HYDROSTATIC TEST FOR ENCAPSULATED SYSTEMS

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Introduction

This report documents the results of the Hayes Industries, Ltd. Encapsulated Anchorage Systems.

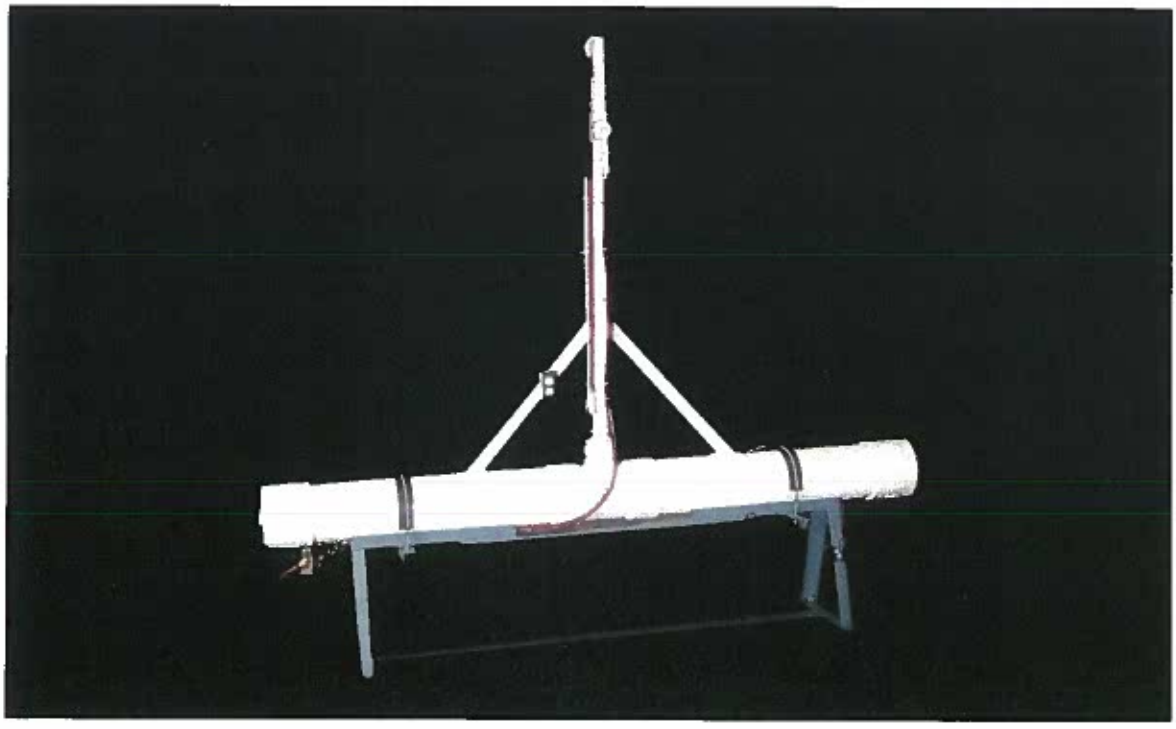
All components were tested as required by the **Post-Tensioning Institute's Field Procedures Manual 3rd Edition, Specification for Un-bonded Single Strand Tendons 2nd Edition, and The Manual for Certification of Plants Producing Un-bonded Single Strand Tendons 3rd Edition**. The testing was performed on representative samples from production runs selected and assembled by Hayes Industries' technicians. The testing procedures and the documented results were certified by an independent outside testing laboratory selected by Hayes Industries, Ltd. that is certified under ASTM C1077, as required by Post-Tension Institute's specifications for un-bonded single strand tendons.

Test Methodology / Scope

The hydrostatic testing of the Hayes Industries, Ltd. Encapsulation Systems was performed in accordance with the specification for un-bonded single strand sections 2.2.6.1 anchorages, C2.2.6.1 anchorages, 2.2.6.2 encapsulated systems, C2.2.6.2 encapsulated systems, 2.3.5 aggressive environments, C2.3.5 aggressive environments, 3.2.3.3 aggressive environments, 3.2.4.4 aggressive environments, 3.5.2 aggressive environments, C3.5.2 aggressive environments (See Tab III).

