APTUS®
concrete connections

INSTALLATION GUIDANCE NOTES

ISO 9001
UKAS MANAGEMENT SYSTEMS
8327

Purpose:
The purpose of these guidance notes is to ensure each connection is made with uniformity and consistency to ensure the integrity of the Aptus Coupler connection.

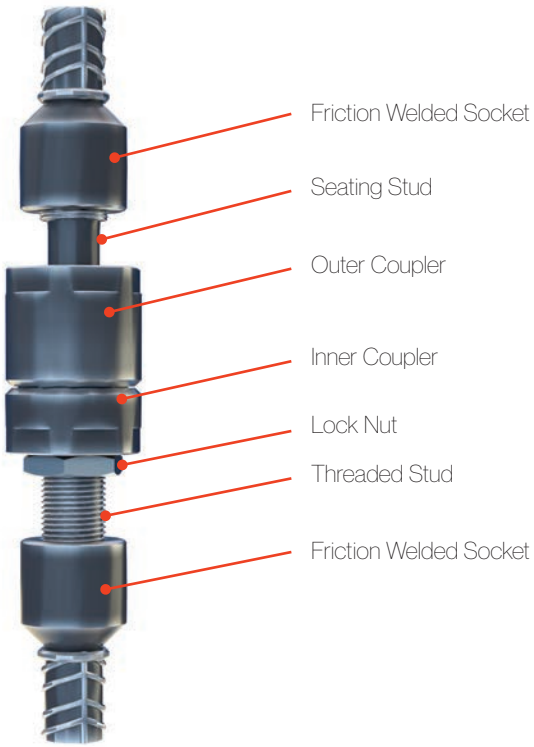
Definitions:
Definition of Snug tight as given in AS4100.

Snug tight - the tightness of a bolt achieved by a few impacts of an impact wrench or by the full effort of a person using a standard podger spanner.

Documentation and Certification

ACTIVITY	RESPONSIBILITY	VERIFICATION
SWMS	Precast Installer	Signed SWMS
Personnel Qualifications	Precast Installer	High Risk Work Licence
Clutch certification	Precaster	Clutch Manufacturer's Certificate
Concrete test report/Cert	Precaster	NATA test report (supplier)
Temp works certification	Precaster	Design Engineer Cert/Letter
Site survey marks	Builder	RLs and Offset marks
QA Photos of columns	APTUS Installer	QA records
Concrete compaction under APTUS column	Concreter	Site Supervisor

Coupler Assembly Components



Precast Element Delivery

Depending on shape and size, the precast elements may be transported in a flat pack arrangement or in a vertical position supported by an "A" frame. The Project Site will determine the order in which the elements are to be delivered. A transport layout is then developed for each load taking into account the weight and size of the elements and the positioning of the elements for transport.

Precast columns arriving on site supported on timber dunnage.

Timbers are to be placed at the end of the columns prior to lifting. This will help to protect the couplers as the column is raised into the vertical position when being lifted off the trailer

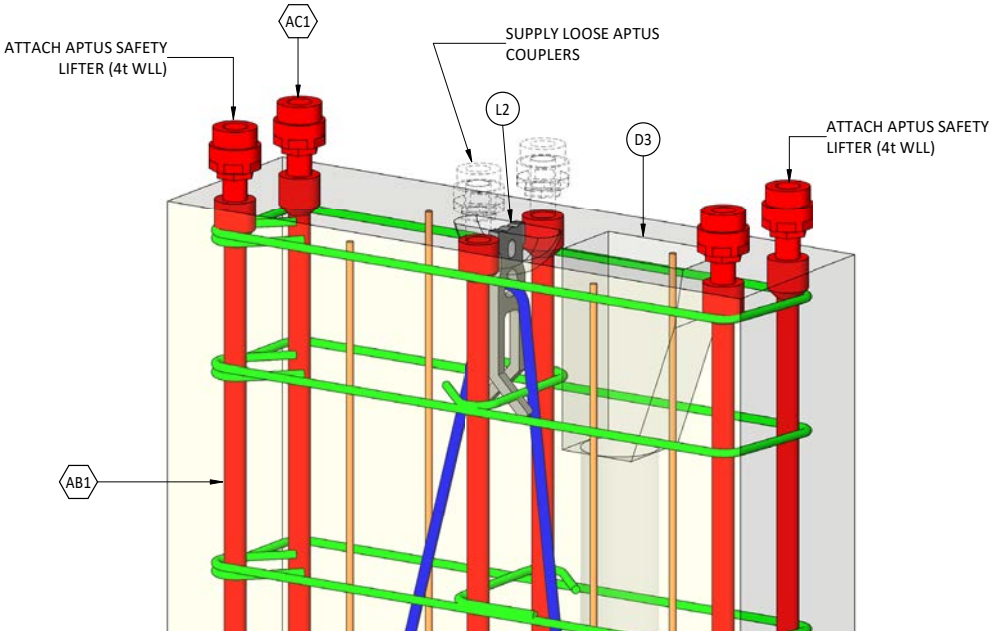
Some elements will not require all Aptus components to be installed before delivery. This maybe due to:

- Aptus safety lifters to be installed
- Aptus components may clash with Lifters during onsite installation
- Aptus lifting plate to be installed to erect element on site

