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X-Discipline Training: Cast-in Hydraulics & Structure

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1.0 Brief Structure Overview

What types of concrete structure have cast-ins?

- Footings

Strips



Pads



Piers



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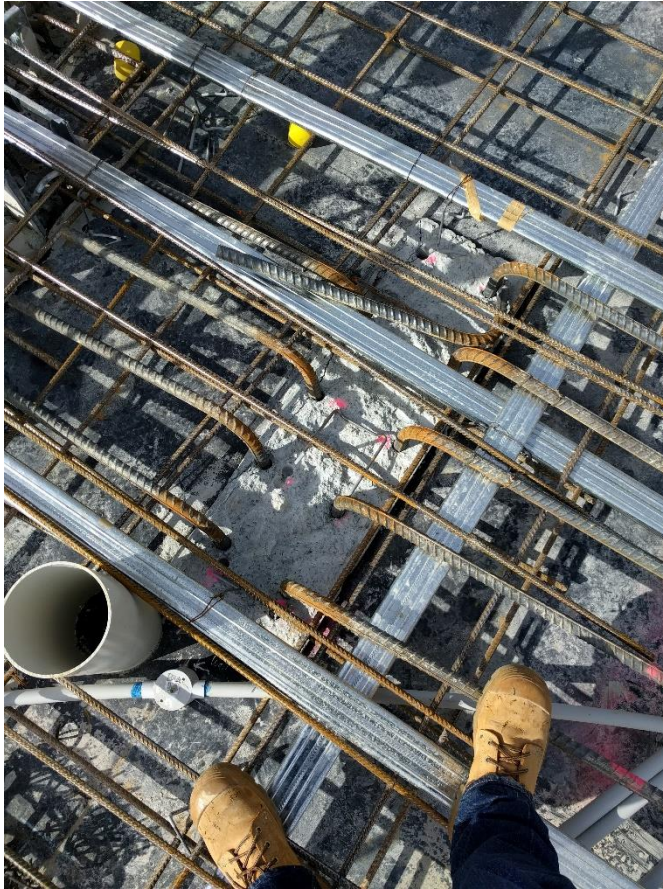


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- Columns (& walls, precast)



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- **Slabs**

On Ground (Waffle, Raft etc.)



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- Slabs

Suspended



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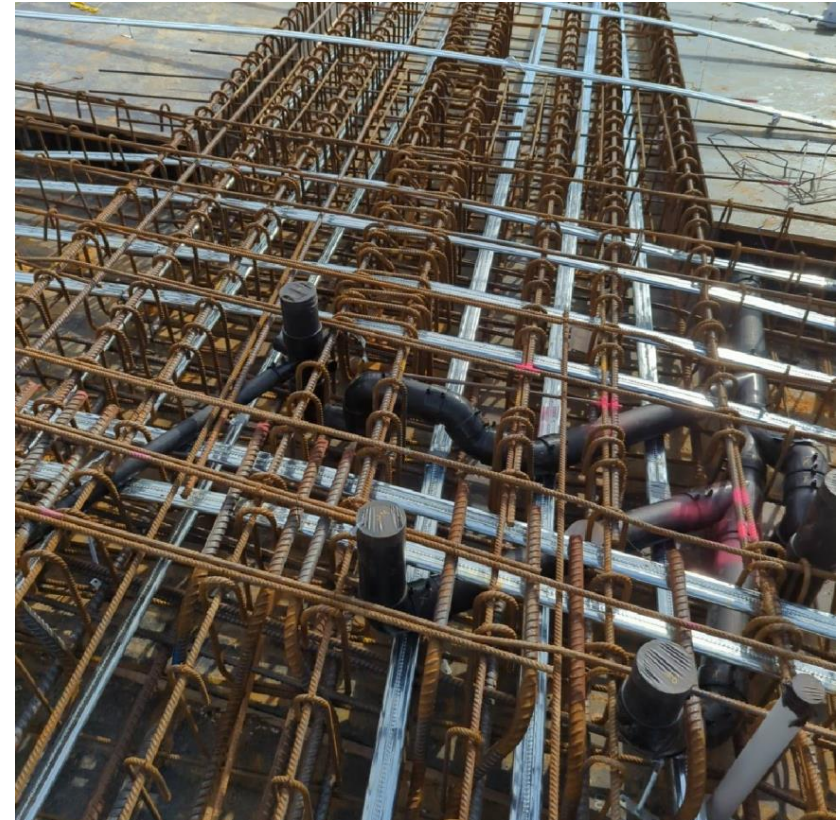
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- Beams (transfers)

