CINTEC
The Anchor
The Cintec Anchor System is a versatile method of structural reinforcement tailored to meet the specific strengthening and repair requirements of individual projects. From historical buildings and monuments to bridges, high-rise blocks and harbour walls, Cintec has the worldwide reputation for resolving the technical challenges of structural preservation, whilst remaining sensitive to the original architecture.

The Grout

Prestec grout is a one component mix, which has the same characteristics as Portland Cement, with graded aggregates and other constituents which, when mixed with water, produce a pumpable grout that exhibits good strength with no shrinkage.

Prestec is made in accordance with the following German DIN standards:
DIN EN 197-1  DIN EN 196  DIN 4226
DIN EN 1367  DIN EN 932  DIN EN 933
DIN 1097  DIN EN 18555  DIN 18557

The grout is independently checked both during manufacture and before final despatch. This control is undertaken by the Material Testing Institute of the German Federal State of Northern Rhine-Westfalia MPA NRW. Proof of the inspection is marked on every bag with the control mark 'U' or 'Überwacht Controlled'.

Typical values of the grout are:

<table>
<thead>
<tr>
<th>MEAN TENSION</th>
<th>PRESSTEC 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/mm² - MPa</td>
<td>PSI</td>
</tr>
<tr>
<td>3 days = 2.5</td>
<td>362 PSI</td>
</tr>
<tr>
<td>7 days = 3.5</td>
<td>507 PSI</td>
</tr>
<tr>
<td>28 days = 4.5</td>
<td>652 PSI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEAN COMPRESSION</th>
<th>PRESSTEC 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/mm² - MPa</td>
<td>PSI</td>
</tr>
<tr>
<td>3 days = 21.2</td>
<td>3074 PSI</td>
</tr>
<tr>
<td>7 days = 37.2</td>
<td>5395 PSI</td>
</tr>
<tr>
<td>28 days = 51.5</td>
<td>7469 PSI</td>
</tr>
</tbody>
</table>

The grout has inorganic flow and anti-shrink additives which meet the requirements of German DIN standards. The grout has also been tested using accelerated shrinkage tests and found to be satisfactory. The grout bonds to the parent material through the sock as it is inflated.

The resistance strength of the in situ construction to resist the anchor load depends on the section utilised. If the section is solid bar, the anchor body is deformed. If the anchor is circular, the section is crimped. On square section material, a plate almost the size of the bore hole is welded to the anchor at both ends to ensure the strength is mobilised.

The Sock

The fabric sleeve is a specially woven polyester based tubular sock with expansion properties to suit the diameter of the bore hole and substrate. The mesh of the sock is designed to contain the aggregates of the mixed grout while still allowing the cement enriched water (milk) to pass through the sock both sizing and bonding the substrate. The sock is manufactured in sizes from 20mm to 300mm in diameter and is adjusted to suit each individual application.

The Reinforcing Member

The types of reinforcing members utilised depend largely on the loads anticipated and the life expectancy of the anchor.

A few examples are listed below:

<table>
<thead>
<tr>
<th>Steel Sizes</th>
<th>Steel Types</th>
<th>Standard</th>
<th>Grade 304</th>
<th>Grade 316</th>
<th>Class</th>
<th>0.2% Proof Stress (KSI) N/mm² / MPa</th>
<th>Ultimate Tensile (KSI) Strength N/mm² / MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>8mm x 0.75mm (5/32 x 0.04)</td>
<td>Circular Hollow Section</td>
<td>BS 6323</td>
<td>304 S11</td>
<td>316 S11</td>
<td>Class</td>
<td>185⁰ 26.8</td>
<td>480⁰ 69.6</td>
</tr>
<tr>
<td>10mm x 1mm (3/8 x 0.04)</td>
<td>Circular Hollow Section</td>
<td>BS 6323</td>
<td>304 S11</td>
<td>316 S11</td>
<td>Class</td>
<td>185⁰ 26.8</td>
<td>480⁰ 69.6</td>
</tr>
<tr>
<td>15 x 1.5mm (5/8 x 0.06)</td>
<td>Square Hollow Section</td>
<td>ASTM A554</td>
<td>AISI 304</td>
<td>AISI 316</td>
<td>Class</td>
<td>210⁰ 30.4</td>
<td>510⁰ 73.9</td>
</tr>
<tr>
<td>20 x 2mm (3/4 x 0.08)</td>
<td>Square Hollow Section</td>
<td>ASTM A554</td>
<td>AISI 304</td>
<td>AISI 316</td>
<td>Class</td>
<td>210⁰ 30.4</td>
<td>510⁰ 73.9</td>
</tr>
<tr>
<td>30 x 3mm (1/8 x 0.12)</td>
<td>Square Hollow Section</td>
<td>ASTM A554</td>
<td>AISI 304</td>
<td>AISI 316</td>
<td>Class</td>
<td>210⁰ 30.4</td>
<td>510⁰ 73.9</td>
</tr>
</tbody>
</table>