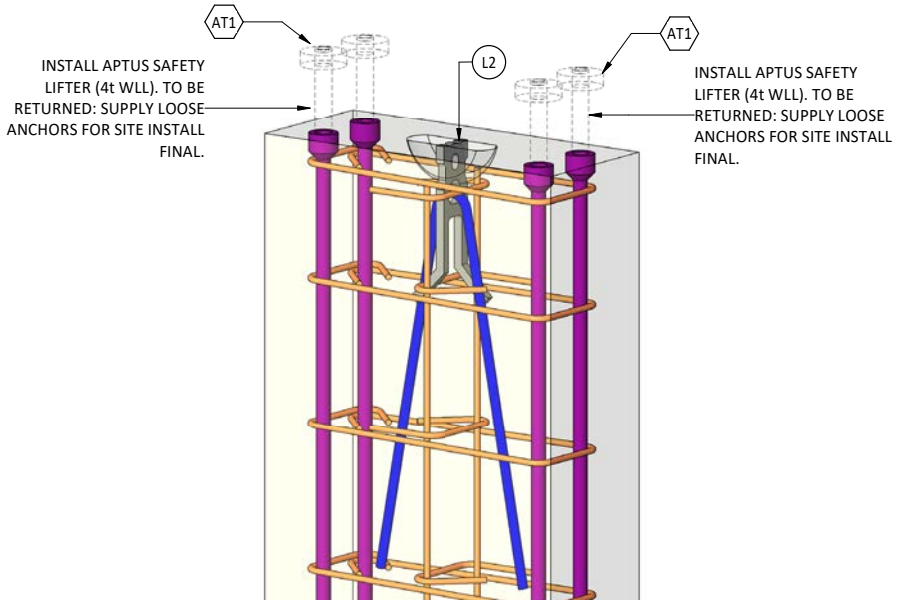
The precast element workshop drawing will provide the information that details the size and orientation of each of the Aptus components. The workshop drawing will also highlight and provide information as to which components will be supplied loose.

Examples of highlighted components and information may include:

- Supply loose Aptus couplers



- Install Aptus Safety Lifter. Supply loose anchors for final site install.



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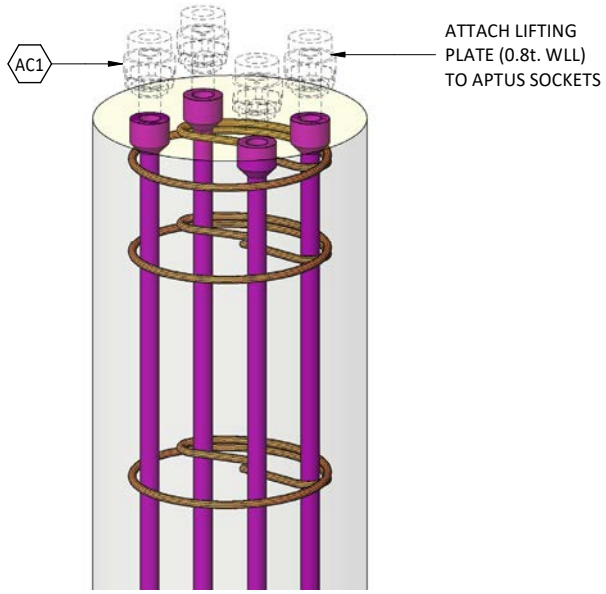


Where this is noted a sticker stating “Aptus Supply Loose” or “Lifting Plate Required” is to be attached to the element. If lifting plate is required, this will mean that the Aptus components will be supplied loose.

Each element’s components are to be placed in a separate box along with the workshop drawing for that element. The box is then taped up and labelled with the Element number, type and quantities of components. This process also applies to any Outer Couplers or Threaded Anchors that have been removed from the bottom of the element for transport. (e.g. coupler landing on part of the “A” frame support when element is being transported.)

The loose component box is to travel to site on the same transport the corresponding element is being delivered on. A photo is to be taken of the transport load and also of each ‘loose supply’ box clearly showing the unit number on each of the boxes to ensure they have been loaded with the corresponding element.

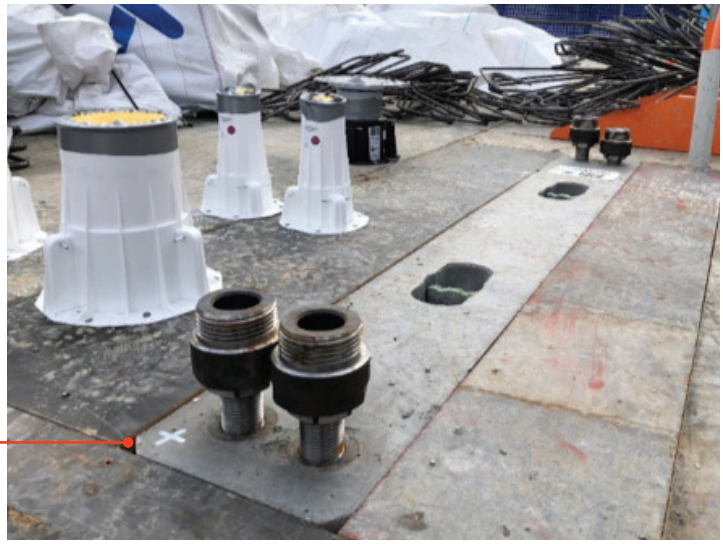
Preliminary Works to Precast Element Erection

Prior to the erection of the precast element the protective plastic caps are removed from the couplers. Select one of the corner assemblies to set to the nominated RL for the precast element. A reference RL is marked on site by the Builders Surveyor generally on part of the structure e.g. the lift core. All the lock nuts can be loosened and wound down to allow for adjustment when setting the couplers to the nominated RL.

