



PRECAST MANUFACTURE
GUIDANCE NOTES

2019

CONTENTS

2 Scope and Purpose	3
3 References	3
4 Quality Management System	4
5 Inspection and Test Plan	4
6 Material Procurement	4
7 Process Development	5
7.1 Workshop Drawings	5
7.2 Reinforcement	6
7.3 Pre-pour Inspection	9
7.4 Concrete Acceptance	9
7.5 Early Strength	9
7.6 Post-pour Inspection	9
7.7 Aptus coupler assembly	10
7.8 Delivery	17
8 Quality Records	17
8.1 Identification and Traceability	17
9 Table 1	18

2 SCOPE AND PURPOSE:

Aptus manufactures and supplies reinforcement mechanical coupler systems for use in precast concrete elements for the construction industry. The coupler system is typically used in the vertical precast concrete elements that form part of the integral structure of high-rise apartment and office buildings although the system can be adapted to suit any precast concrete structure.

The purpose of this document is to provide the guidelines for the precast manufacture process utilizing Aptus components. The manufacturing process is to be carried out with uniformity to ensure the integrity of the Aptus Coupler connection and to consistently provide product that meets customer and regulatory requirements.

These notes are a guide only and it is Precast manufacturer's responsibility is to ensure they meet the requirements of applicable standards and statutory obligations that apply to their local industry.

3 REFERENCES:

Australian and International Standards

ISO 9001:2015 Quality Management System

AS 3600 Concrete Structures

AS 1012.3.1 Methods of Testing Concrete

AS/NZ 4671 Steel Reinforcing Materials

BS 4449 2005: Steel for the Reinforcement of Concrete

BS EN 1992-1-1 Design of Concrete Structures

BS EN 12350-2 Testing fresh concrete

BS 1881 Testing Concrete

4 QUALITY MANAGEMENT SYSTEM

The Precast Manufacturer shall establish, implement and maintain a Quality Management System accredited to ISO 9001:2015 that complies with APTUS requirements, Agreements or Contracts.

Manufacturing activities shall be carried out in accordance with the provisions of the Manufacturer's Quality System which shall comply with ISO 9001:2015.

5 INSPECTION AND TEST PLAN

The Precast Manufacturer is to develop and implement an Inspection and Test Plan that covers all aspects of the manufacturing processes inclusive of compliance testing. The ITP will provide details for the positive identification and traceability of all work activities, measurements and tests.

Inspection and test procedures shall be included in an Inspection and Test Plan and shall include:

- The work process and associated inspection and test points;
- The allocation of responsibilities for carrying out the inspections and testing;
- The required frequency of the inspections and testing;
- The methods to be used for measurements and tests;
- The criteria for acceptance;
- Measurements or tests which involve use of calibrated equipment; and
- All Hold Points

Hold Point means an identified point in a process beyond which manufacturing shall not proceed without the nominated authorization to proceed past a specified hold point (e.g. Designated concrete lifting strength)

6 MATERIAL PROCUREMENT:

All material and component suppliers shall have a Quality Management System accredited to ISO 9001:2015. In addition, reinforcement suppliers are to be ACRS approved (Australia), CARES approved (UK). Reinforcement is to comply with AS/NZ 4671 (AUS), BS 4449 (UK). All reinforcement records shall be maintained, these include the Reinforcement tag, Heat Numbers and associated Mill Certificates.

Aptus Bars, Components, End Shutters and Fabrication Ancillaries are supplied by Aptus. Aptus End Shutters can be fabricated by precast manufacturers but must strictly adhere to Aptus specifications.

The Concrete Mix Design is to be approved by the client prior to production. The Concrete Mix Design Approval shall constitute a Hold Point.

Concrete testing Laboratories are to be NATA approved (AUS), UKAS approved (UK).

7 PROCESS DEVELOPMENT:

The Precast Manufacturer is to develop and maintain pre-set procedures and work processes. Checks shall be performed at each stage of production to ensure product conformity.

7.1 WORKSHOP DRAWINGS

Production on a precast element is not to commence until the Workshop drawing approved by the client has been issued "For Construction". Workshop drawing approval shall constitute a Hold Point.