M8 to M50 Allthread Studding | BS 6105 | AISI 304 | AISI 316 |
5/16 2⁰ |

The grade 316 contains Molybdenum, which improves the resistance to corrosion and is beneficial especially in chemically aggressive environments. Higher grades of stainless steel are available for specialist applications.

* For guidance only. Figures are based on steel before forming and welding.
Archtec – “Key hole surgery for bridges”

Archtec is a partnership of companies with specific skills brought together to provide an innovative masonry arch strengthening system. Archtec utilises Cintec anchors for an optimum level of bridge reinforcement. It is both efficient and cost effective and keeps traffic disruption to a minimum. Bridge strengths have been increased by as little as 3 tonnes gross vehicle weight to 40 tonnes plus HB or special loading.

Paratec – Parapet wall strengthening

Cintec anchors are an effective method for strengthening parapet walls from stress and impact. In the above image, a test section of existing masonry wall has been post-tensioned against wind and dynamic pressure. The positive results demonstrate Cintec to be an economic and aesthetic solution. Designs to achieve vehicle containment ratings as high as P6 have been completed.
The Cintec System

The Cintec Commitment

Cintec world wide recognizes and respects the feelings of local communities in respect to what they regard as Heritage or Historic buildings and structures, regardless of whether or not the buildings/structures are formally designated as such. To this end Cintec works to the guidelines of the Secretary of the Interior’s Standards for Historic rehabilitations, the principles of the Venice Charter of 1964 and the Burra Charter of 1979.

Bridge Requirements

In North America there are over 1,000 masonry arch bridges. Europe has many thousands of such structures; 40,000 in the UK alone are in continual use by highways, railways and waterways. Most are well over 100 years old, and as of January 1999 the European directive 96/58/EEC requires that all major (trunk) road bridges be capable of 40 Tonne (89,500 lbs) axle loading.

Archtect Response

Archtect provides a unique bridge reinforcement system - a complete diagnostic, design and installation service, utilising state of the art technology and drilling methods specially designed to strengthen masonry arch bridges.

How it Works

The Cintec Anchor System comprises a steel bar enclosed in a mesh fabric sleeve into which a specially developed grout is injected under low pressure.

Installation is through drilled holes produced by wet or dry diamond coring technology. The flexible sleeve of woven polyester restrains the grout flow and expands up to twice its previous diameter, moulding itself into the shapes and spaces within the walls to provide a strong mechanical bond along the entire length of the anchor. This will often dispense with the need for patress plates on the exterior of the structure.

The grout is a Portland cement based product, containing graded aggregates and other constituents which, when mixed with water, produce a pumpable cementitious grout that exhibits good strength without shrinkage.
Paratec

Parapet Wall Strengthening from Cintec

No two masonry bridges are the same and this also applies to their parapet walls. The requirements specified for individual walls can differ considerably and must reconcile a variety of needs. These may include impact containment, vehicle redirection, the protection of others in the vicinity, compatibility with the masonry structure as a whole, as well as the visual appearance of the strengthening solution implemented.