Example of RL mark by the Builder's Surveyor

Once the selected coupler has been set to the nominated RL, the lock nut is tightened to secure it in position and a mark placed next to the coupler to indicate that it has been set to level. This coupler assembly is now fixed and is not to be adjusted any further throughout the erection process.

Mark to indicate which coupler is set to level – the "RL" coupler



Setting Couplers to Level

Step 1:
From the coupler that has been set to the RL set the level of the adjacent corner coupler with the use of a spirit level.

Step 2:
From the coupler that has been set to the RL set the level of the parallel corner coupler with the use of a spirit level or with the use of the laser level if the spirit level does not reach.

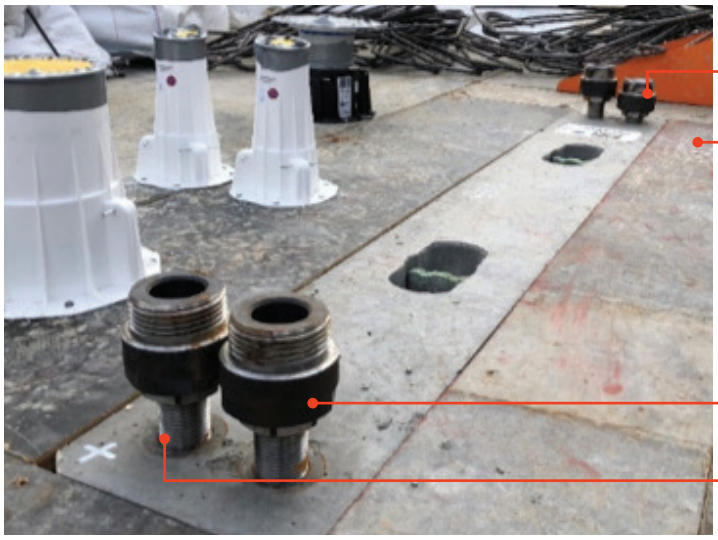
Leave the coupler on the last corner (and any other couplers) wound down below the level of the three couplers set to the correct RL. This prevents interference during the plumbing process. At this point the RL coupler is the only one to which the lock nut has been tightened.

IMPORTANT NOTE:
Only three couplers are used to plumb the precast element.

Setting the level of the adjacent coupler from the RL coupler.