Suspended



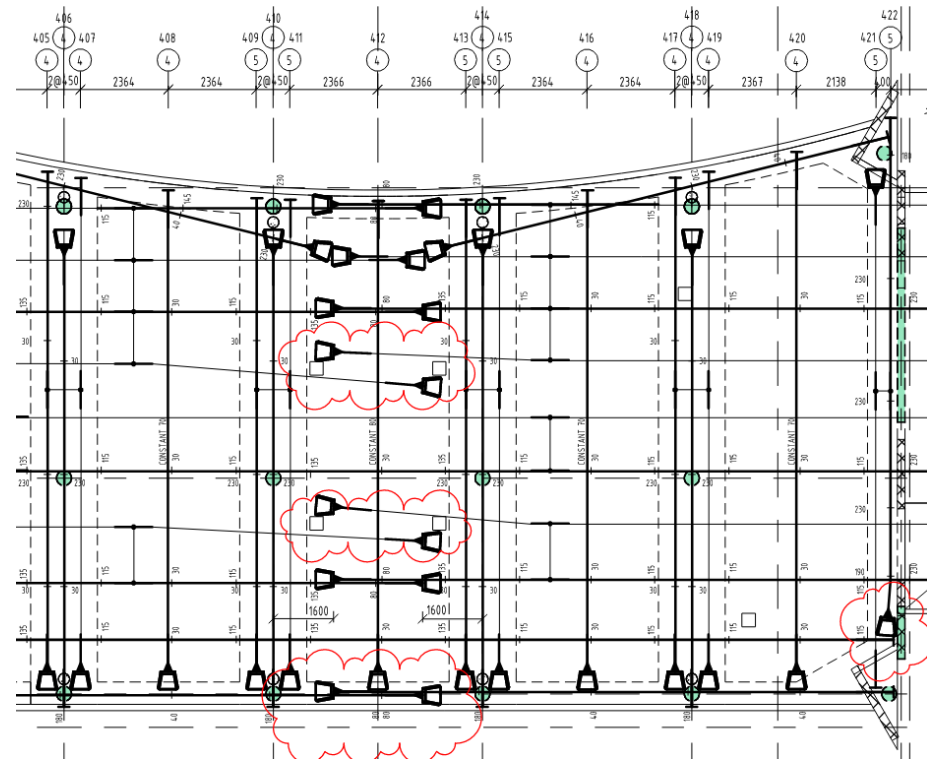
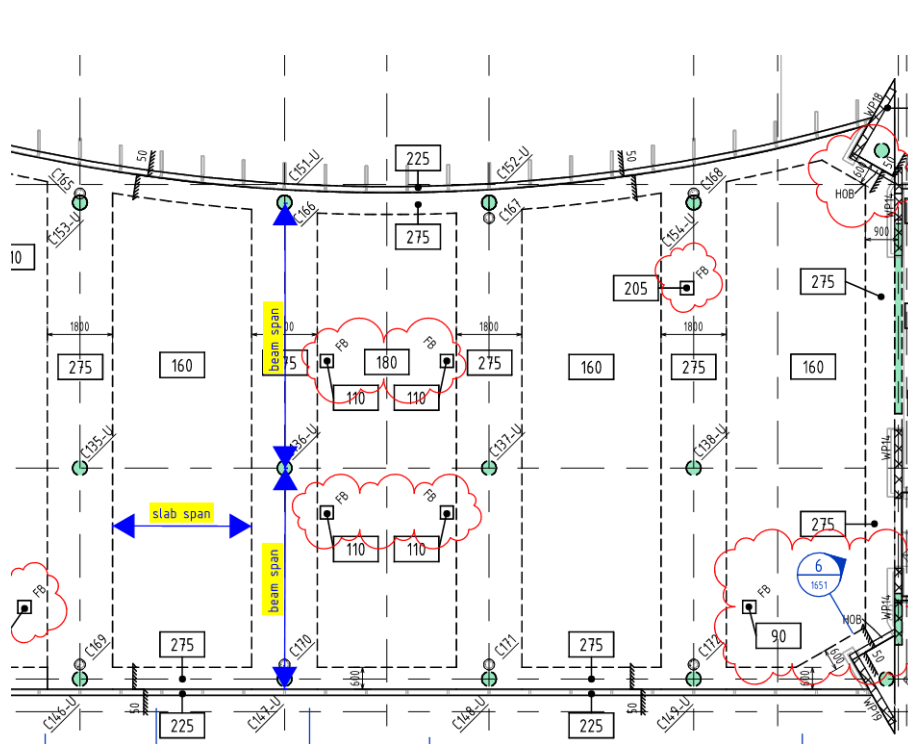
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2.0 Slabs, beams & reinforcement / PT

Types of suspended beam and slab arrangements:

One Way (primary load transfer in 1 direction to support)

Beams & slabs



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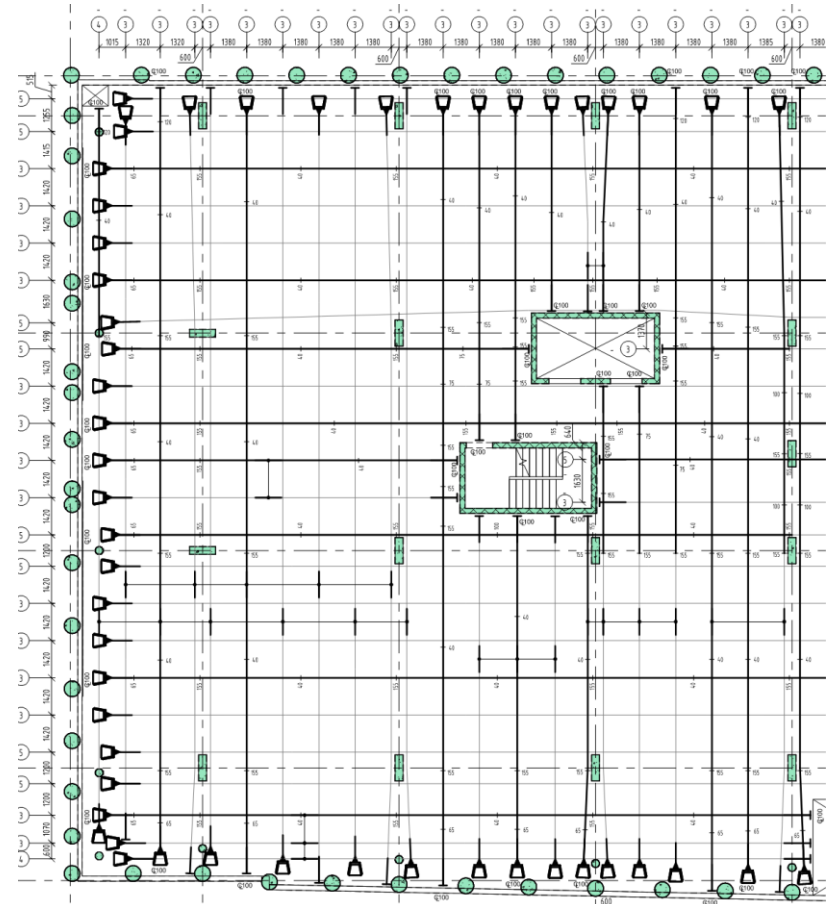
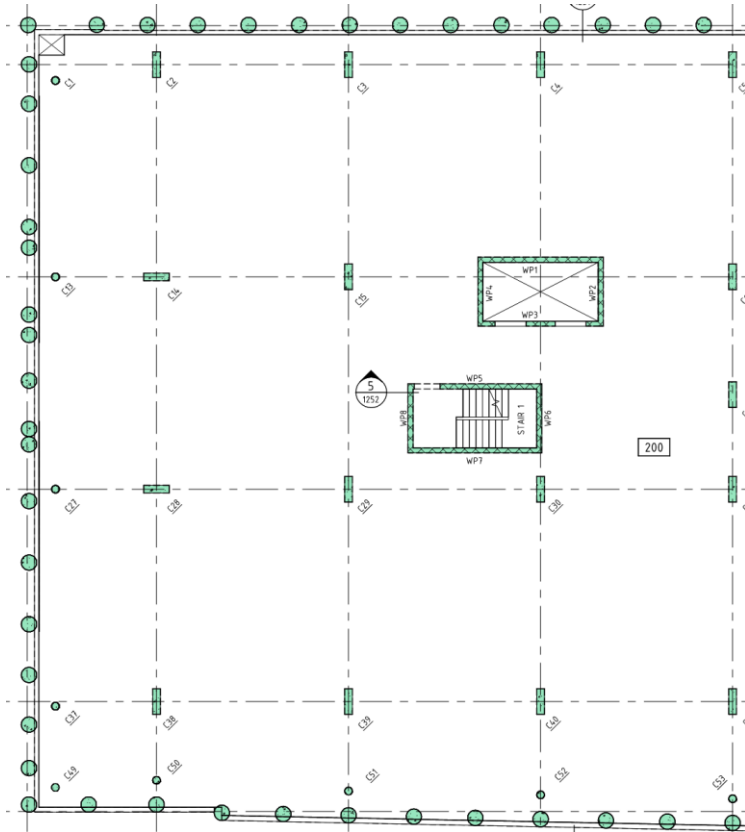
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Two Way (primary load transfer in 2 directions to support)

Flat slabs (w/ drop panels, column capitals etc.)