Typical Aptus information on a workshop drawing:

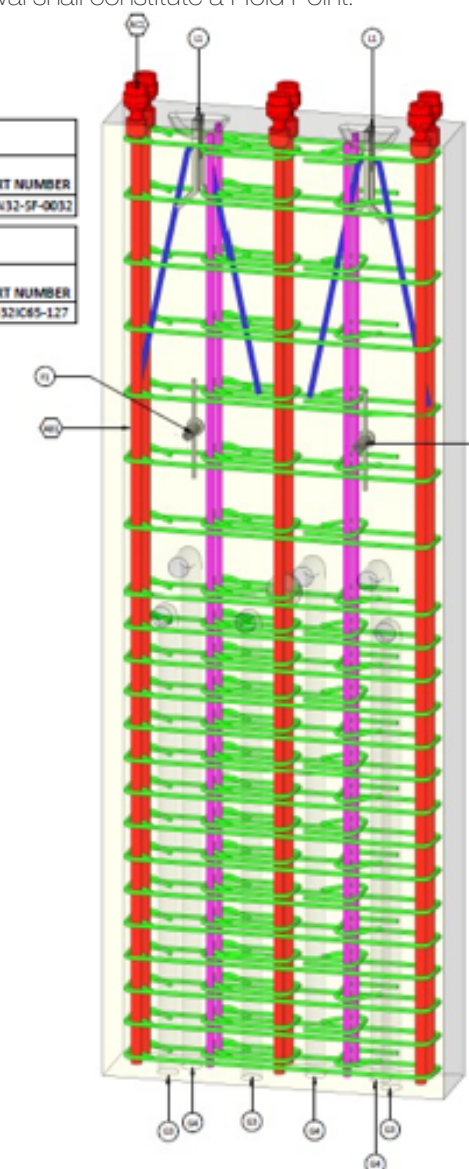
APTUS BAR SCHEDULE						
ITEM NUMBER	COMPONENT	A	B	PIN DIA.	Q/A LENGTH	QTY. PART NUMBER
AB1	N32 (M36) STRAIGHT FEMALE BAR	2855	0	0	2855	6 SB-N32-SF-0032

APTUS - INSTALL PRIOR TO DISPATCH				
ITEM NUMBER	COMPONENT	Q/A LENGTH	QTY.	PART NUMBER
AC1	N32 (M36) INNER COUPLER ASSEMBLY - 127 STUD		6	SA-S2IC65-127

Typical Workshop Drawing Title Block

STATUS: FOR CONSTRUCTION	
CLIENT	
PROJECT	
SUBJECT	
PROJECT No. - DRAWING No.	260-05TC007
REVISION	A

ORIGINAL SIZE A1



7.2 REINFORCEMENT

The reinforcement cage is fabricated external to the casting bed and transferred to the casting bed according to production schedule requirements. The reinforcement cage is to be tagged with the Precast Element Unique Identification mark. For traceability all reinforcement information (heat numbers, mill certs) and Aptus component IDs that were used in the cage fabrication shall be recorded against the Precast Element Unique Identification mark on a reinforcement inspection check sheet. The reinforcement inspection check sheet will form part of the quality records for the precast element.



Always fix the bottom shutter to the fabrication jig first, ensuring it is held square and secure.



Aptus bars can then be secured to the bottom shutter and conventional reinforcing placed loosely in position.

Securing the Aptus bars to the bottom shutter first ensures the latter fitment of the Outer couplers is consistent – this provides for a much quicker installation process on site.



The top shutter is then secured to the Aptus bars and the conventional reinforcement fixed



There is no jig required to fix the top shutter, it is held in position by the Aptus bars.



Completed reinforcement cages



Any tolerance adjustment in the Aptus bars ($\pm 5\text{mm}$) is always taken into account at the top of the precast element – any discrepancy is taken up later through the adjustment provided by the Inner Coupler.



- ① The fabricated reinforcement cage is then placed on the casting bed.
- ① Industry standard side shutters are simply clamped in position against the top and bottom shutters on the casting bed.
- ① Standard concrete placement processes

7.3 PRE-POUR INSPECTION

Pre-pour inspections are to be undertaken prior to ordering concrete. Pre-pour inspection sign off approval shall constitute a Hold Point. Pre-pour inspections are checked against the approved workshop drawing. Inspections are to ensure correct dimensions, reinforcement cage orientation, cast in items etc. The Hold Point for pouring cannot be passed until the Pre-pour inspection indicates the element is conforming. The pre-pour inspection checklist will form part of the quality records for the precast element.