Test Equipment

The test assembly included a steel stand that held a PVC hydrostatic test chamber, a fluid tank with pump and hydrostatic pressure stack with fluid level measure. This test assembly is shown below. (See Diagram)



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PTI Guide Specification

Specification for Unbonded Single Strand Tendons

(The following contains all areas of the PTI specification that are related to the testing and installation of the encapsulated anchorage system.) The requirements used for the testing of the Hayes Industries, Ltd. Encapsulated Systems are underlined.)

2.2.6 Anchorages and Couplers in Aggressive Environments

2.2.6.1 Anchorages

Anchorages intended for use in aggressive environments shall be protected against corrosion. A watertight connection of the sheathing to the anchorage and watertight enclosure of the wedge cavity and prestressing steel is required to provide corrosion protection of the anchor, wedge, and prestressing steel at the fixed end, intermediate, and stressing end anchorages. Anchorages shall be designed to attain watertight encapsulation of prestressing steel and all connections shall have demonstrated the ability to remain watertight when subject to hydrostatic pressure of 1.25 psi (0.0086 Mpa) for a period of 24 hours.

C2.2.6.1 Anchorages

Corrosion protection of the anchorage may be obtained by various means, including epoxy coating or plastic encapsulation. The use of epoxy coatings is acceptable; however, special inspection is required to identify damage that can occur to the epoxy system during transportation, handling and installation. Damaging the epoxy coating would breach the encapsulation and make the system unacceptable. Encapsulation systems that employ the use of "bare" metallic anchorages produced from a material that is subject to corrosion are unacceptable.

When testing an encapsulated assembly for water tightness, the specimen should be arranged in a horizontal position to ensure equal hydrostatic pressure of 1.25 psi (0.0086 Mpa) (minimum) over the entire length of the specimen length. The hydrostatic pressure of 1.25 psi (0.0086 Mpa) approximates 3 feet (1m) of hydrostatic head. This pressure is considered to be a worst case situation for normal beam and slab applications. For structures where the hydrostatic head may exceed 3 feet (1 m) (for example swimming pools, tanks, beams, or slabs below grade) the project specification should require a more stringent test performance.

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It is recommended that hydrostatic testing include the following additional requirements:

A) Testing should be certified by an outside independent testing laboratory selected by the system manufacturer. The independent testing laboratory should be certified under ASTM C1077.
B) Representative samples from production runs selected and assembled by the manufacturer should be used in testing
C) Stressing-end, intermediate, and fixed-end assemblies should each be tested.
D) Three tests are required for each assembly with all three passing for the system to pass.
E) Retesting is required whenever a component of an assembly changes or the testing criteria changes.
F) The manufacturer of the encapsulation system should provide identification of all component part of their individual system and provide assembly instructions that will be sent to the field for the system tested.
G) The following method should be used for detecting the presence of moisture:
    i) Add white pigment to the P-T coating
    ii) Use a colored dye in the water that will contrast with the white color of the P-T coating.
    iii) The "Pass" criteria is no colored dye staining, anywhere on the white P-T coating, inside the encapsulation system.

Encapsulation systems using components from different manufacturers are acceptable provided they are tested with A-G above.

2.2.6.2 Encapsulated Systems

Encapsulation systems using "tape" as a component are acceptable provided they pass all requirements of the hydrostatic water test and the requirements of Section 3.2.5.2.

Sleeves used to connect the sheathing to the anchorages of encapsulated systems shall meet the following requirements:

A) Meet or exceed the same requirements as the sheathing for durability during fabrication, transportation, handling, storage, and installation.
B) Have 50 mil (1.25 mm) minimum thickness.
C) Have a positive mechanical connection to the anchorage at all stressing-ends, intermediate and fixed ends.
D) Have a minimum 4 in. (100 mm) overlap between the end of the extruded sheathing covering the prestressing steel and the end of the sleeve and the seal.
E) Be translucent or have other method of verifying the absence of voids in the P-T coating material.
F) Be translucent or have other method of verifying overlap with sheathing.

