

**POST TENSIONING**  
**– The Adaptable Structural Solution**

# **Part 3 – Heavy Duty Industrial Slabs and Pavements**

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Sydney

## Typical Post Tensioning Applications

- ✓ Warehouse Floors
- ✓ Container handling and Storage Facilities
- ✓ Tank Floors
- ✓ Other
  - ✓ Rail Sidings
  - ✓ Wharf Pavements
  - ✓ Cool Stores Slabs
  - ✓ Airport Apron Slabs
  - ✓ Sporting area Slabs

## Characteristics of PT Slabs and Pavements

- ✓ Large Joint Free Area
- ✓ Load Capacity and Robustness
- ✓ Suitable on Poor Subgrade
- ✓ Thin and Flexible
- ✓ Durability and Active Crack Control
- ✓ Ideal for Liquid Storage Structures
- ✓ Efficient use of Materials
- ✓ Suitable for Internal and External Conditions
- ✓ Quality Controlled Product.

### 3. Heavy Duty Industrial PT Slabs and Pavements

## Issues

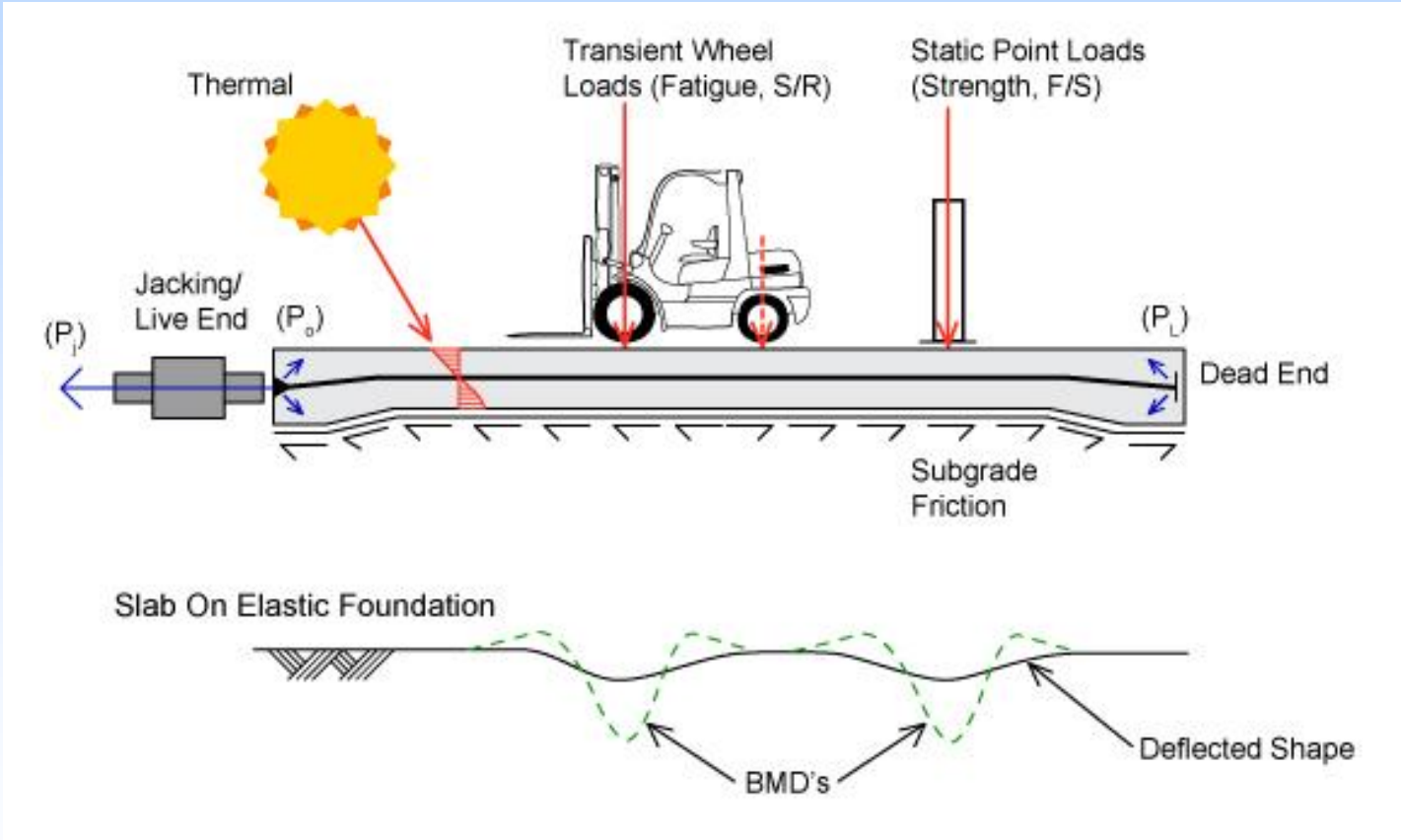
- ❑ Joints are few, Real movements will Occur
- ❑ Restraint and Subgrade Friction
- ❑ Construction Process and Planning
- ❑ Design for Purpose and Best Economy
- ❑ Future Modifications