7.4 CONCRETE ACCEPTANCE

Each concrete delivery is to be checked for acceptance as per the approved mix design. Concrete acceptance approval shall constitute a Hold Point. The check is to confirm the correct concrete mix has been supplied, slumps and added water are as per the approved mix design. The element identification, concrete delivery docket and test information will be recorded on the concrete tester's field sheet. This will form part of the quality records for the precast element.

7.5 EARLY STRENGTH

Early strength of concrete as per Design requirements is to be confirmed before removal of the forms and lifting of the precast element. Early strength confirmation shall constitute a Hold Point. The early strength confirmation will be provided by the approved concrete testing laboratory. A concrete test certificate in the approved format is to be provided and will form part of the quality records for the precast element.

7.6 POST-POUR INSPECTION

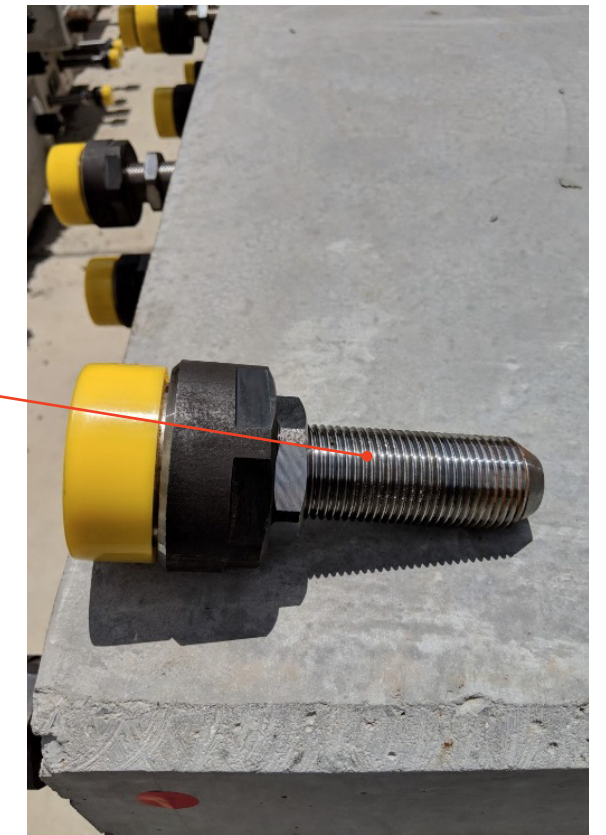
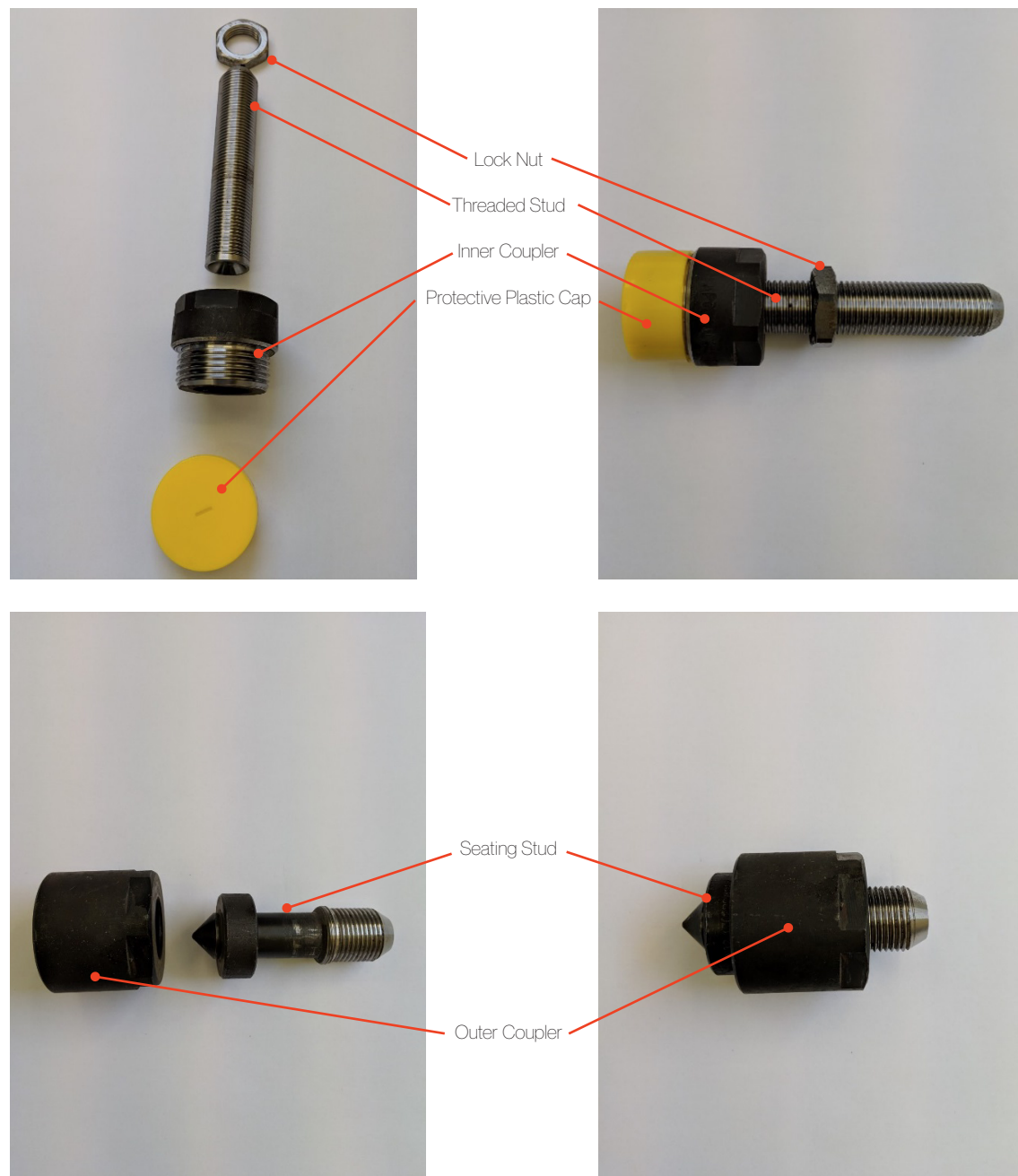
Post pour inspections are checked against the approved workshop drawing once the element has been lifted from the casting bed and taken from the casting area. The unique identification label is now fixed to the precast element. Once the element is in the dressing area post-production checks are undertaken. Inspections include checking the surface finish is to Client/Specification requirement, any rectification to be undertaken, dimension checks, fixtures and inserts located. The inspection check sheet will form part of the quality records for the precast element.

