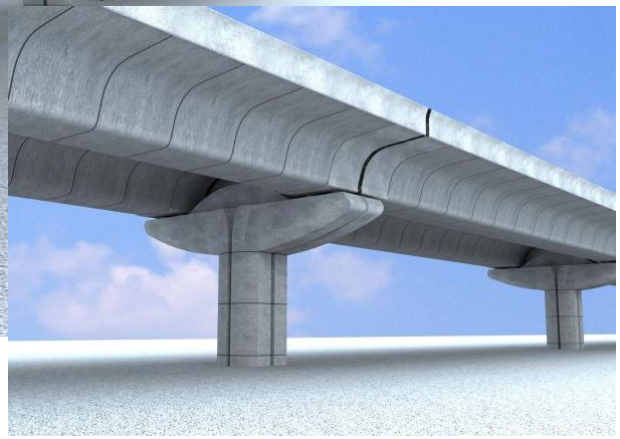
Sadr Elevated Expressway

TEHRAN

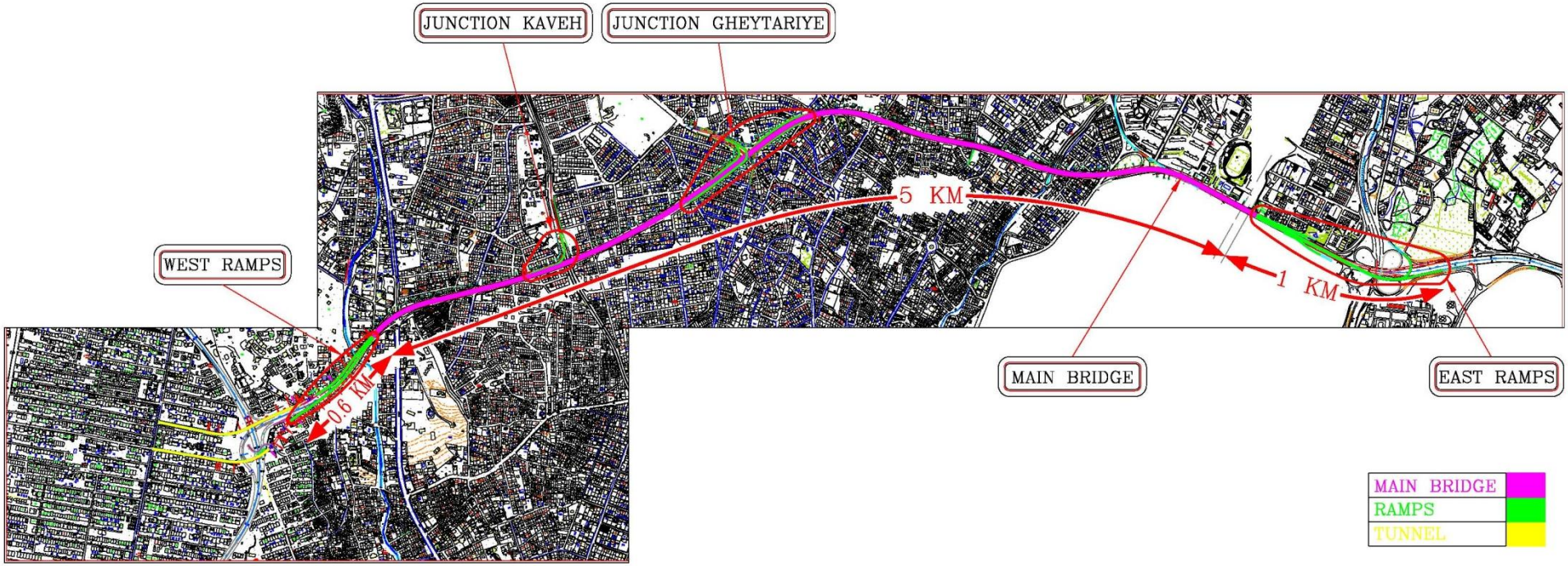


Organisations Involved

- **Client: Municipality of Tehran**
- **Contractor: Shahid Rajaie Special Group**
- **Structural Designer: Karane Consulting Engineers**
- **Alignment design, sound barrier, lighting, peripheral structures, etc: Various consultants**

