strength butt joint for a bar in tension comprises a mechanical coupler satisfying the following criteria.

a - When a test is made of a representation gauge length assembly comprising reinforcement of the size grade and profile to be used and a coupler of the precise type to be used, the permanent elongation after loading to 0.6fy should not exceed 0.1 mm.

b - The tensile strength of the coupled bar should exceed 287.5 N/mm² for Grade 250, 483 N/mm² for Grade 460A and 497 N/mm² for Grade 460B.

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<th>SAMPLE REFERENCE</th>
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<td>CROSS SECTIONAL AREA, So (mm²)*</td>
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<td>0.6 Fy (kN)</td>
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<tr>
<td>PERMANENT ELONGATION AFTER</td>
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<td>LOADING TO 0.6 Fy (mm)</td>
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<tr>
<td>TENSILE STRENGTH, Rm (N/mm²)</td>
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<td>MODE OF FAILURE</td>
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</table>

Note: * The cross sectional area of the bar were based on the respective nominal diameter as per Table 2 of MS 146: 2000.

** The tensile test was not requested by Halfen Moment Sdn. Bhd.
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