7.7 APTUS COUPLER ASSEMBLY

PC-PRO4-01

- Following standard post-production procedures, the Inner Coupler Assemblies are secured into the top of the precast element and the Outer Coupler Assemblies are secured into the bottom of the precast element. When installing Aptus components, refer to the workshop drawing for that element for correct orientation and component sizes.
- When installing components – DO NOT FORCE THE THREAD -. If the component starts to bind – IMMEDIATELY STOP- Notify your Supervisor for corrective action.
- Precast elements are then placed into storage and are now ready for delivery to site.

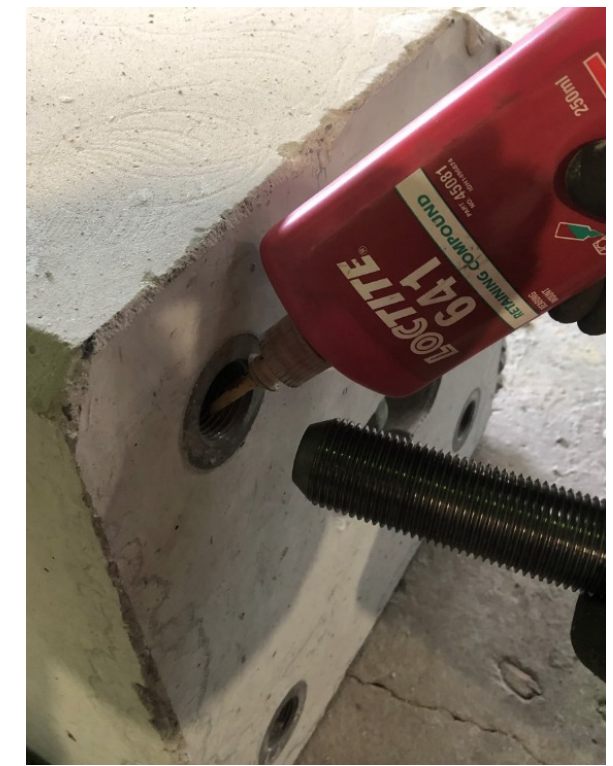
COUPLER ASSEMBLY COMPONENTS



Ensure socket is clean and free of debris.