Sleeves on the stressing end of the intermediate anchorages must be long enough to cover the sheathing removed during stressing and have the required 4 in. (100 mm) overlap.

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2.3.5 Aggressive Environments

The sheathing connection to sleeving at couplers and to all stressing-end, intermediate, and fixed-end anchorages shall be watertight and free of air voids.

C.2.3.5 Aggressive Environments

This requirement ensures complete encapsulation of the tendon from end to end. A watertight connection may be achieved by either using special connector pieces that provide a watertight connection to the anchor at one end and to the sheathing at the other end, or by other means meeting the water tightness test performance criteria. For water tightness testing requirements, refer to C.2.2.6.1.

3.2.3.3 Aggressive Environments

In aggressive environments, caps and sleeves shall be installed within one working day after the acceptance and approval of the elongation records by the Engineer.

3.2.4.4 Aggressive Environments

Fixed end anchorages intended for use in aggressive environments shall be covered at the anchor cavity side with a watertight cap. The cap shall be shop installed, after coating and filling the tendon tail and wedge area with the same P-T coating used over the length of the tendon.

3.5.2 Aggressive Environments

Before grouting stressing pockets, stressing-end anchorages intended for use in aggressive environments shall be sealed with a watertight cap filled with P-T coating.

C3.5.2 Aggressive Environments

The design of the stressing end cap should provide for a method of visual inspection to verify that the cap is filled with P-T coating and has been properly installed.

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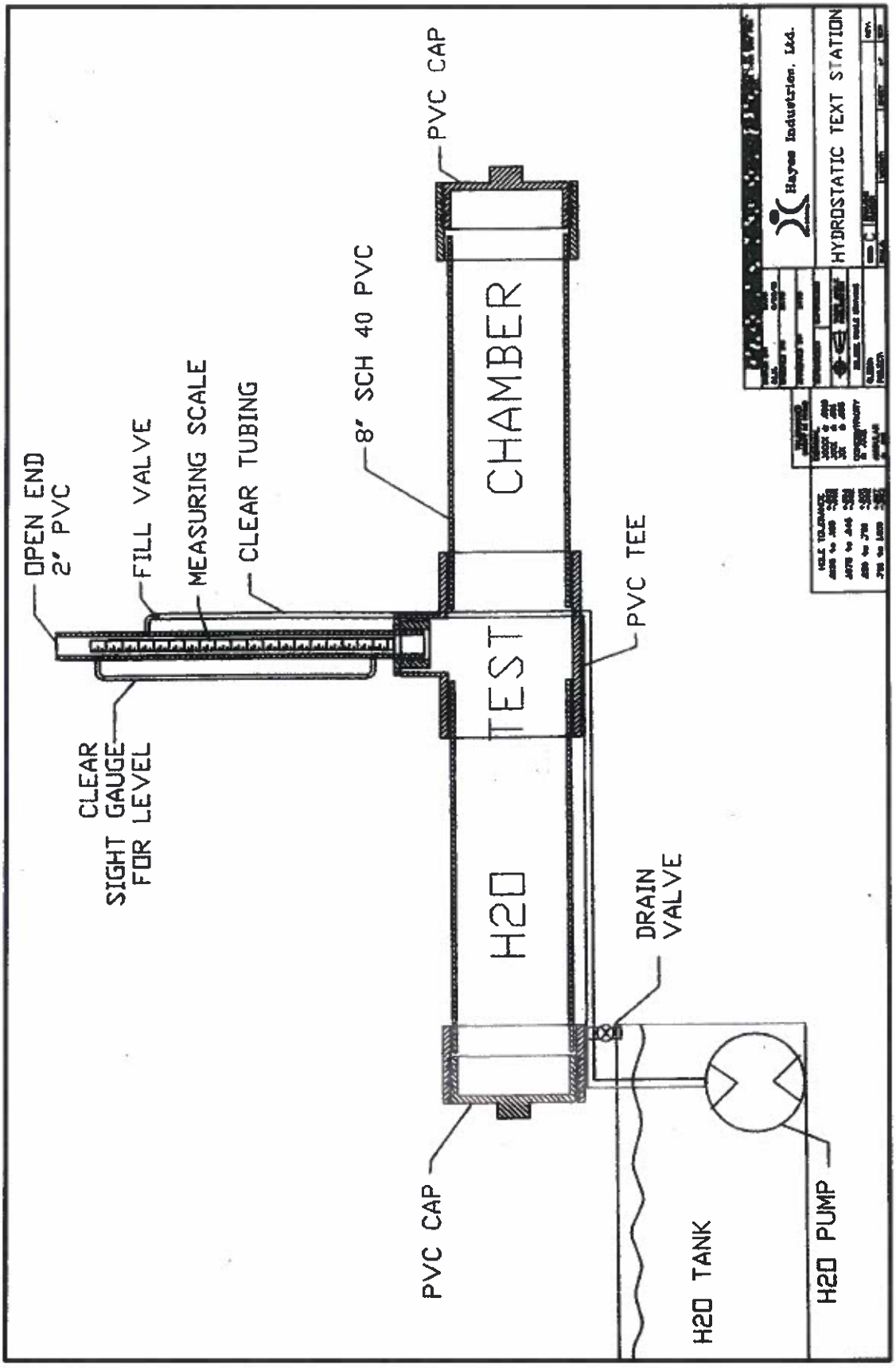
Hydrostatic Test Chamber