Beams & slabs



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Role of PT and Reinforcement

- Provide crack control & tensile strength
- Control deflections
- PT places concrete in compression
- Primarily at tension
- Compression reinforcement in transfers also
- For shear relatively close to support Esp. in deeper beams

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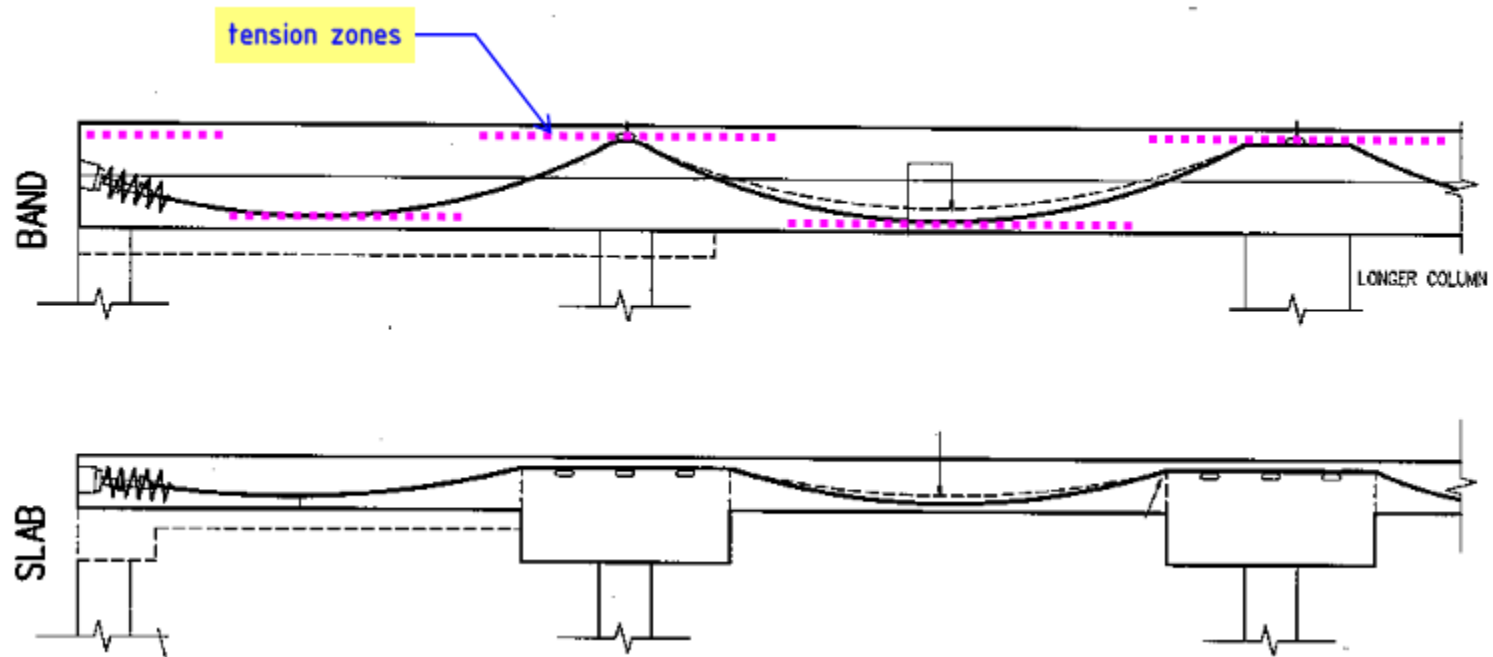
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Typical PT profile & Reo section



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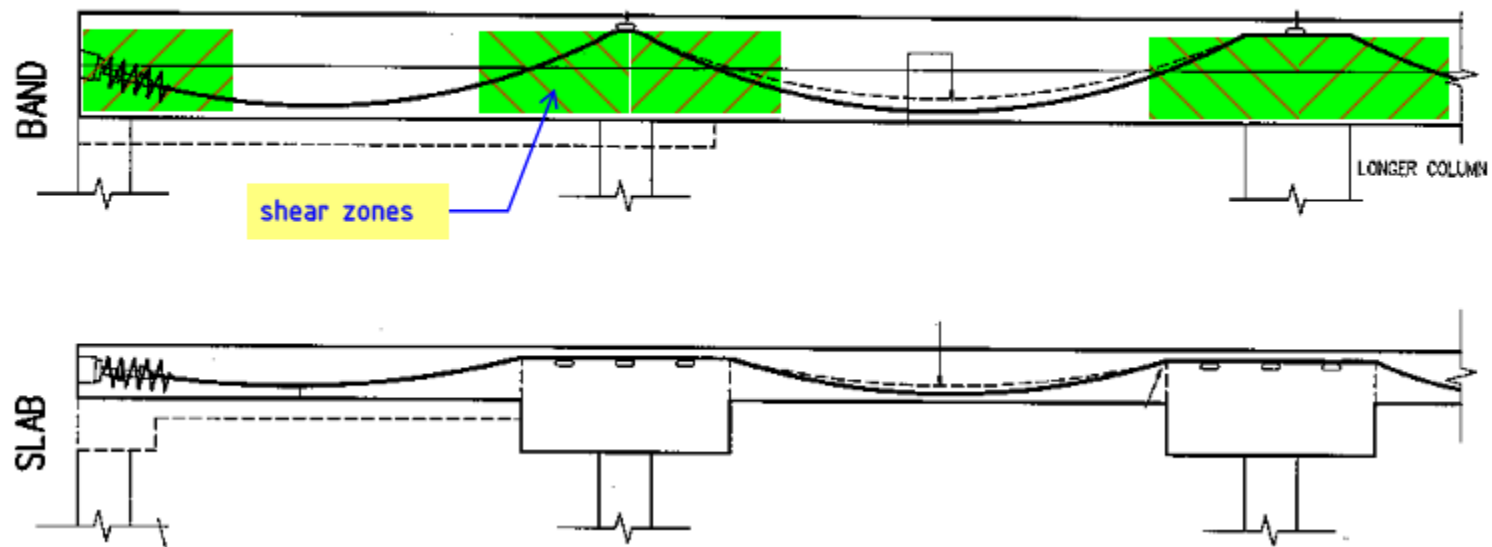
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Typical shear zones



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3.0 Hydraulic Overview

What types of cast-in pipes?