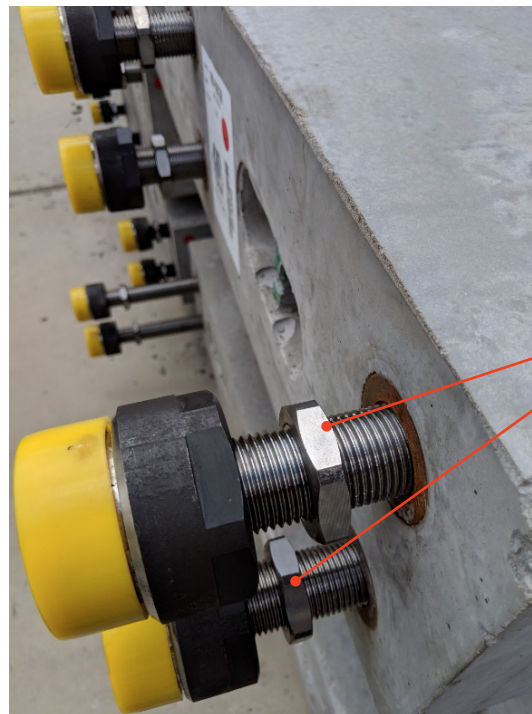


Screw the inner coupler assembly into the socket. Loctite 641 Retaining Compound is to be applied to the female threads located within the friction





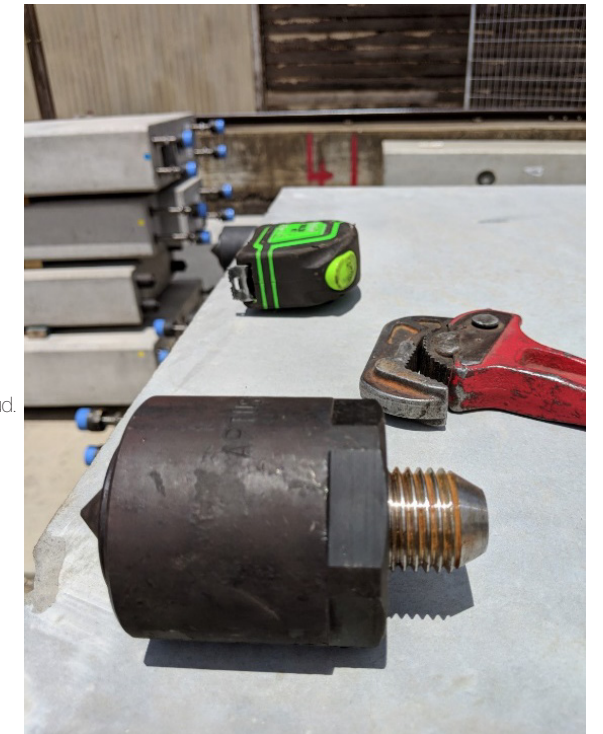
Once the Inner Coupler Assembly has been wound into position, do a check measurement to ensure the correct length stud has been used.
Then tighten to "Snug Tight" with the use of an adjustable pipe wrench.



Once the Inner Coupler Assembly has been tightened the lock nuts are loosened off to allow for the installation process on site.