3. Heavy Duty Industrial PT Slabs and Pavements

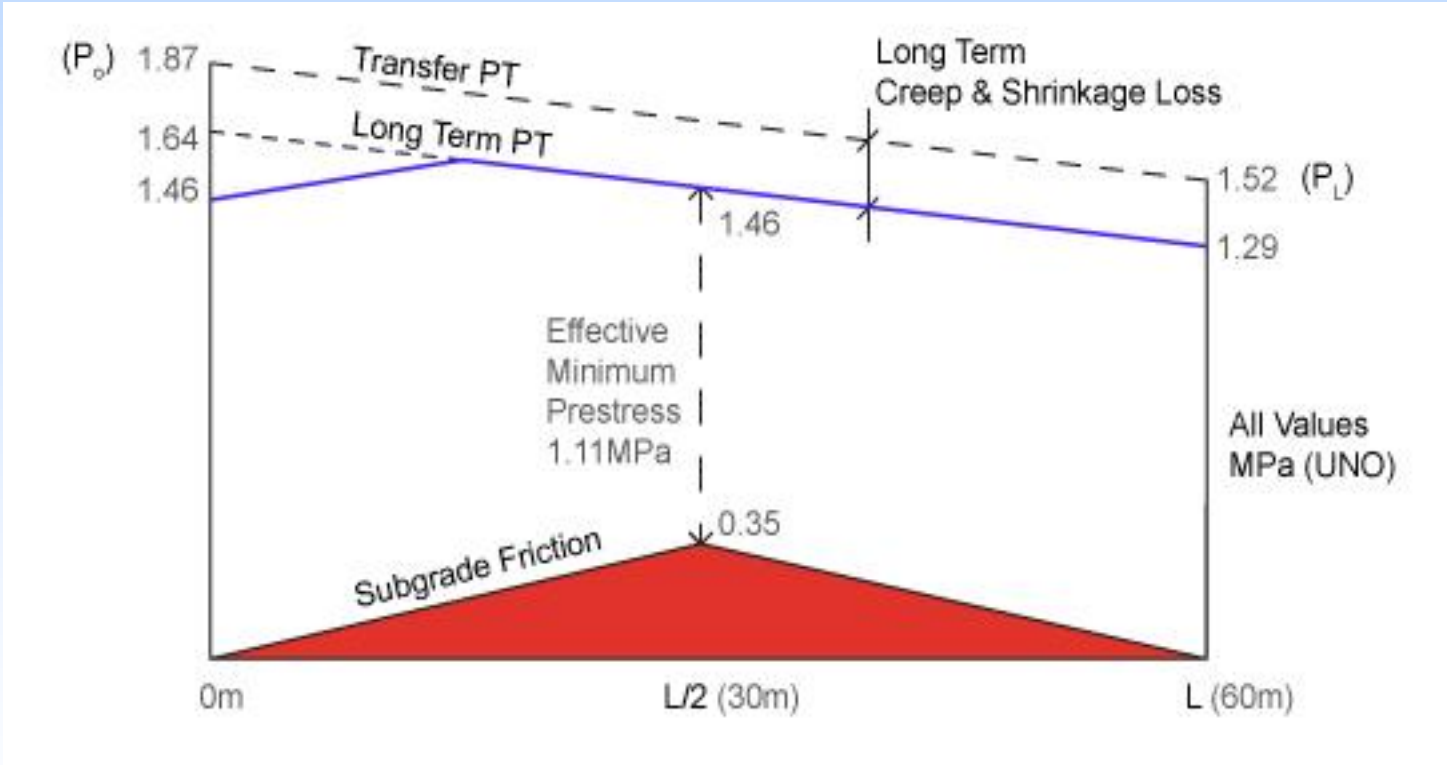
Design

➤ Loading

➤ Analysis



# Post Tensioning Basics



Available Strength = Concrete Flex. Strength + Effective Min. Prestress

### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Melbourne Market Relocation, 2011

- Builder: Lend Lease
  - Project Engineer: Bird Group
  - Post Tensioning: VSL Australia