Vertical penetrations

Horizontal penetrations

Horizontal Cast-ins with Vertical Penetrations

Floor Waste, Grated drain, Traps & bends etc.

Structural Notching

What Cast-in elements require further attention and coordination between STR & HYD?

Essentially all penetrations through suspended elements will require Coordination. Relying on Architecture to do any form of coordination will pose a risk.



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Vertical Penetrations

- Fixtures/Stacks/Riser locations
- Fire collar placement
- Vertical elements below suspended slabs
- Height clearances below structure can be achieved
- Penetrations over Band beams

Horizontal Penetrations

- When/Why are they required
- Fire collar placement
- Penetrations through Precast
- Reinforcement cover both top and bottom
- Consider Fall on pipe through structural element and implications on reinforcement, particularly PT

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Typical Balcony drain

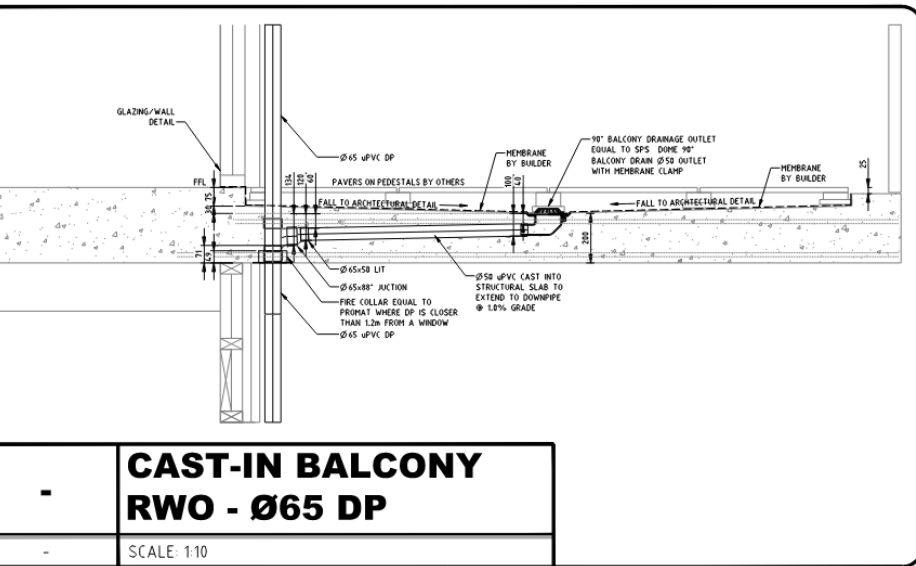


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4.0 Integration Of Hyd & Str

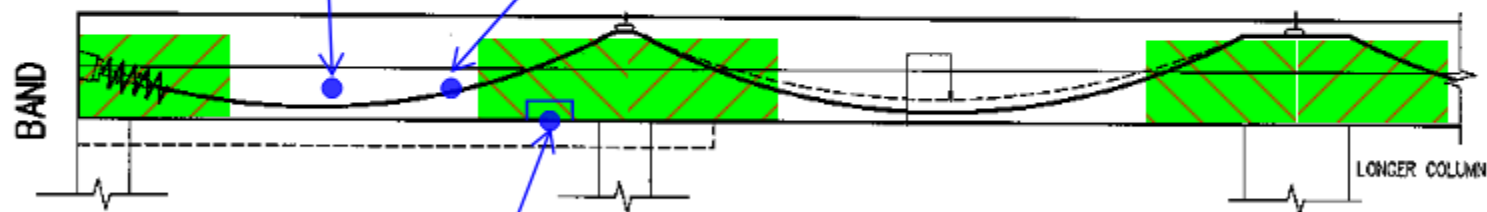
- **Horizontal important items**
 - Falls to be considered, covers top & bottom
 - Traps or bends from horiz to vertical pipe
 - Notching of soffits for horiz at shear zones
 - Grated drains at ramps etc
- **Vertical pipes important items**
 - individual not as much of an issue
 - Groups (stacks), especially near a column more of an issue
- **Coordinate early and communicate between disciplines**
 - At Tender – high level review, majority of cast-ins allowed for
 - At AFC – detailed coordination with PT shop drawings
 - Avoid variations
- **Advise design team on any issues**
 - Architectural layout of bathrooms, toilet pans, grated drains that could be an issue
 - Cast-in construction and installation – can it be done? concrete, reo placement etc.
 - Future access to drainage required for maintenance?
- **Documentation**
 - Clear and concise – especially at transfers
 - Ensure information is current / up to date