Adjacent Coupler

RL Coupler



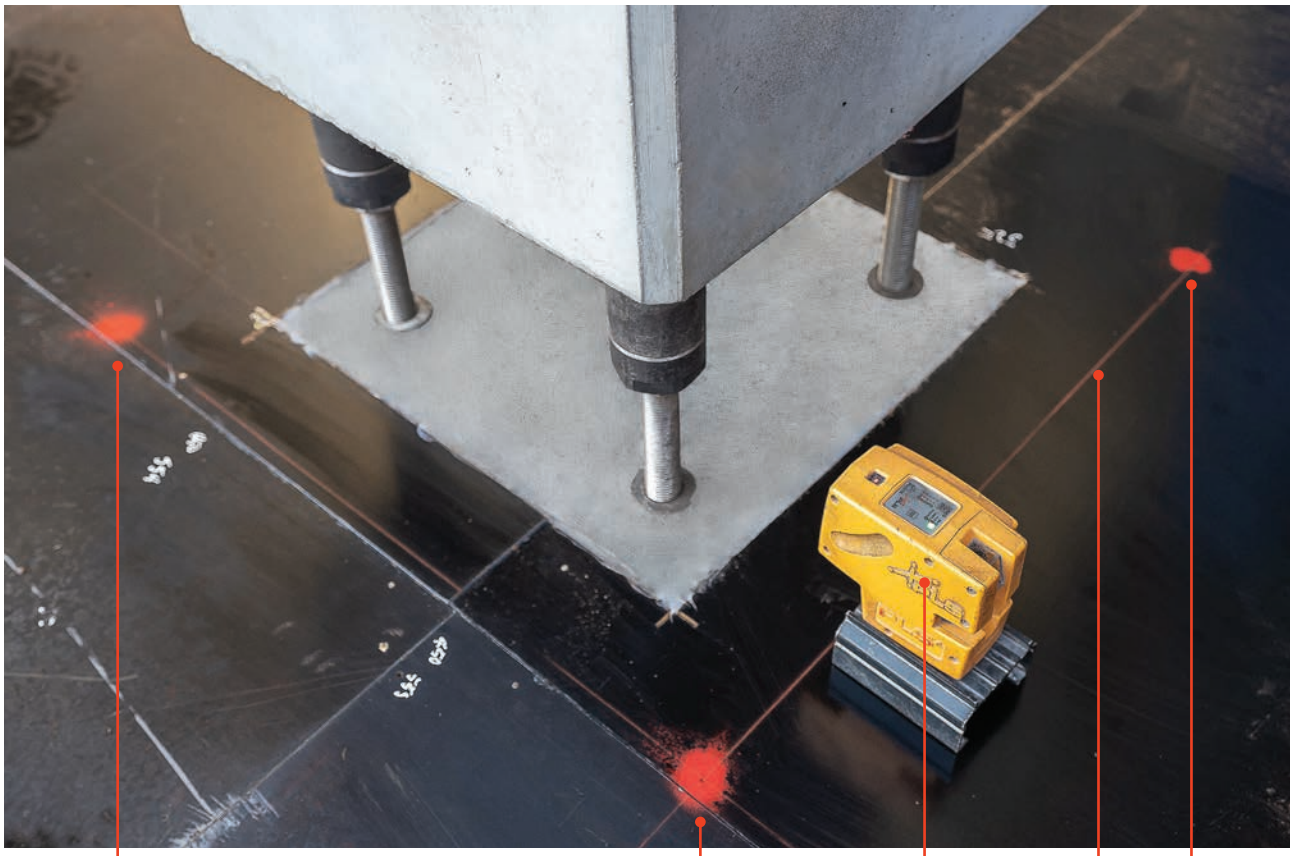
Parallel Coupler

Corner Coupler
(and any other remaining couplers) are set down below the level of other couplers.

Adjacent Coupler

RL Coupler

After the couplers have been set, a chalk line is marked between the offsets that have been set by the site surveyor. This line will be used to set the precast element position during the erection process.



Precast Element Erection Process

The precast element is craned into position under control of the site dogman with directions being given by the precast erection supervisor.

The precast element is lowered until the seating studs come into contact with the inner couplers. The precast element now will be sitting on the three levelled couplers only. The outer couplers are screwed hand tight onto the three “seated” inner couplers which were previously set to level.

NOTE:
The locating pin on the seating head prevents the precast element from slipping sideways off the inner couplers.

Positioning & plumbing the element

Always start on the narrow face first!

Once the couplers have been screwed down the dogman can instruct the crane operator to take a little load off (ensuring the weight of the element is sufficiently "resting" on the three couplers).

The corner coupler (and any other remaining couplers) remain screwed down and disengaged so as not to interfere with the plumbing process.

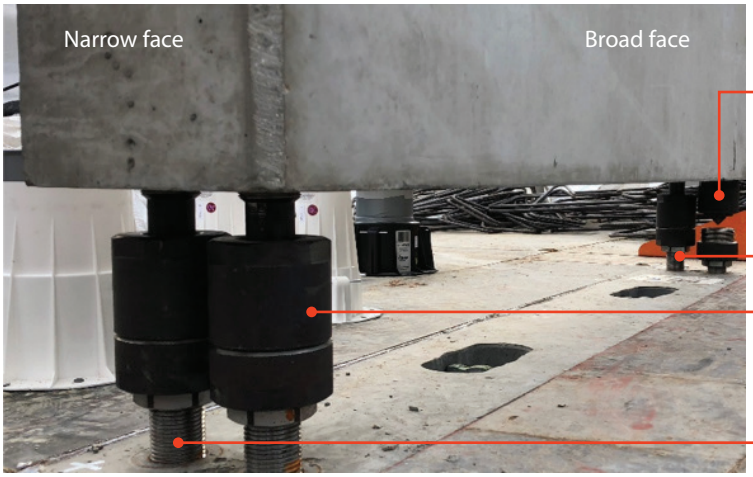
The base of the precast element is then checked for parallel to the surveyed offset lines along the broad face. The lateral tolerance in the coupler allows for minor adjustment if required.

The vertical alignment of the narrow face is to be achieved by adjusting the "parallel coupler" up or down until the desired position is achieved. This is measured by the use of a laser level or spirit level.

The base of the narrow face is checked against the surveyed off-sets. The lateral tolerance in the coupler allows for minor adjustment if required.

The vertical alignment of the broad face is then be achieved by adjusting the “adjacent coupler” up or down until the desired position is achieved. This is again measured using a laser level or spirit level.

In summary, the precast element is erected and plumbed using three couplers only!!! Remaining couplers are engaged only after the plumbing process is completed.



This coupler remains loose until the precast element is plumb. Once the precast element is plumb this coupler can be engaged and tightened.

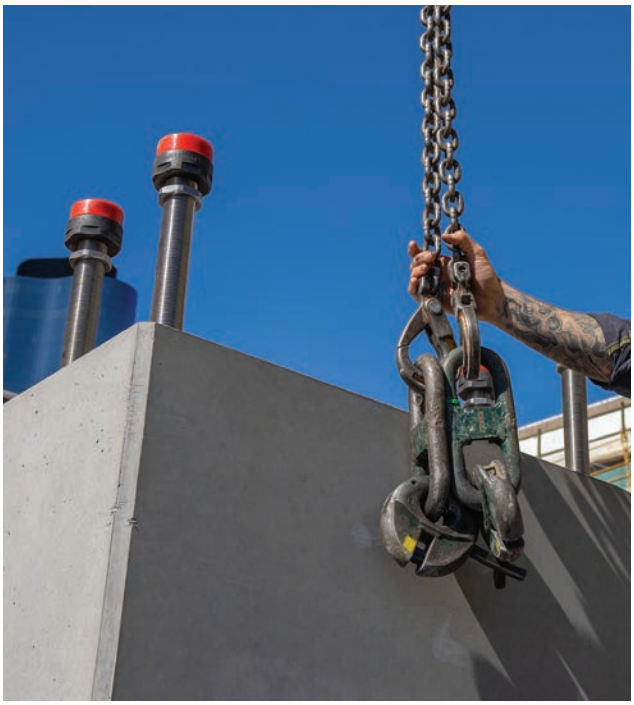
1. The parallel coupler is raised or lowered to plumb the precast element on the narrow face