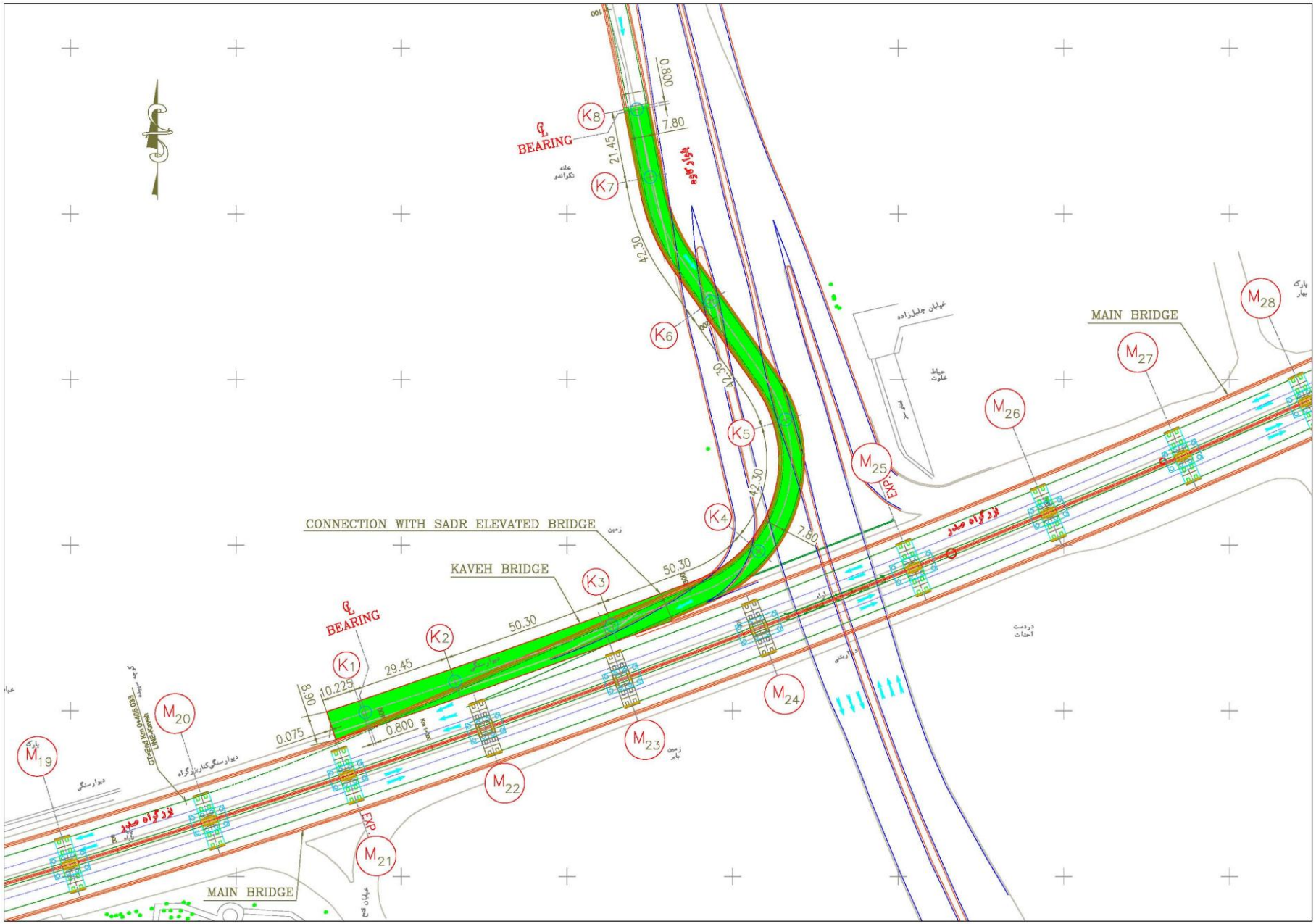
Why Do We Need the Elevated Expressway?