- Horizontal cast-ins

generally ok
consider cover to PT

may need to adjust
PT drape or raise /
lower pipe to suit
PT



need to consider
reduced shear depth

need to maintain covers
above and below pipe

SLAB

need to maintain cover
between pipe & reo also

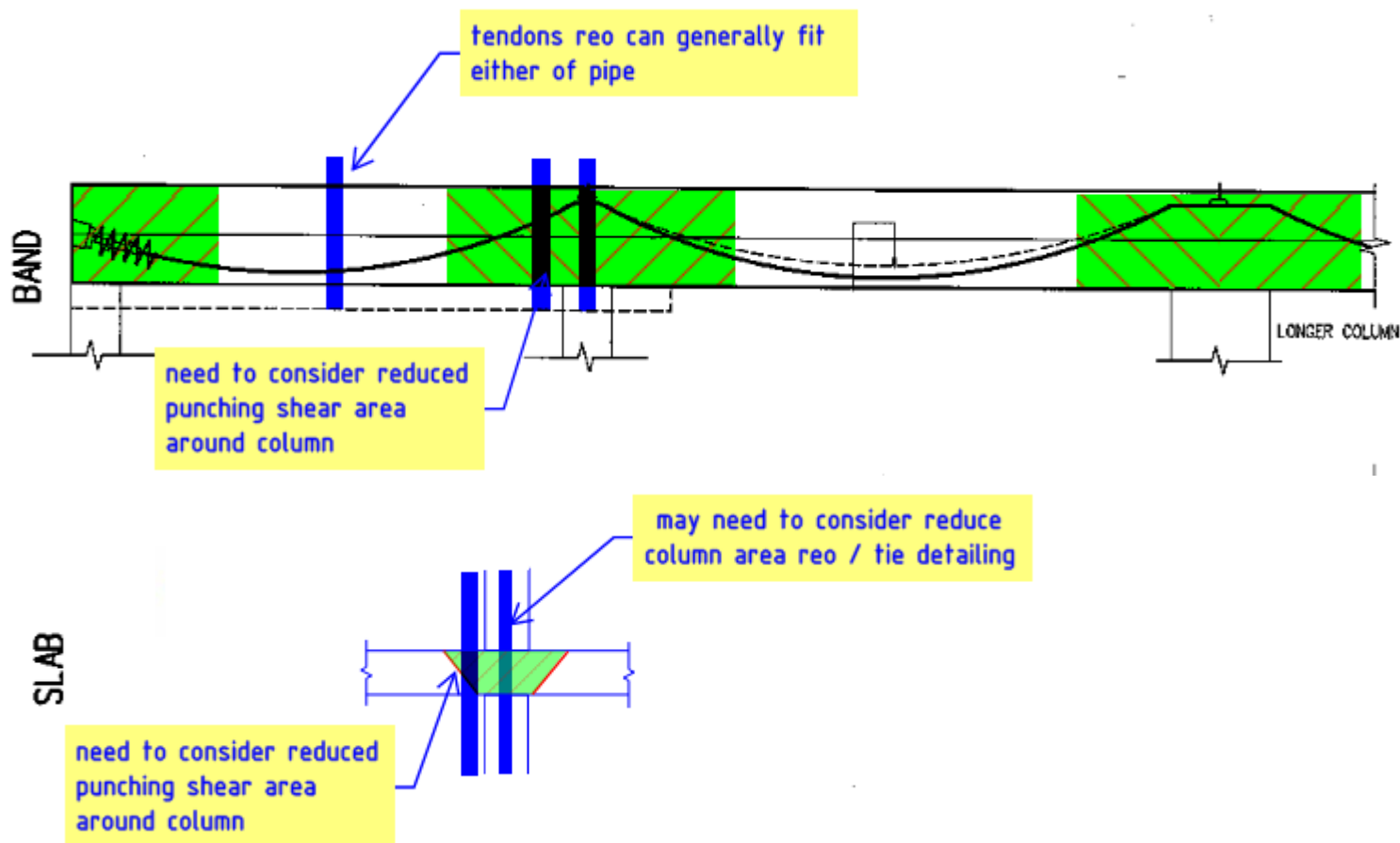


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- Vertical cast-ins



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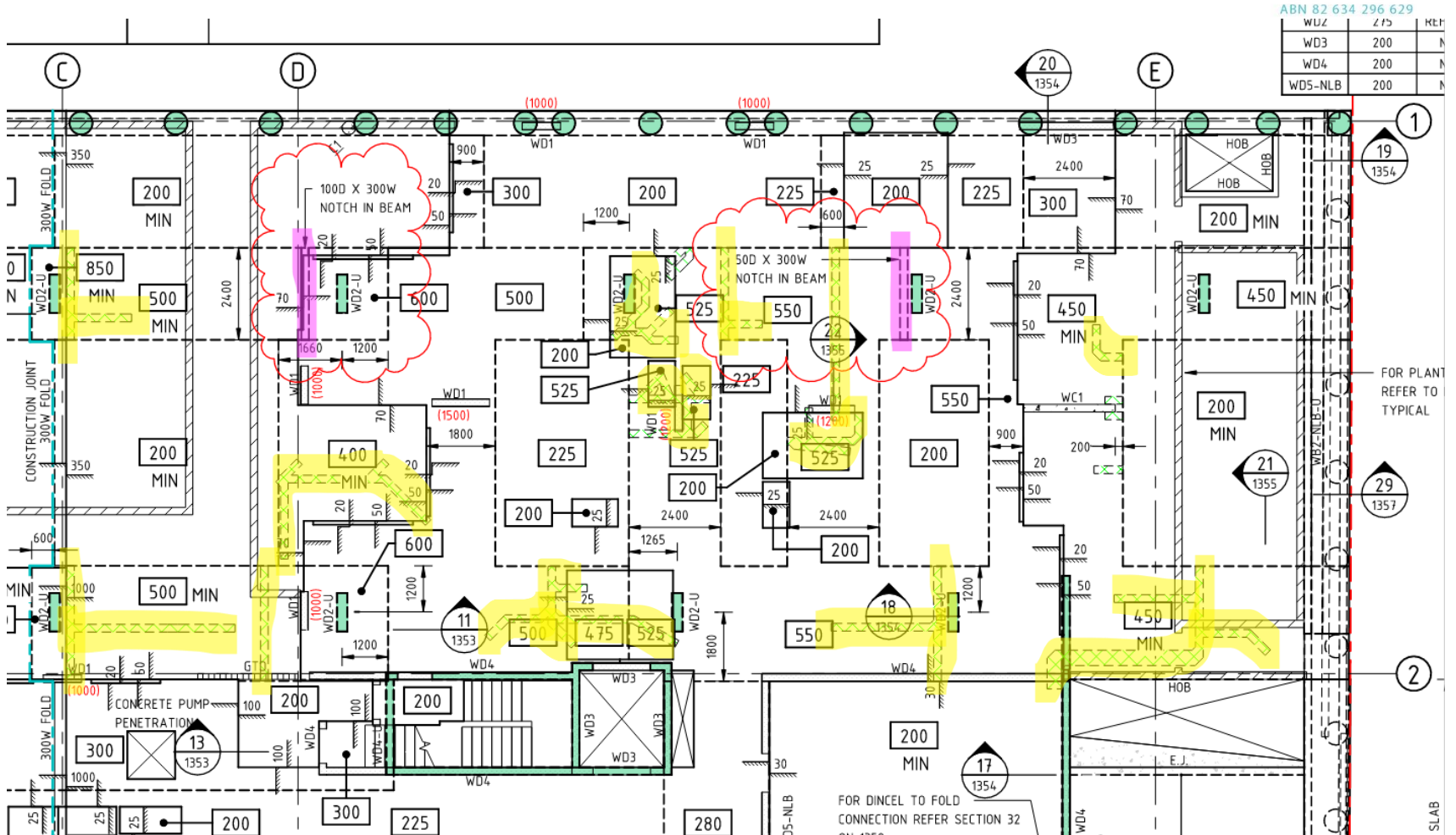