2. The adjacent coupler is raised or lowered to plumb the precast element on the broad face

The locked in RL coupler is to remain fixed at all times

Now that the element is positioned and plumbed, four couplers can be fully engaged.

Two spanners are used, one to hold the inner coupler in position while the other tightens the outer coupler.



All components are tightened to snug tight

Once four coupler assemblies have been tightened the precast erector will instruct the dogman to release the crane.

Securing the element

The final step is to ensure lock nuts are tightened and secured against every coupler on the element.

This is also done with two spanners, one to hold the coupler in position and the other to tighten the lock nut.

All components are tightened to snug tight.

Where there are multiple coupler assemblies for the precast element, the crane can be released once there have been four coupler assemblies fully engaged and tightened to snug tight. The nominated coupler assemblies that need to be fully engaged and tightened are detailed on the Aptus Typical Details Drawing No. S0050 attached to this document.

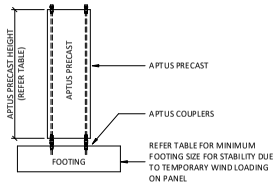
Photos of the fully tightened couplers to be taken as QA evidence that couplers have been fully engaged before concrete pour.

Panel mark to be included in photo.

Adequate compaction of the concrete must be maintained around the Aptus coupler connections. Details for the concrete vibration methods are outlined in Aptus Details Drawing No. S0065 attached to this document.

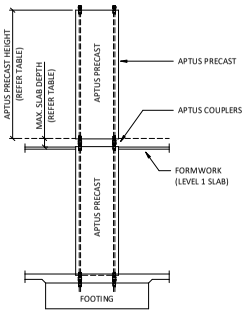
DESIGN ASSUMPTIONS

1. WIND LOAD
   A. REGION : B
   B. TERRAIN CATEGORY: 2.5
   C. IMPORTANCE LEVEL: 2
   D. ULTIMATE WIND SPEED: Vu (100 Yr) = 48m/s
2. 20MPa MINIMUM CONCRETE STRENGTH OF FOOTING, SLAB & COLUMN AT TIME OF ERECTION.
3. FORMWORK SHALL NOT USE THE COLUMN AS A BRACING ELEMENT.



STAGE 1 APTUS PRECAST ERECTION

1. STARTER BARS WITH APTUS SOCKETS CAST INTO FOOTING.
2. FOOTING CONCRETE STRENGTH TO ACHIEVE 20MPa.
3. INSTALL APTUS COUPLERS & ERECT APTUS PRECAST
4. POUR SLAB ON GROUND UNDER BASE OF APTUS PRECAST.

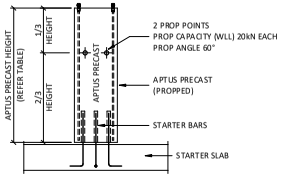


STAGE 2 APTUS PRECAST ERECTION

1. ERECT LEVEL 1 FORMWORK.
2. ENSURE SLAB ON GROUND HAS A MIN CONCRETE STRENGTH OF 20MPa.
3. INSTALL APTUS COUPLERS & ERECT APTUS PRECAST.
4. POUR SLAB.

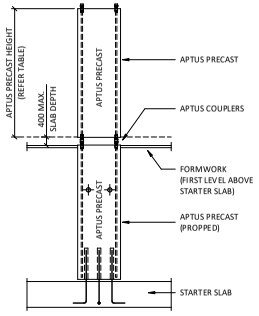
APTUS PRECAST ERECTION PROCEDURE AT PAD FOOTING/PILE

BASEMENT / PODIUM COLUMNS				
COLUMN SIZE	MIN. No. OF COUPLERS	MAX. COLUMN HEIGHT	MAX. SLAB DEPTH	MIN. FOOTING SIZE
1000 x 200	4	4000	500	1500 x 1500 x 800 D
1000 x 300	4	4000	700	1500 x 1500 x 800 D
1000 x 300	6	6000	600	1800 x 1800 x 800 D



STAGE 1 APTUS PRECAST ERECTION

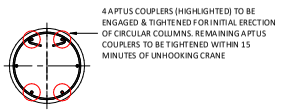
1. STARTER BARS CAST INTO STARTER SLAB.
2. ERECT APTUS PRECAST OVER STARTER BARS & INSTALL PROPS (2 MIN.)
3. GROUT STARTER BAR VOIDS.