The Anchor

The Cintec Anchor System provides a highly versatile method of internal structural reinforcement that is tailored to meet the specific requirements of each parapet wall. This service, known as Paratec is backed by extensive research and development, this includes advanced computer modelling, practical testing and also the experience built up from numerous strengthening projects. The Paratec system can strengthen a masonry wall while remaining sensitive to the original architecture and without any narrowing of the road way.

Research & Development

The comprehensive service offered by Paratec includes advanced computer modelling techniques that simulate the effects of a vehicle impact upon a specified masonry wall. Working in conjunction with both software specialists and consulting engineers, Paratec utilises an advanced dynamic software incorporating a discrete element analysis technique that enables the behaviour of parapet walls to be accurately predicted under various circumstances.
**Anchor Principles**

**TERRA-COTTA – Typical Detail**

Typical, 12mm dia. solid round threaded Cintec Anchor in 32mm dia hole 64mm dia. sock min. 2 Per T/C unit size & length subject to site conditions.

**RAC for Hollow Pot/Brick Cavity Wall**

- 30 – 80 mm sock expansion for hollow pot void
- 6, 8 or 10mm circular hollow section stainless steel body
- 20mm drilled hole
- N.B. Sock diameter can be varied to suit applications
- Length to suit – standard overall length 215mm

**'I' Beam Securements to Masonry Facades**

- Hook Connector
- 'I' Beam
- Securing Nuts
- Stud Anchors
- Diameter to suit loading
- Angle brackets
- Alternative attachments to 'I' beam when access to rear of façade is restricted

**Stitching Anchor – Type CHS**

- Sock expands into the soft friable core
- Anchor body design dependent on load but normally:
  - CHS 18, SHS 15, 20, 30 ST, DRB
  - Number and position dependent on structural condition
- Length to suit

**Retaining Wall/Ground Anchoring**

- Retaining wall
- Post tensioned anchor
- Once installation is completed, a piece of the original drilled core can be replaced to conceal the anchor

**Stitching Anchor Application – Type CHS**

- Typical Arch Consolidation
- 30mm drilled hole
- 15 x 15 or 20 x 20 SHS, ST, DRB, CHS stitching anchor drilled 90° to the normal
- 30 x 30 WSA anchor to carry the main load
- Anchor positioned to suit individual wall conditions

**Abbreviations**

- CHS – Circular Hollow Section
- RAC – Remedial Anchor Cavity
- ST – Stud
- DRB – Deformed Rib Bar
- SHS – Square Hollow Section
- WSA – Wall Supporting Anchor
Anchor Principles

An oversize hole is drilled between the substrates to be secured.

The Cintec system comprises a steel section in a mesh fabric sleeve, into which a specially developed cementitious grout is injected under low pressure. The flexible sleeve of woven polyester restrains the flow and moulds the anchor into the shapes and spaces within the walls, providing a strong mechanical bond.

The large surface area of the expanded anchor creates a reinforcement system that dispenses with the need for unsightly patress plates on the exterior of the structure, providing an invisible mend.

The designed Cintec anchor is placed in the correct position.

The anchor is inflated like a balloon to provide a permanent cementitious anchoring solution using one of Cintec's range of sympathetic grouts.

Presstec grout pumped under pressure through the anchor body into the fabric sock.

Grout Flood Hole

Grout Flood

Testing Regimes

Seismic testing on full scale model of Sao Vicente de Fora Monastery – Italy

Anchor pull out tests following exposure to extreme heat in the burnt out remains of Fullers’ Brewery

On location tensile load testing in Sandstone

Measurements being taken during load testing of masonry arch bridge at T.R.L.
- Designed to the requirements of each application
- Quickly installed
- Age tested for durability
- Fire resistant
- Cementitious, therefore sympathetic to the original structure
- Controlled grout flow & containment
- Invisible when installed
- Effective for structural repairs, ground anchoring, parapet walls & masonry arch strengthening

This brochure offers a simple guide to the standard applications undertaken with the Cintec Anchor System. It does not give detailed technical information necessary for a specific design, but indicates the types of problem solvable within the design parameters of the system. Cintec has both in-house and contracted engineers offering advice and providing the entire design work without initial consultation fees. The cost of specialist engineering advice is normally incorporated in the final anchor price.

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