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HYDROSTATIC TEST REPORT

Tested for:	Hayes Industries, Ltd. 14030 Florence Road Sugar Land, TX 77498	Project Name:	PT Cable Water Testing
Date:	April 8, 2014	Project No.:	0204622

On April 8, 2014 a representative from Professional Services Industries, Inc. witnessed the testing of the Hayes Industries Posi-Lock Plus Encapsulated Anchorage System. The test was conducted within a hydrostatic pressure chamber and the components were arranged in a horizontal position to ensure equal hydrostatic pressure of at least 1.25 psi, which approximates 3 feet of hydrostatic head.

The representative encapsulated anchorage samples were from production runs selected and assembled by Hayes Industries technicians. Three samples were tested. To detect for the presence of moisture within the anchorage, white pigment P/T coating was used on the P/T cable. A red colored dye was added in the water within the chamber to contrast with the white color of the P/T coating. The "Pass" criterion was no colored dye staining inside the encapsulation system anywhere on the white P/T coating. The integrated anchorage sleeve had at its thinnest point a minimum 50-mil thickness, were translucent and as absent of voids as possible.

An inspector witnessed the placement of the components into the test chamber and 24 hours later witnessed the removal of the components from the same test chamber. The components were disassembled and inspected visually verifying that there was no staining of the white pigmented grease and no visible water intrusion in the anchorage system.

This is to confirm that the .5" Hayes Posi-Lock Plus Encapsulated Anchor System meets the test requirements of the Post Tensioning Institutes Field Procedures Manual, Specification for the Un-Bonded Single Strand Tendons, and the American Concrete Institutes Specification for Un bonded Single-Strand Tendons (ACI 423.7 07) per Section 2.6.8.

If you have any questions or require additional information, please contact our office at your convenience.

Respectfully submitted,
Professional Service Industries, Inc.

Michael D. Phares, CWI
Department Manager, NDE

Hydrostatic Test Components/Results

Qty.	Sample I.D.	Water Depth	Submersion Time	Result
3	H000445 PLP-Live End Assembly Includes: Grease Cap	44"	24 hours	No water penetration
3	H000436 PLP – Fixed End Assembly Includes: Grease Cap	44"	24 hours	No water penetration
3	H000438 PLP – Intermediate Assembly Includes: Grease Cap Spindle Wedge Set VDS Long Sleeve VDS Short Sleeve Spindle Nut Seal Intermediate Spindle	44"	24 hours	No water penetration
3	H001256 PLP – Intermediate Assembly Includes: Grease Cap Spindle Wedge Set Split Tube Seal 24" Tube Spindle Nut Seal Intermediate Spindle O-Ring Grease Tube and Intermediate Spindle	44"	24 hours	No water penetration