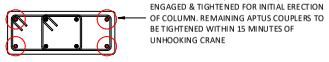
STAGE 2 APTUS PRECAST ERECTION

1. ERECT FIRST LEVEL OF FORMWORK ABOVE STARTER SLAB.
2. ENSURE STARTER SLAB HAS A MIN CONCRETE STRENGTH OF 20MPa AND GROUT AROUND STARTER BARS HAS A MIN STRENGTH OF 20MPa.
3. INSTALL APTUS COUPLERS & ERECT APTUS PRECAST.
4. POUR FIRST LEVEL ABOVE STARTER LEVEL.
5. REMOVE PROPS A MIN OF 3 DAYS AFTER FIRST LEVEL ABOVE STARTER SLAB HAS BEEN POURED

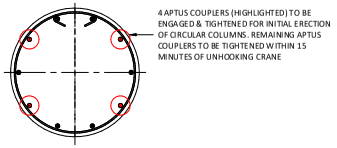
APTUS PRECAST ERECTION PROCEDURE AT STARTER SLAB



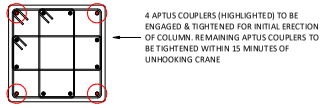
SMALL CIRCULAR COLUMN



RECTANGULAR COLUMN

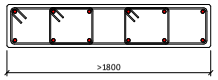


LARGE CIRCULAR COLUMN



SQUARE COLUMN

CIRCULAR COLUMN LIFTING AND INSTALLATION SEQUENCE



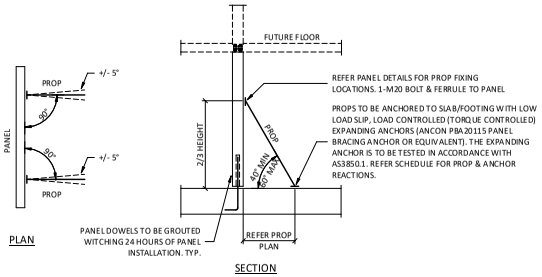
WHERE LENGTH > 1800 - ALL APTUS COUPLERS TO BE ENGAGED & TIGHTENED PRIOR TO CRANE BEING UNHOOKED, UNLESS PRIOR APPROVAL SORT BY PROPPING ENGINEER.

LONG COLUMN LIFTING AND INSTALLATION SEQUENCE

SHORT COLUMN LIFTING AND INSTALLATION SEQUENCE

APTUS ERECTION & PROPPING NOTES

1. APTUS COUPLERS ARE TO BE INSTALLED IN ACCORDANCE WITH APTUS INSTALLATION GUIDANCE NOTE.
2. FOR COLUMNS WITH A MAXIMUM PLAN DIMENSION LESS THAN 1800mm, AND WHERE MORE THAN 4 COUPLERS ARE DETAILED, ONLY 4 APTUS COUPLERS NEED TO BE ENGAGED AND TIGHTENED BEFORE CRANE CAN BE UNHOOKED. THE REMAINING COUPLERS TO BE ENGAGED AND TIGHTENED WITHIN 15 MINUTES OF UNHOOKING THE CRANE. MAXIMUM WIND SPEED AT TIME OF INSTALLATION IS 30 km/h.



PANEL PROPPING AT STARTER SLAB

1. PROPS TO HAVE 20kN MINIMUM SAFE WORKING LOAD AT EXTENDED POSITION.
2. SLAB ON GROUND TO BE 150mm MINIMUM THICKNESS. SUSPENDED SLABS TO BE 150mm MINIMUM THICKNESS. IF SUSPENDED SLAB IS LESS THAN 150mm OR 125mm ABOVE ANY METAL TRAY RIBS, THE CONNECTION MUST BE AN M20 THROUGH BOLT.
3. THE PANEL MUST BE 175mm MINIMUM THICKNESS WITH MINIMUM OF TWO DOWELS AND PROPS. THE MAXIMUM DISTANCE BETWEEN PROPS IS TO BE 2400mm UNLESS PROP IS SPECIFICALLY DESIGNED FOR. PANELS ARE NOT RETAINING MORE THAN 600mm OF SOIL AT IT'S BASE.
4. THE DOWEL IN LOWER PANEL TO BE GROUTED 2 DAYS MINIMUM BEFORE ERECTING THE PANEL OVER. GROUT DOWEL IN NEWLY ERECTED PANEL WITHIN 24 HOURS.

REV	DATE	DESCRIPTION	DWN	DES	CHK	APP
A	16.05.18	UPDATED TO SLAB				
B	25.09.18	UPDATED TO SLAB	AB	BT		
C	05.09.19	UPDATED TO SLAB	AB			BT

APTUS concrete connections

PROJECT
TYPICAL DETAILS

SUBJECT
APTUS PROPPING REQUIREMENTS

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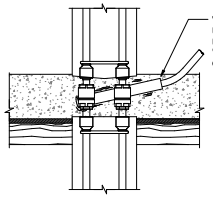
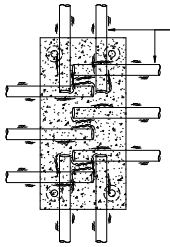
PROJECT No.	DRAWING No.	REVISION
16339	S0050	C