  - PT Designer: Hyder Consulting
- 
- 55,000m<sup>2</sup> Internal Slabs
  - 25,000m<sup>2</sup> External Areas
  - Design
    - ✓ 11tonne axle load forklift,
    - ✓ 5tonne post loads
    - ✓ T44 Trucks
    - ✓ Subgrade CBR 3%





### 3. Heavy Duty Industrial PT Slabs and Pavements

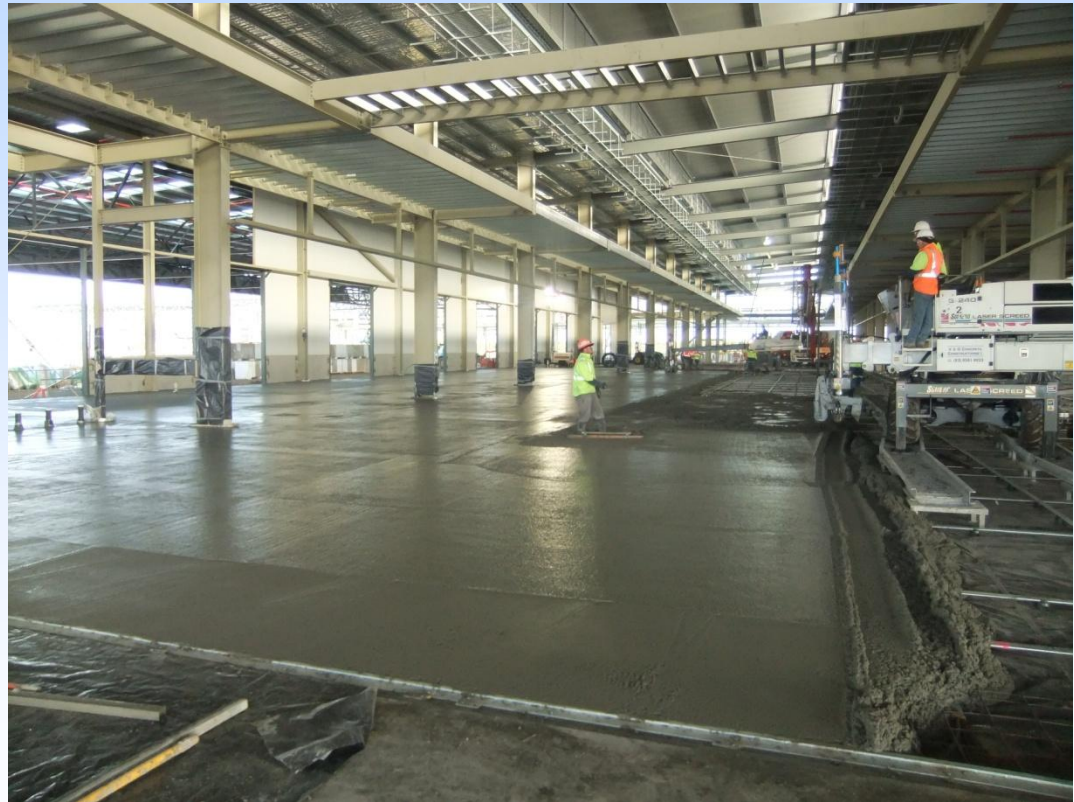
## Project Example: Melbourne Market Relocation 2011