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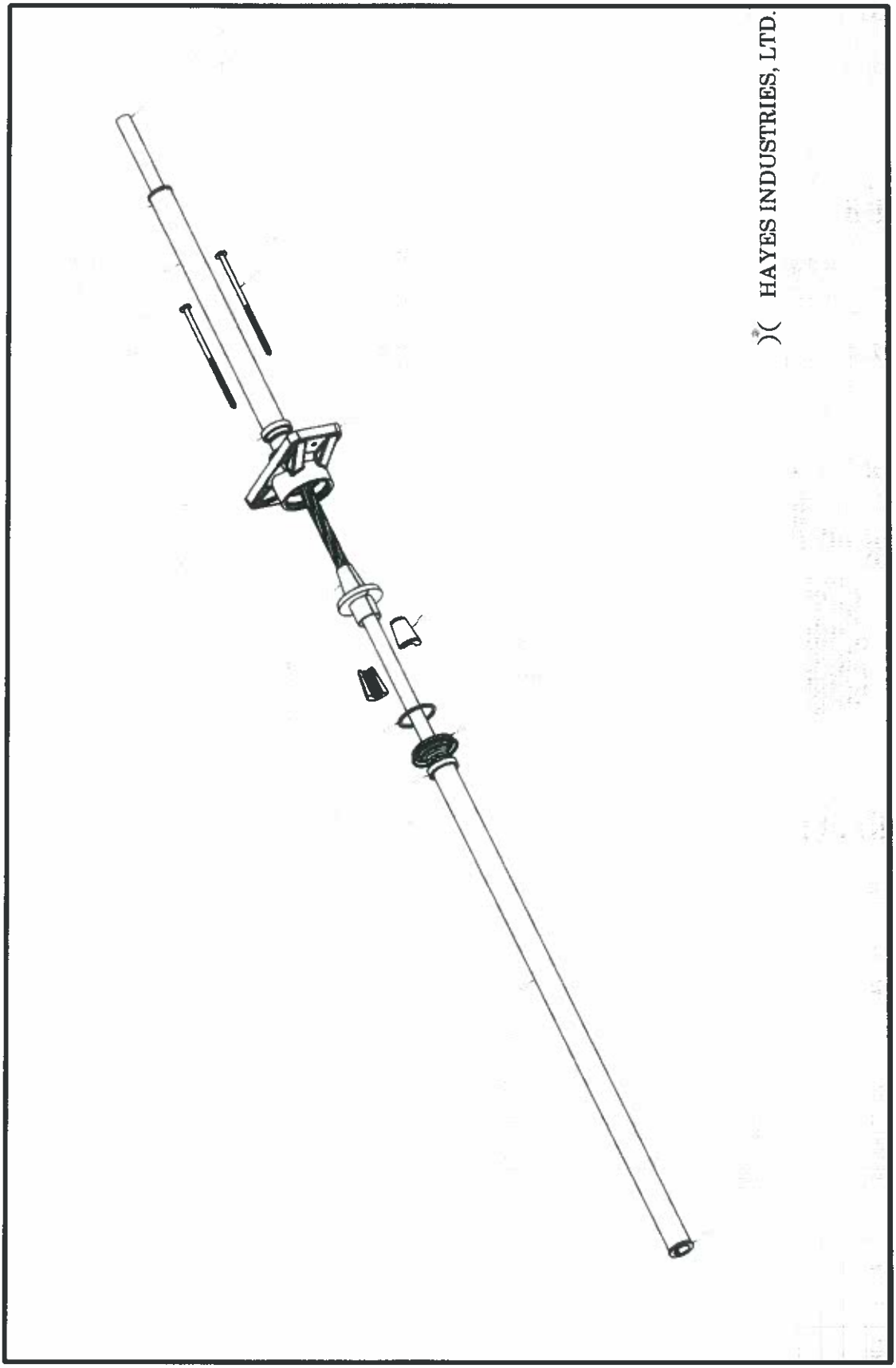
Standard PosiLock Intermediate