ORIGINAL SIZE A1

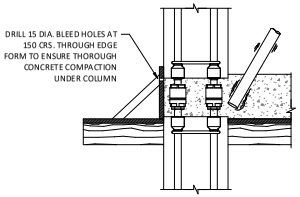
REV	DATE	DESCRIPTION	DWN	DES	CHK	APP
A	16.05.18	UPDATED TO SLAB				
B	25.09.18	UPDATED TO SLAB	AB	BT		
C	31.05.19	UPDATED TO SLAB	AB	BT		
D	02.08.19	UPDATED TO SLAB	MV	BT		



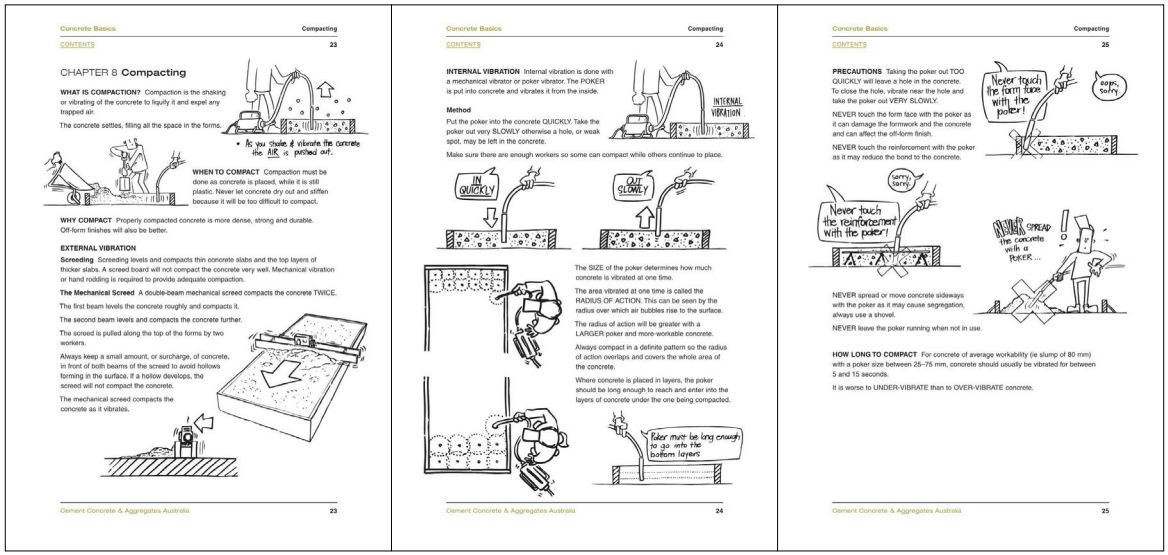
SLAB COMPACTION
AT COLUMN
SCALE 1:10



VIBRATION LOCATIONS
SCALE 1:10



EDGE COLUMN
BLEED HOLE DETAIL
SCALE 1:10



Concrete Basics — Compacting
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CHAPTER 8 **Compacting**

WHAT IS COMPACTION? Compaction is the shaking or vibrating of the concrete to liquify it and expel any trapped air.

The concrete settles, filling all the space in the forms.

• As you shake & vibrate the concrete the AIR is pushed out.

WHEN TO COMPACT Compaction must be done as concrete is placed, while it is still plastic. Never let concrete dry out and stiffen because it will be too difficult to compact.

WHY COMPACT Properly compacted concrete is more dense, strong and durable. Off-form finishes will also be better.

EXTERNAL VIBRATION

Screeding Screeding levels and compacts thin concrete slabs and the top layers of thicker slabs. A screed board will not compact the concrete very well. Mechanical vibration or hand rodding is required to provide adequate compaction.

The Mechanical Screed A double-beam mechanical screed compacts the concrete TWICE.

The first beam levels the concrete roughly and compacts it.

The second beam levels and compacts the concrete further.

The screed is pulled along the top of the forms by two workers.

Always keep a small amount, or surcharge, of concrete, in front of both beams of the screed to avoid hollows forming in the surface. If a hollow develops, the screed will not compact the concrete.

The mechanical screed compacts the concrete as it vibrates.

Cement Concrete & Aggregates Australia 23

Concrete Basics — Compacting
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INTERNAL VIBRATION Internal vibration is done with a mechanical vibrator or poker vibrator. The POKER is put into concrete and vibrates it from the inside.

INTERNAL VIBRATION

Method

Put the poker into the concrete QUICKLY. Take the poker out very SLOWLY otherwise a hole, or weak spot, may be left in the concrete.

Make sure there are enough workers so some can compact while others continue to place.

IN QUICKLY

OUT SLOWLY

The SIZE of the poker determines how much concrete is vibrated at one time.

The area vibrated at one time is called the RADIUS OF ACTION. This can be seen by the radius over which air bubbles rise to the surface.

The radius of action will be greater with a LARGER poker and more-workable concrete.

Always compact in a definite pattern so the radius of action overlaps and covers the whole area of the concrete.

Where concrete is placed in layers, the poker should be long enough to reach and enter into the layers of concrete under the one being compacted.

Poker must be long enough to go into the bottom layers

Cement Concrete & Aggregates Australia 24

Concrete Basics — Compacting
CONTENTS 25

PRECAUTIONS Taking the poker out TOO QUICKLY will leave a hole in the concrete. To close the hole, vibrate near the hole and take the poker out VERY SLOWLY.