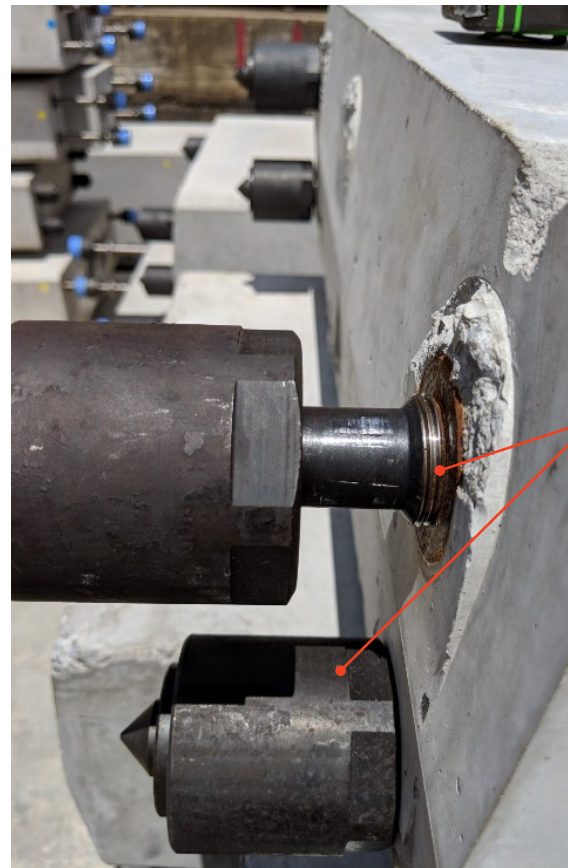


Wind the Outer Coupler down off the threaded section on the seating stud.



Ensure the socket is clean and free of debris before screwing in the seating stud. Loctite 641 Retaining Compound is to be applied to the female threads located within the friction welded sockets. Tighten the seating stud to "Snug Tight" with the use of an adjustable pipe wrench.





Once the seating stud is fixed into position, wind the Outer Coupler back up onto the threaded section of the Seating Stud. This will allow for the positioning of the Seating Stud during the installation process on site.



Precast elements in storage ready for delivery to site.

Precast Element Delivery Loose Supply of Components Lifting Plate Required

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.

Some elements will not require all Aptus components to be installed before delivery.

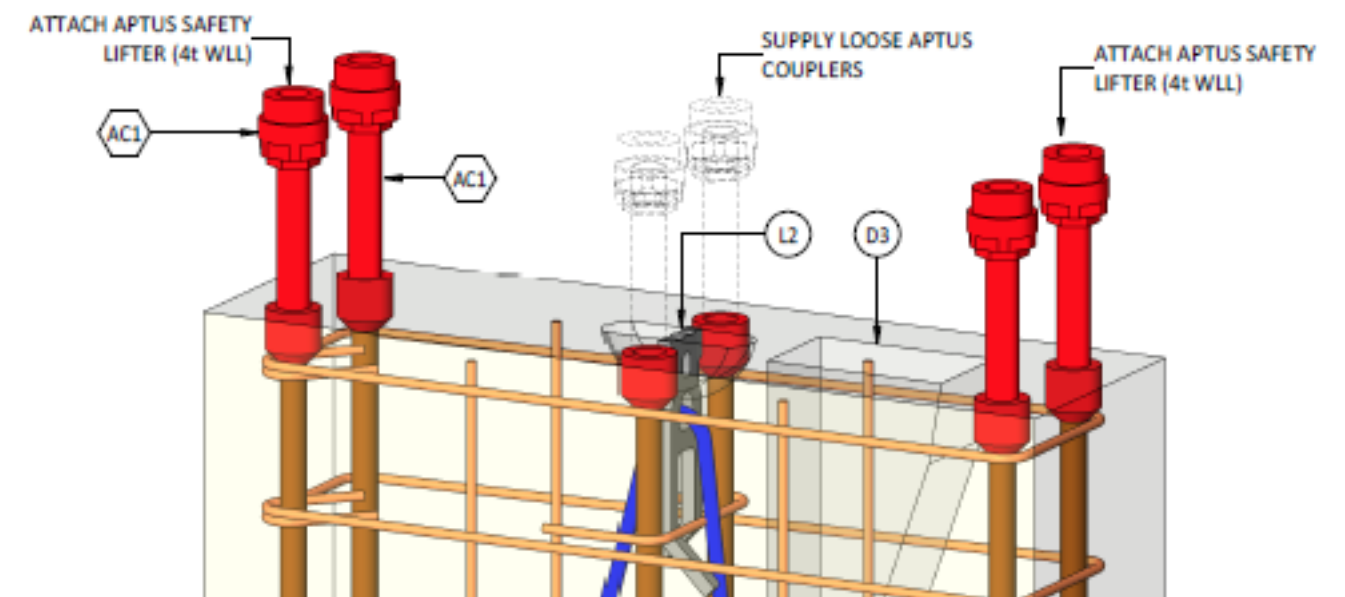
This maybe due to:

- ⦿ 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.