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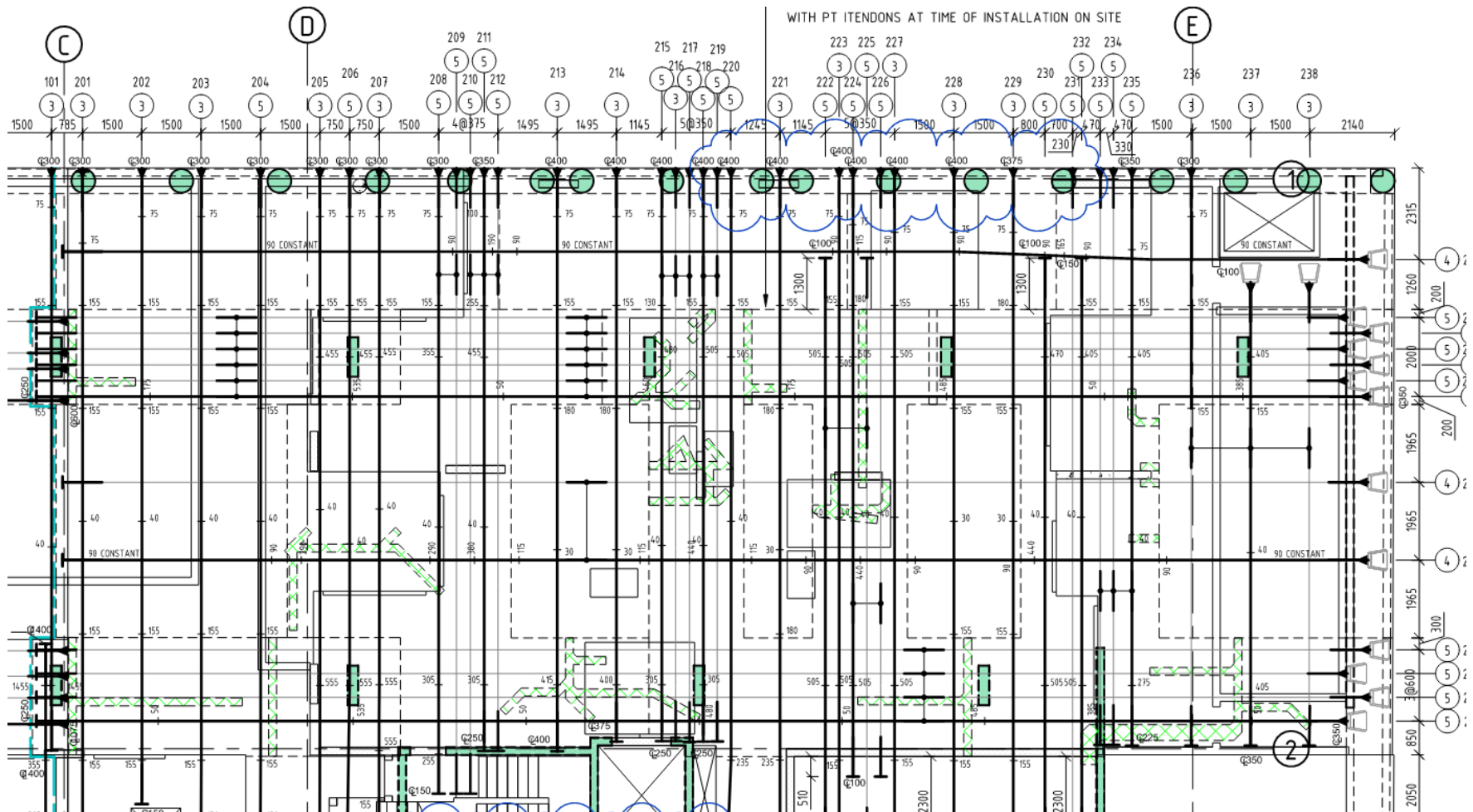
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Marking Plan



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PT Plan



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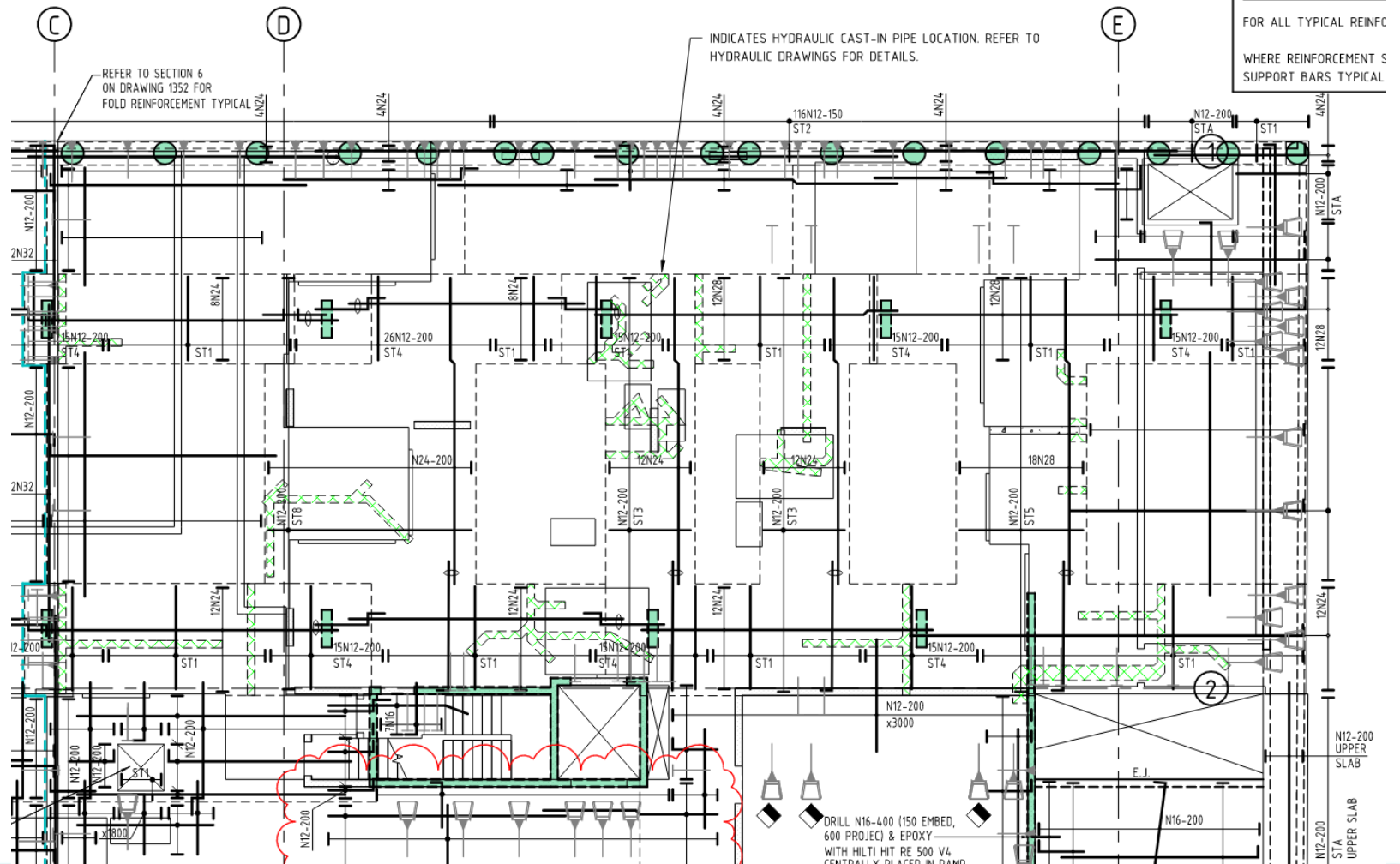