### Details

- Slab 150mm thick
- Concrete S40 / Flex5.0MPa
- Typical Pour 2400m<sup>2</sup>
- MJs up to 119m apart

### Notes

- ✓ Columns and Floor Services
- ✓ Pour Undercover Protected
- ✓ Use of Laser Screed
- ✓ 1:150 fall to suit site





### 3. Heavy Duty Industrial PT Slabs and Pavements

## PT Ground Slabs - Attention to Detail

- ✓ Column Blockouts,
- ✓ Bondbreaker Materials
- ✓ Edge Rebar and Joint Protection
- ✓ Grout tubes looped and to edge



### 3. Heavy Duty Industrial PT Slabs and Pavements

## PT Slabs - Concrete Pour

- ✓ Planning
- ✓ Laser Screeds
- ✓ Flat and Burnished finish
- ✓ Curing





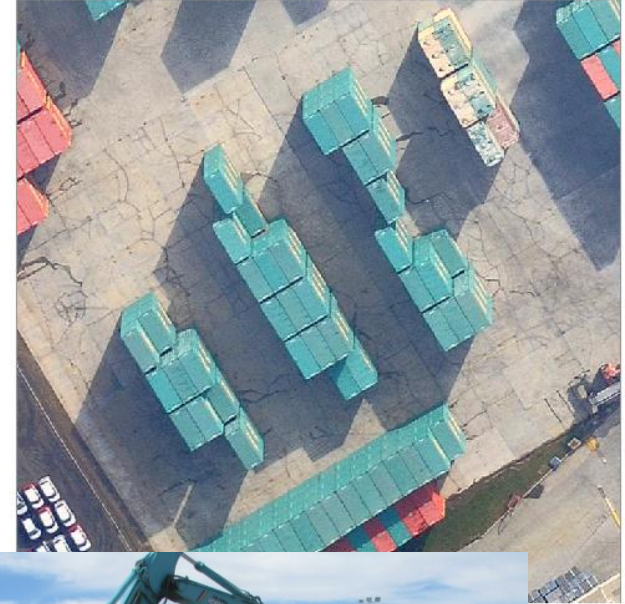
### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane Laverton, 2009 - 2010

- 20,000m<sup>2</sup> HD Replaced Pavement
- Slab 260thick, Concrete S40
- Subbase, 150mm 3% CSCR
- Design
  - ✓ 110tonne Container Reachstacker
  - ✓ 30tonne Container Stacked 3 high
  - ✓ Concrete S45 / flex 5.5MPa
  - ✓ Subgrade CBR 3%
- Operator
  - ❑ Toll Intermodal
- Project Engineer
  - ❑ Hyder Consulting Melb.
- PT Subcontractor
  - ❑ Structural Systems Vic.



Captured on: Monday, 21 June 2010



17/03/2011

### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane

- Replace 320mm Fibre Reinforced and
- Replace 375mm Conventional RC
  - ☐ Severe cracking
  - ☐ Subgrade pumping
  - ☐ Structural Failure
  - ☐ Joint Deterioration
  - ☐ Operational OHS Issues





### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane

- Possibly largest Ever PT Slab Area Pour – 5824m<sup>2</sup>
  - ✓ 14hr pour commencing 3.00am
  - ✓ 3 Placement Pumps
  - ✓ 2 Laser Screeds
  - ✓ 260 truck deliveries



### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane

#### ➤ Planning is Everything

- ✓ Backup Plant and Supply
- ✓ Automation equipment
- ✓ Modest Manpower
- ✓ Curing





### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane

- Partial and Final Stress
- Quality Control Signoff





### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Cherry Lane

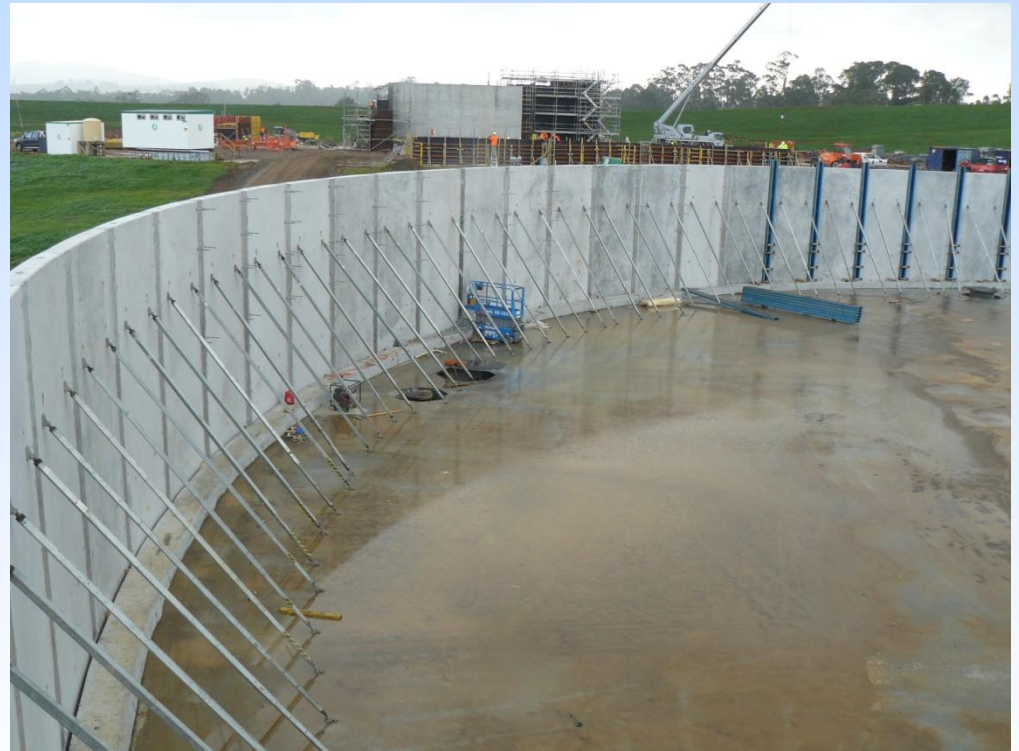
✓ Completed Facility



### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Tarago Connect Water Reservoir 2008

- 72m ID Water Tank
- PT Base Slab and PT Ring Beam
- PT Precast wall panels
- Authority - Melbourne Water
- Project Engineer – GHD
- Alliance Contractor
  - Boulderstone and United Group
- D&C PT Contractor - VSL Australia



### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Tarago Connect Water Reservoir 2008

- PT Slab 170mm thick,
- Concrete S40
- Subgrade Preparation
- Subgrade drainage layer
- Sand Bedding to reduce friction





### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Tarago Connect Water Reservoir 2008

- Cut & Filled Ground
- Polythene layer throughout



### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Tarago Connect Water Reservoir 2008

- Slab 170thick,
- Concrete S40
- Single Pour – 4020m<sup>2</sup>
- Pipe Block out detail





### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: Stuart Rail Terminal Townsville, 2007

- 640m Long Slab Siding (8x80m)
- Concrete S45 , Flex5.5MPa
- Reconstruction of failed Asphalt
- PT D&C Contractor
  - Structural Systems Qld



### 3. Heavy Duty Industrial PT Slabs and Pavements

## Project Example: AB Oxford Cold Storage, Melbourne 2006

- 180mm PT Slab
- Increased P/A for Durability
- Polystyrene Insulation Layer
- No edge Thickenings
- PT D&C Contractor
  - ❑ Structural Systems





# POST TENSIONED GROUND SLABS AND PAVEMENTS

## – The Adaptable Structural Solution

A summary of PT Ground Slab Design and Construction Issues can be found in

- PTIA newsletters 2011 No.1 and No. 2
- Download from the PTIA website

➤ Thankyou