Never touch the form face with the poker!

oops, sorry

NEVER touch the form face with the poker as it can damage the formwork and the concrete and can affect the off-form finish.

NEVER touch the reinforcement with the poker as it may reduce the bond to the concrete.

sorry, sorry

Never touch the reinforcement with the poker!

NEVER spread the concrete with a POKER ...

NEVER spread or move concrete sideways with the poker as it may cause segregation, always use a shovel.

NEVER leave the poker running when not in use.

HOW LONG TO COMPACT For concrete of average workability (ie slump of 80 mm) with a poker size between 25–75 mm, concrete should usually be vibrated for between 5 and 15 seconds.

It is worse to UNDER-VIBRATE than to OVER-VIBRATE concrete.

Cement Concrete & Aggregates Australia 25

Cement Concrete Aggregates Australia (2010), *Concrete Basics - A Guide to Concrete Practice, 7th Edition*, Chapter 8 Compacting, online at http://www.ccaa.com.au/imis_prod/documents/ConcreteBasics.pdf

APTUS™ concrete connections

PROJECT
TYPICAL DETAILS

SUBJECT
CONCRETE COMPACTION REQUIREMENTS

PROJECT No.	DRAWING No.	REVISION
16339	S0065	D

ORIGINAL SIZE A1

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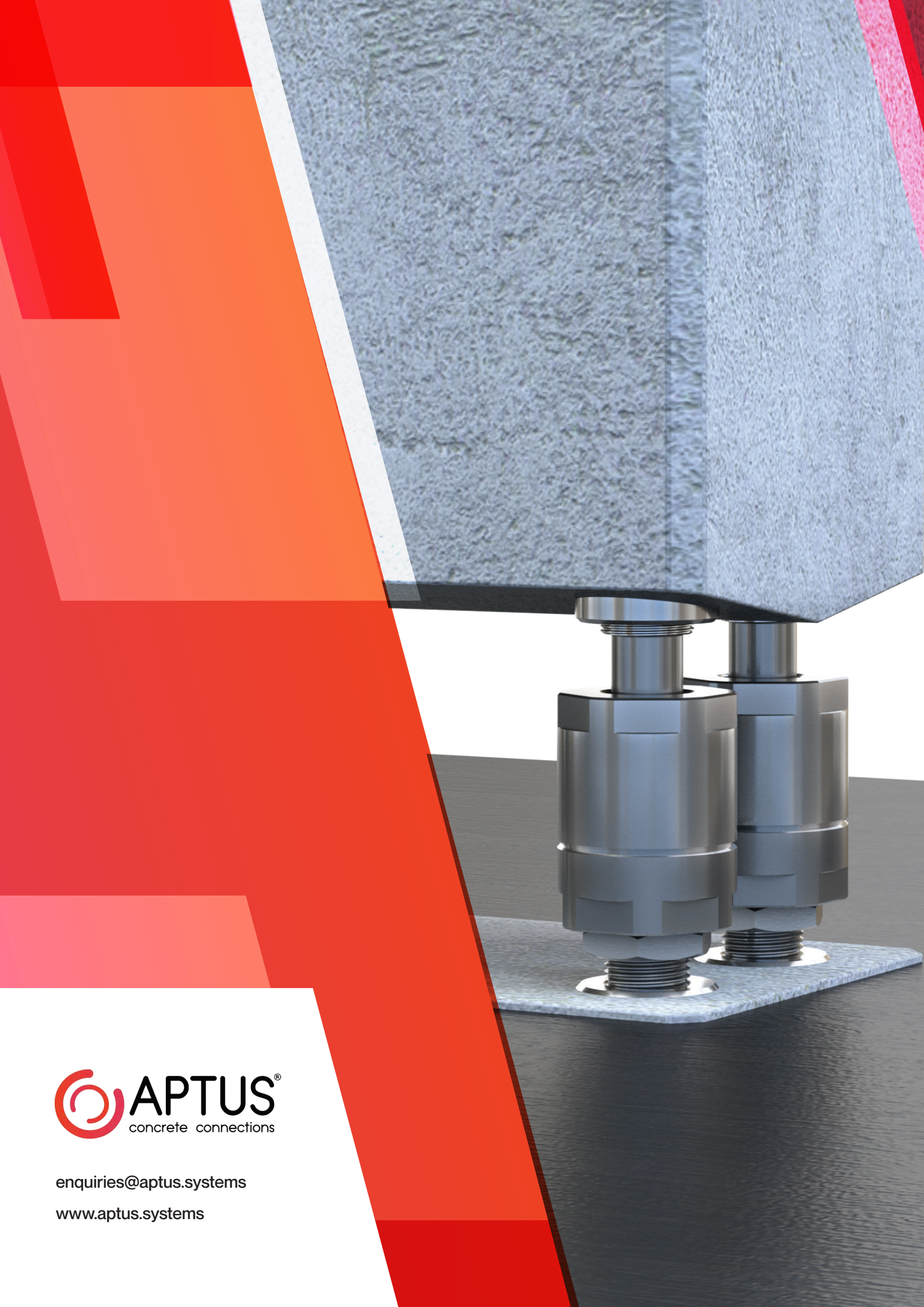

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