General Layout

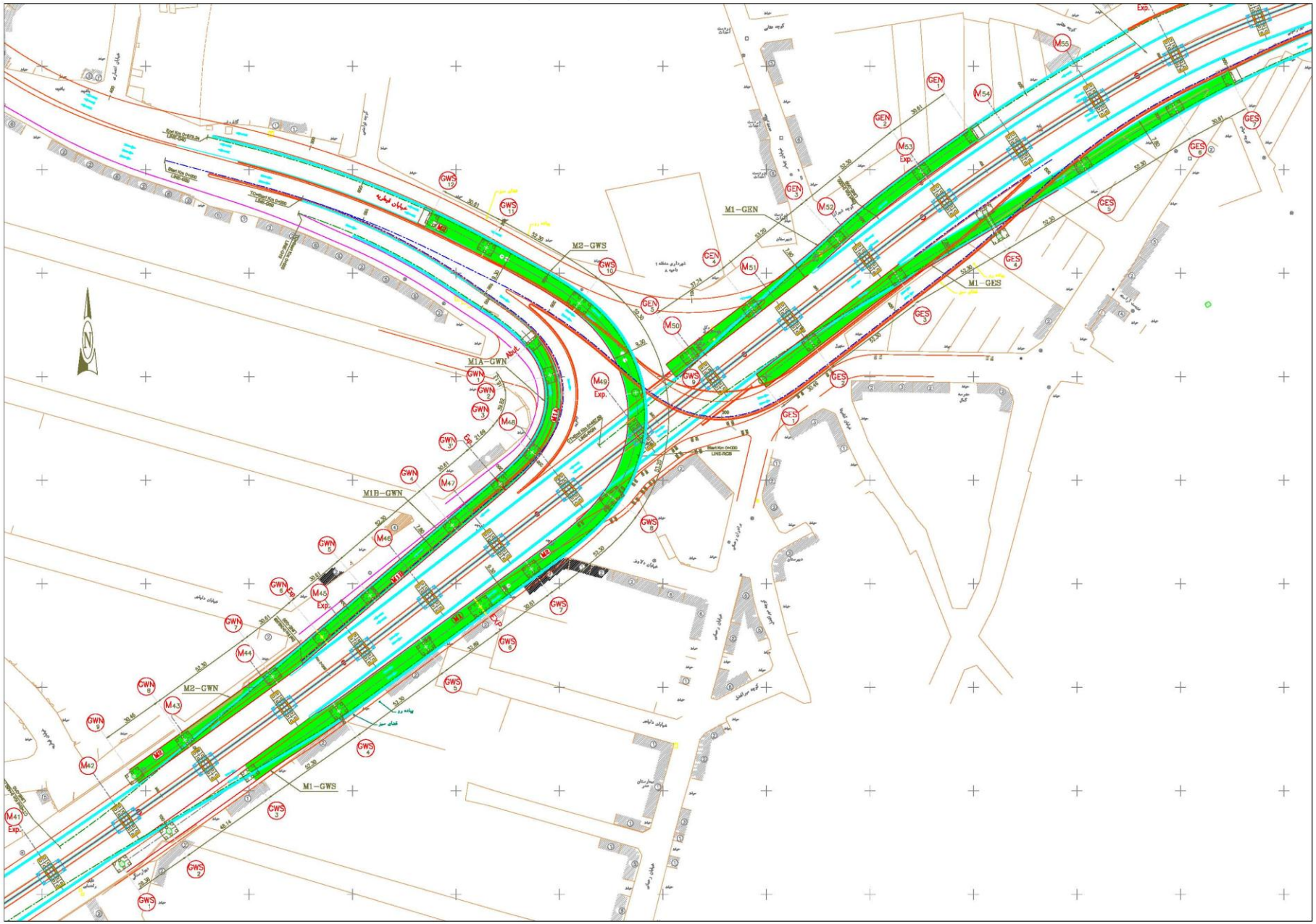


West Ramps

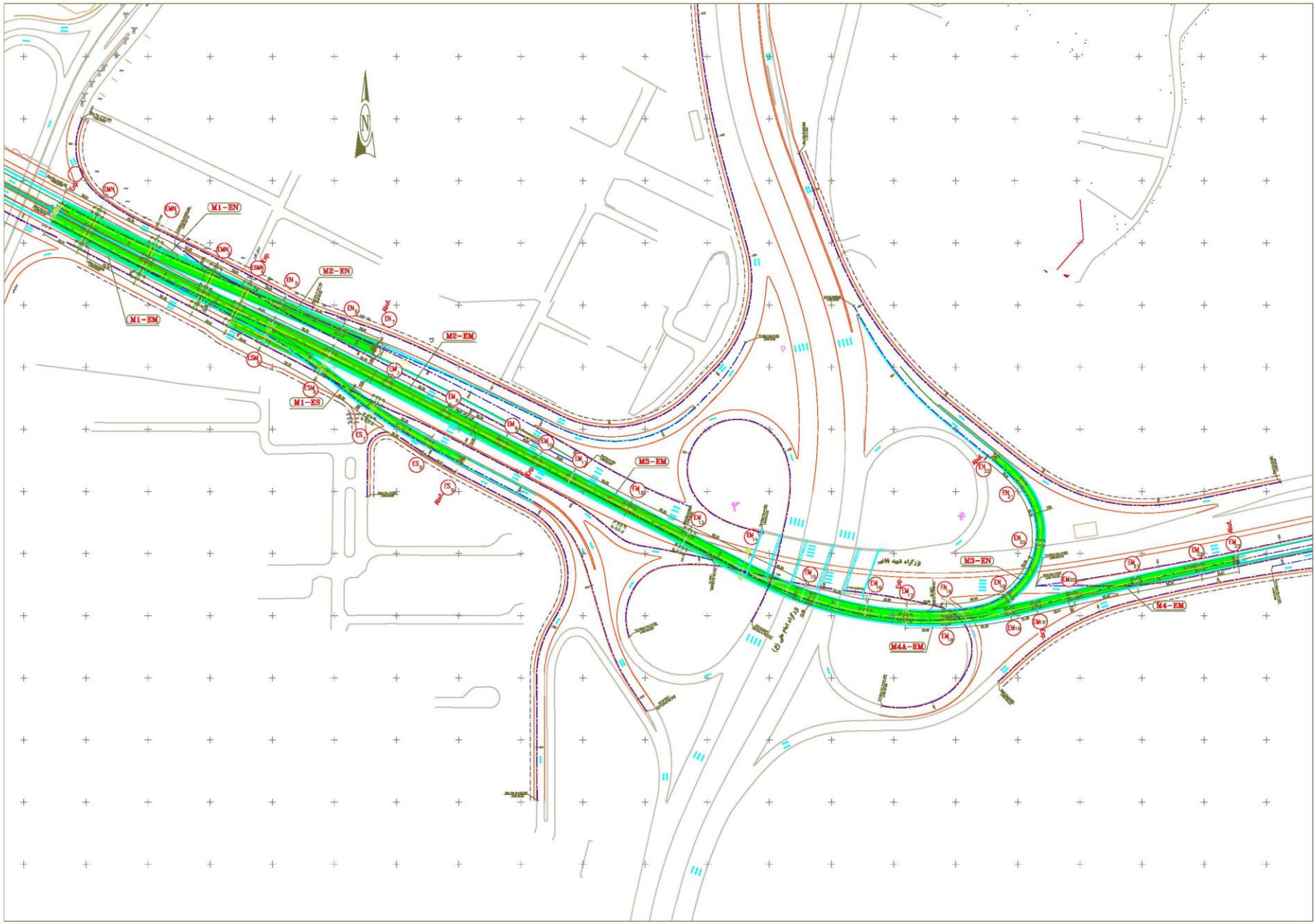
Kaveh Junction



Gheytariye Junction



East Ramps



Project Size

	Length, m	**Deck Area**, m^2	**Width**, m	**Min Radius**, m	**Max Pier Height**, m
Main Bridge	4,900	112,000	22.7	315	18
Ramps & Junctions	4,200	43,000	7.8-13.2	40	19.2
Total	9,100	155,000			