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Bottom Reinforcement Plan



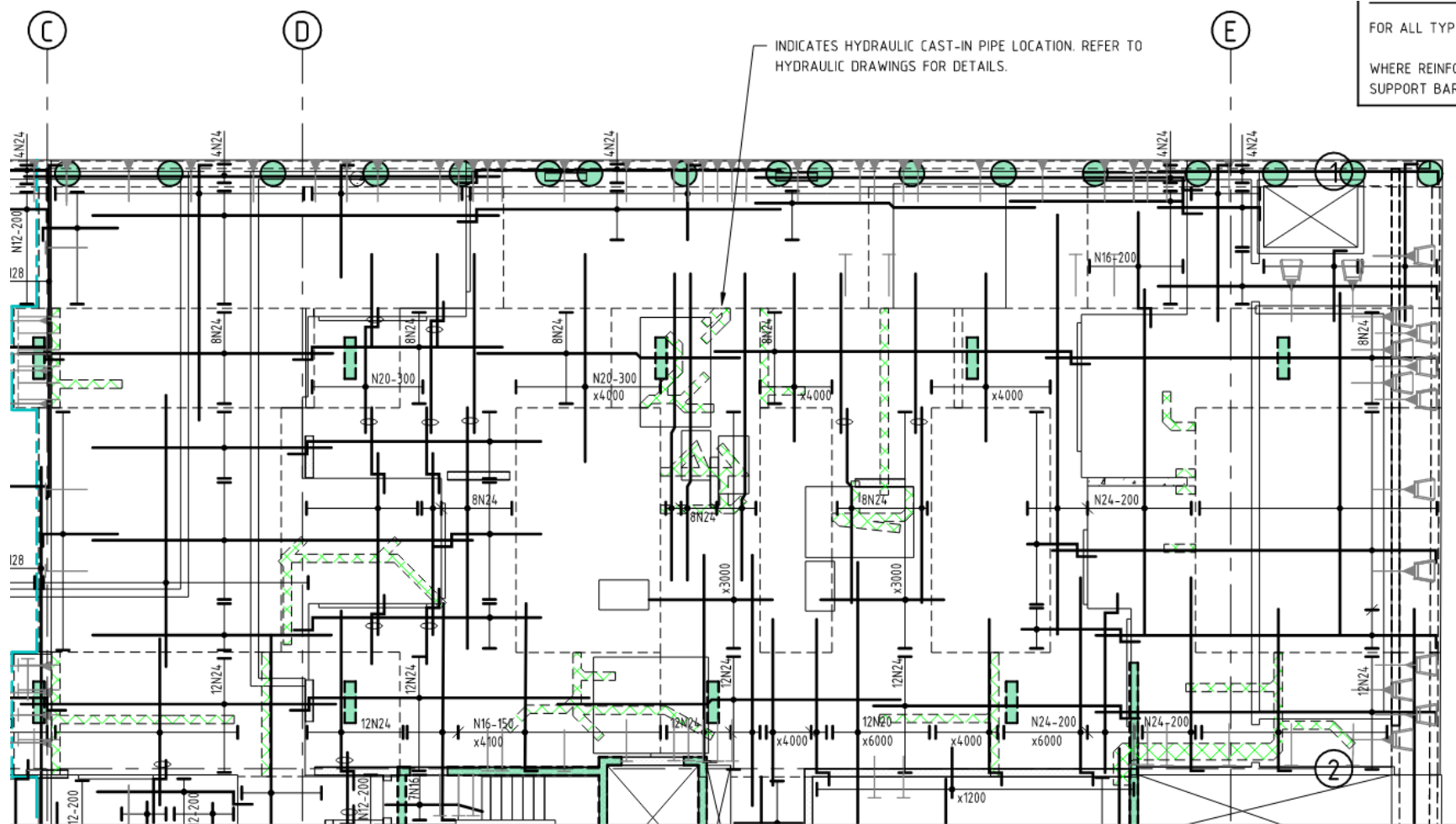


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Top Reinforcement Plan



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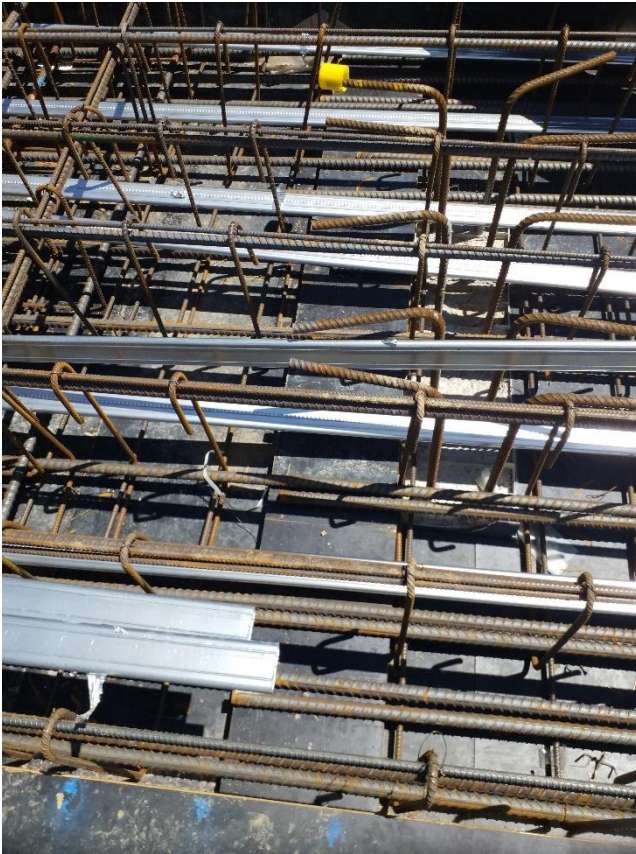
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5.0 Examples Of Site Installation