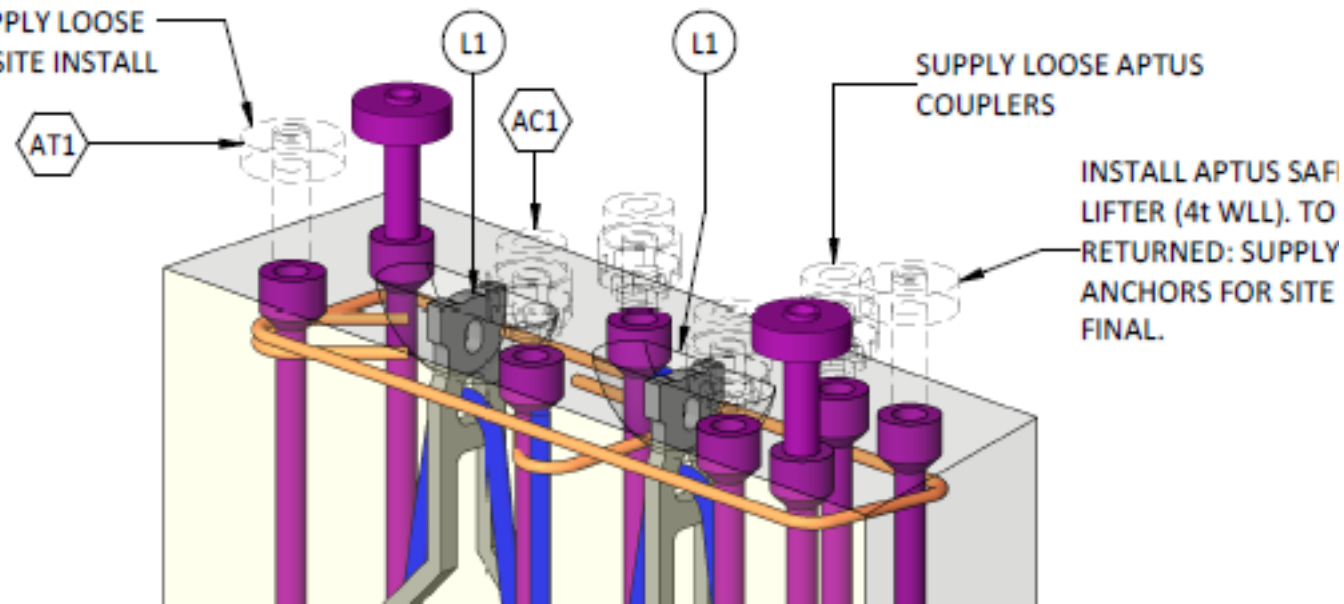
Examples of highlighted components and information may include:

- ⦿ Supply loose Aptus couplers

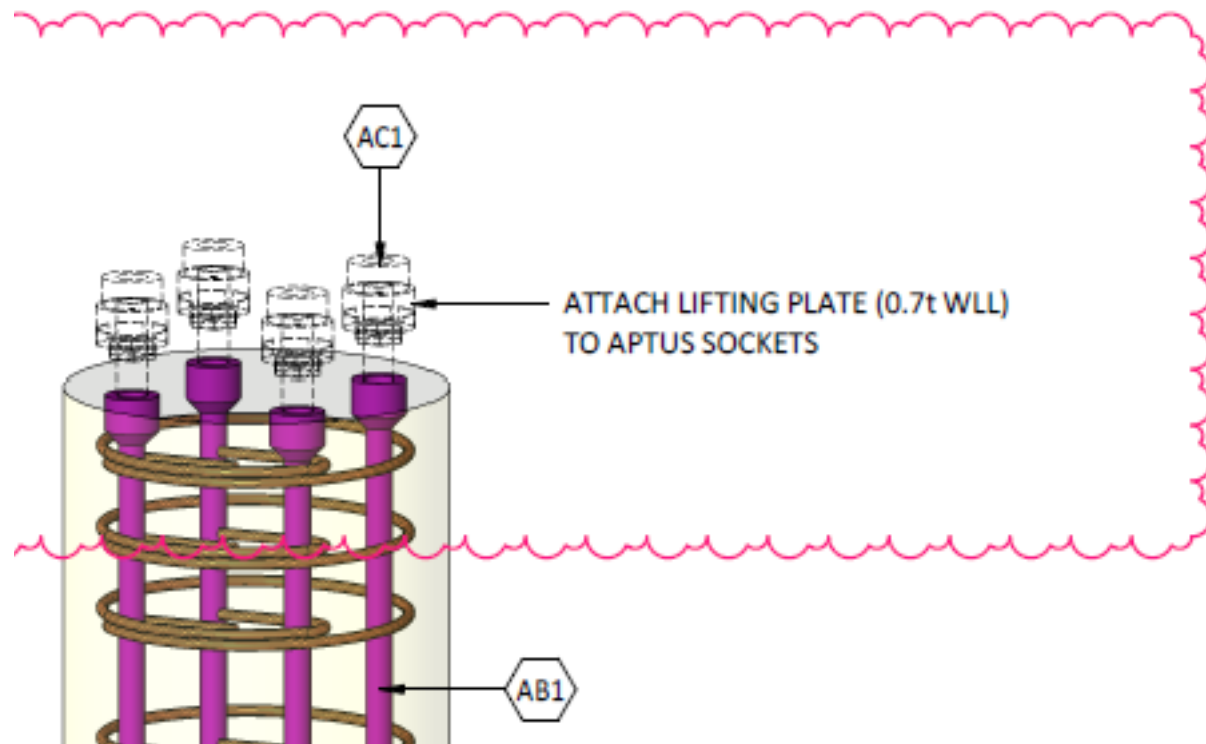


☉ Install Aptus Safety Lifter. Supply loose anchors for final site install.

APTUS SAFETY
(t WLL). TO BE
ED: SUPPLY LOOSE
S FOR SITE INSTALL



☉ Attach lifting plate to Aptus couplers



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.

7.8 DELIVERY

Record checks of each precast element are to be verified before the delivery of the precast element to site. The record check shall constitute a Hold Point. A list of records for each element is outlined in Table 1. All records must be available before an element can be delivered to site.

8 QUALITY RECORDS:

The Precast Manufacturer shall, from the commencement of each Precast Supply Contract until the completion of that Precast Supply Contract, establish, file and maintain at its facility for inspection by Aptus or other Interested Parties up-to-date records which demonstrate implementation of the Precast Manufacturer's Quality Management System.

The Precast Manufacturer shall retain all production records for each precast element in accordance with the Manufacturer's statutory requirements and company policy.

The manufacturing records that shall be retained are outlined in Table 1.

8.1 IDENTIFICATION AND TRACEABILITY

Each precast element shall have a unique identification which will be marked on the element by a means of a label that is sufficiently durable to remain intact until the element is erected on site. The label will state the date of manufacture, unique element identification and the weight of the element. The unique identification is generated from the unit's individual element number defined in the approved workshop drawing. The element identification shall be referred to in all process inspections and test records. This will allow for traceability to each precast element.

9 TABLE 1

Inspection/Test Point		Conformance Criteria	Frequency	Record
Workshop drawings approved by client prior to issue for production	Hold Point	Design Drawings	Each element	Transmittal register, client correspondence
Concrete mix design approval	Hold Point	Project Specifications	Initial	Client Correspondence
Reinforcement Traceability		AS/NZ 4671 BS 4449	Each Precast Element	Reinforcement Tag, Heat Number, Mill Certificate of all reinforcement used in the Precast Element
Aptus Components		Approved Workshop Drawing	Each Precast Element	Manufacture mark of each Aptus component used in the Precast Element
Reinforcement cage inspection – prior to placing in forms		Approved workshop drawings	Each Precast Element	Inspection sheet sign off
Pre-pour inspection – prior to ordering concrete	Hold Point	Approved Workshop Drawing	Each Precast Element	Inspection sheet sign off, Photos of reinforcement cage set up prior to pour.
Concrete Acceptance	Hold Point	Project approved mix design	Each concrete delivery	Concrete delivery docket, concrete tester's field sheet
Concrete Testing		4 Cylinders per sample:1 Day Test x 1 - Stripping and Lifting 28 Day Test x 3 Note: Minimum 2 for 28day tests. Extra 1 should a further early strength test be required.	4 samples every 50 m3 or part thereof	Concrete tester's field sheet, concrete delivery docket, concrete test report
Form removal and lifting	Hold Point	Design lifting strength has been achieved	Each Precast Element	Concrete Test Report
Post Pour Inspection		Approved Workshop Drawing	Each Precast Element	Post pour inspection sheet sign off
Delivery of elements to site – approved for delivery status required	Hold Point	Inspection and Test Plan	Each Precast Element	As stated in Pre-caster's ITP
Project Quality Records		Precast Quality Plan	Each Precast Element	As stated in Pre-caster's ITP



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