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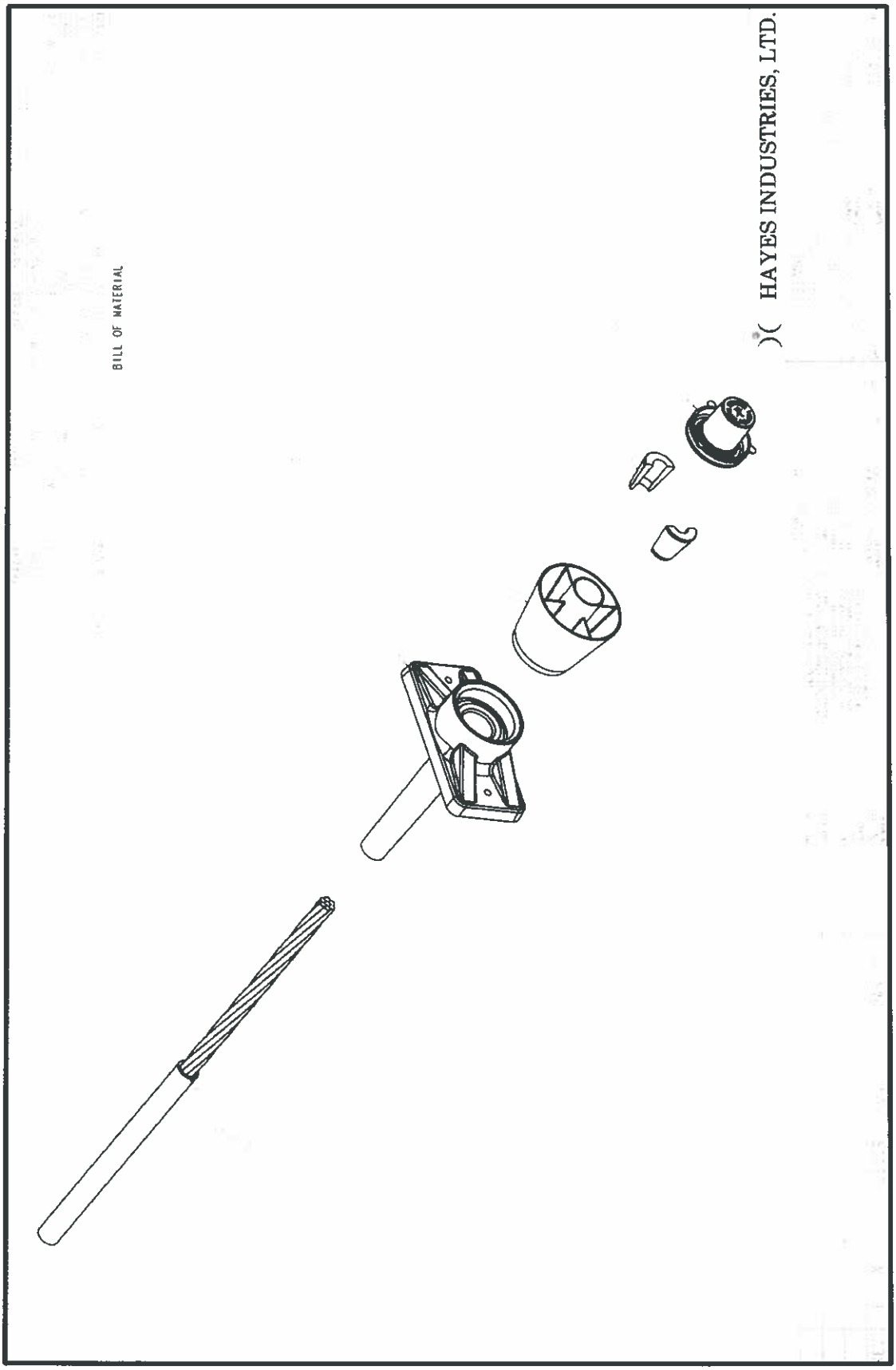
PosiLock Plus Stressing End



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PosiLock Plus Fixed End

BILL OF MATERIAL

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