- Horizontal cast-ins



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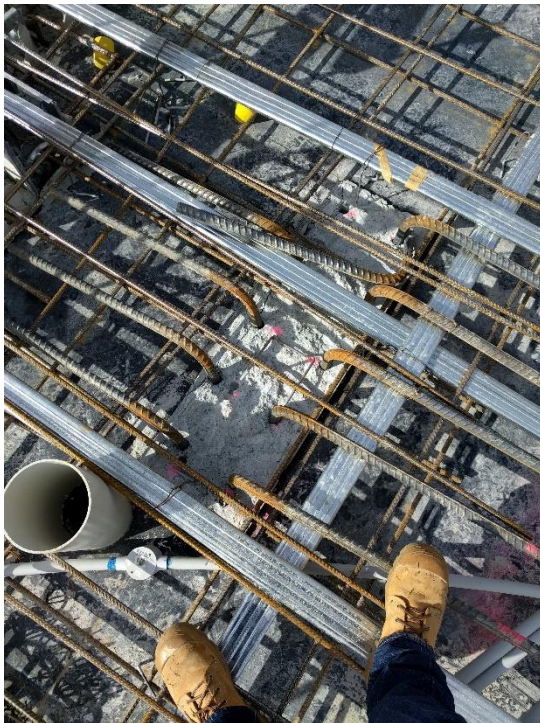


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- **Vertical cast-ins**



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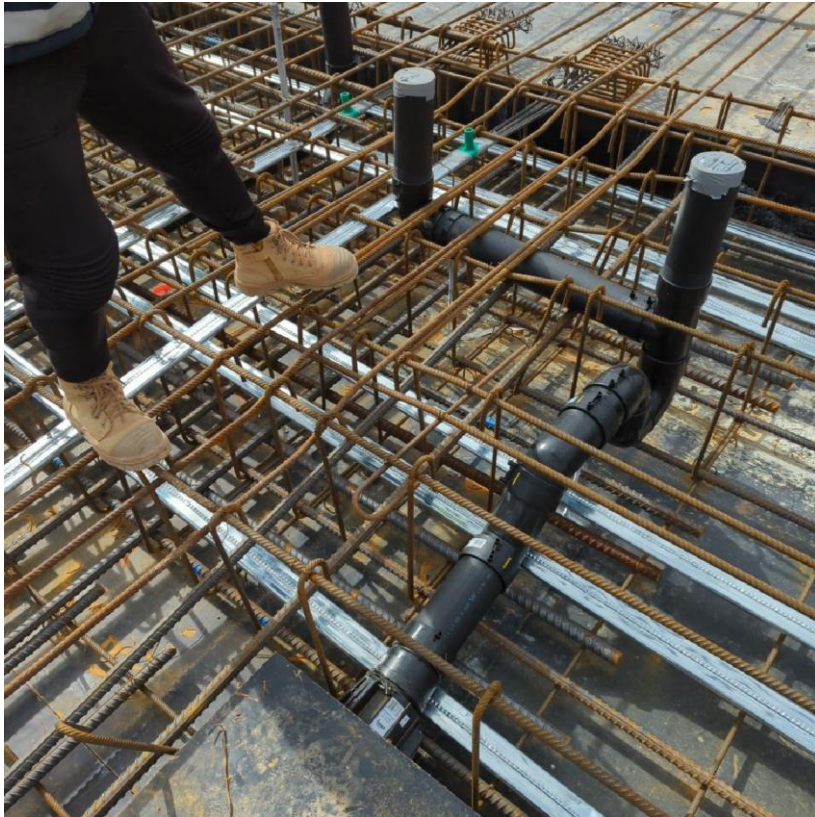
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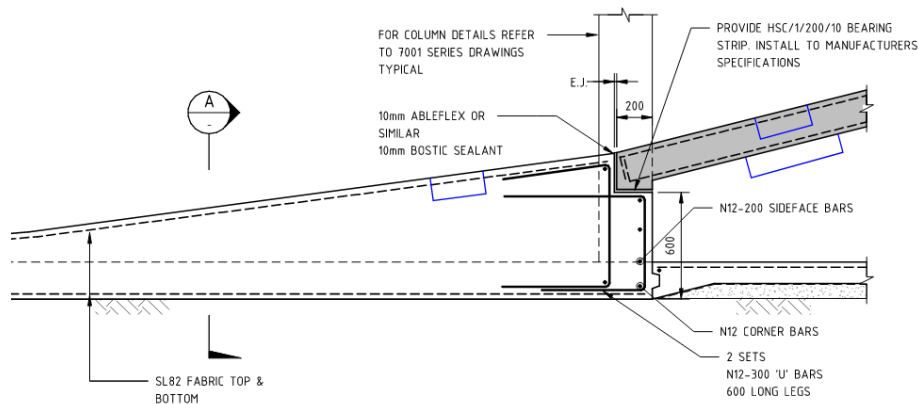
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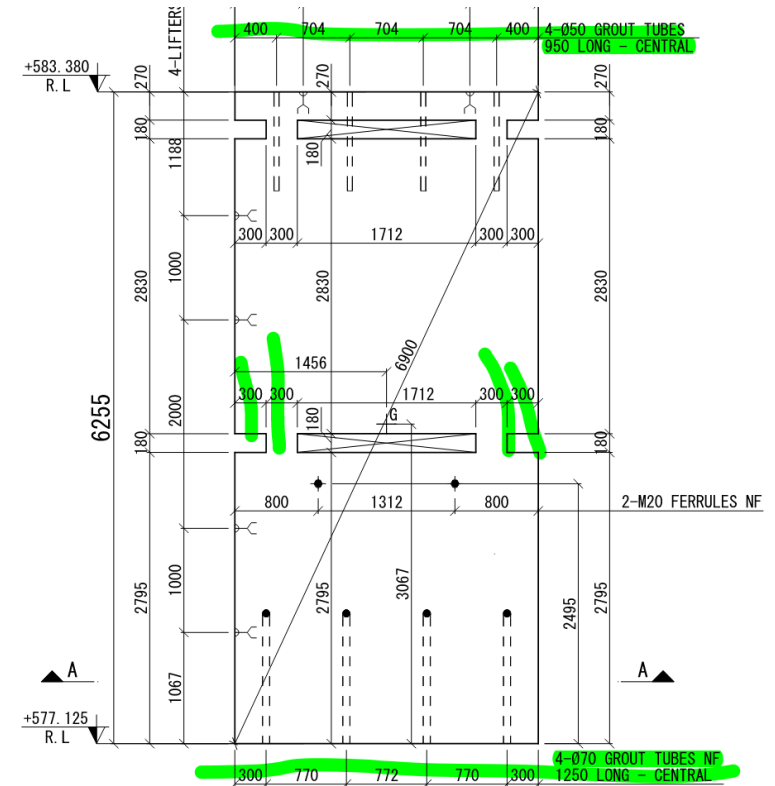
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Ramps & precast



TYPICAL RAMP BASE DETAIL



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6.0 Review & Discussion

QUESTIONS?

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