Main Bridge 72% of total

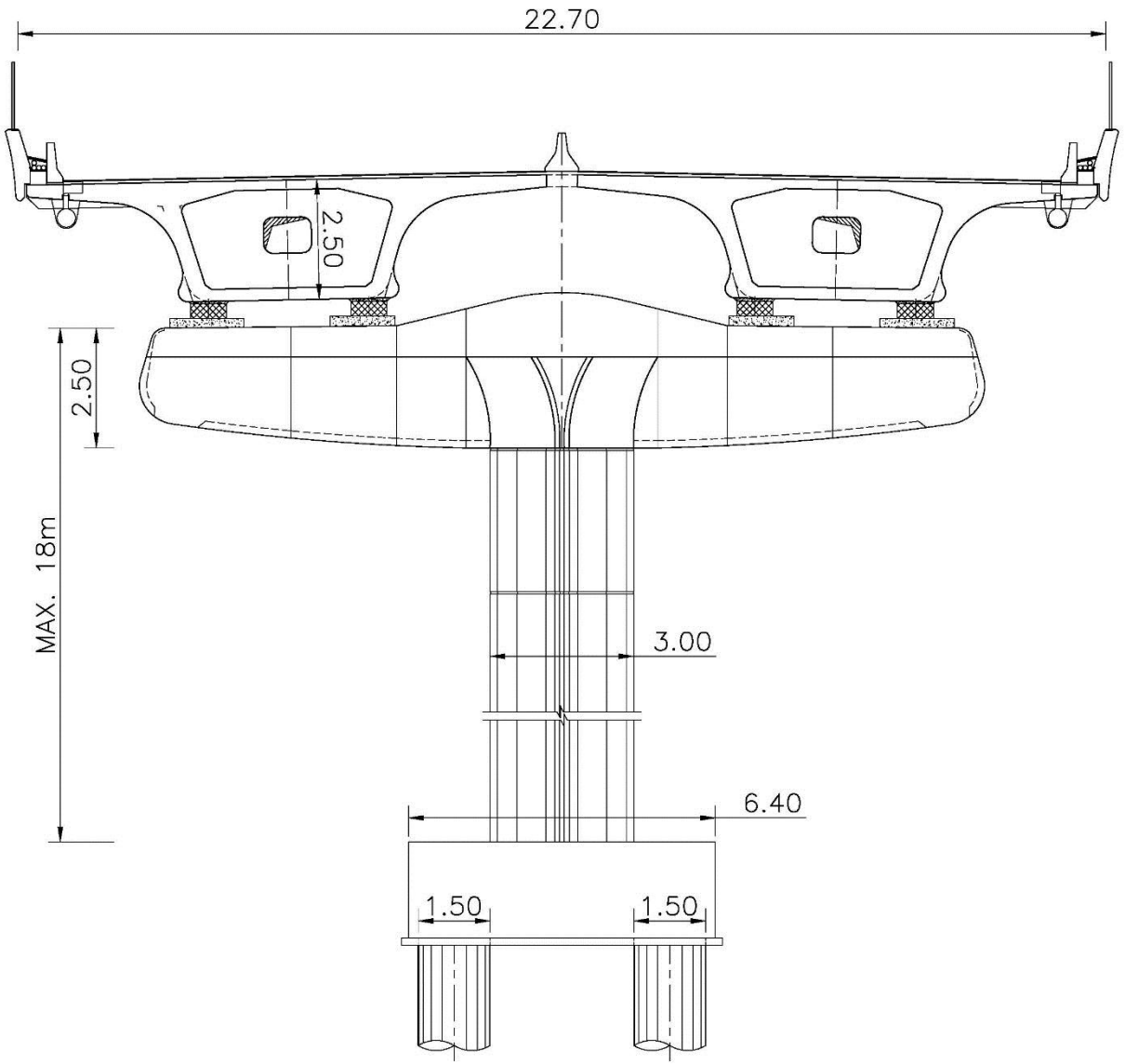
Project Requirements and Solutions

Requirement	Solution
Rapid construction time	Use factory produced precast units
Economy	Use concrete
Minimum interference with existing traffic	Minimise insitu work, work from above
Minimum risk to existing traffic	Minimise insitu work, use large units
Work in restricted space	Minimise insitu work, work from above
Aesthetics	Use factory produced precast units

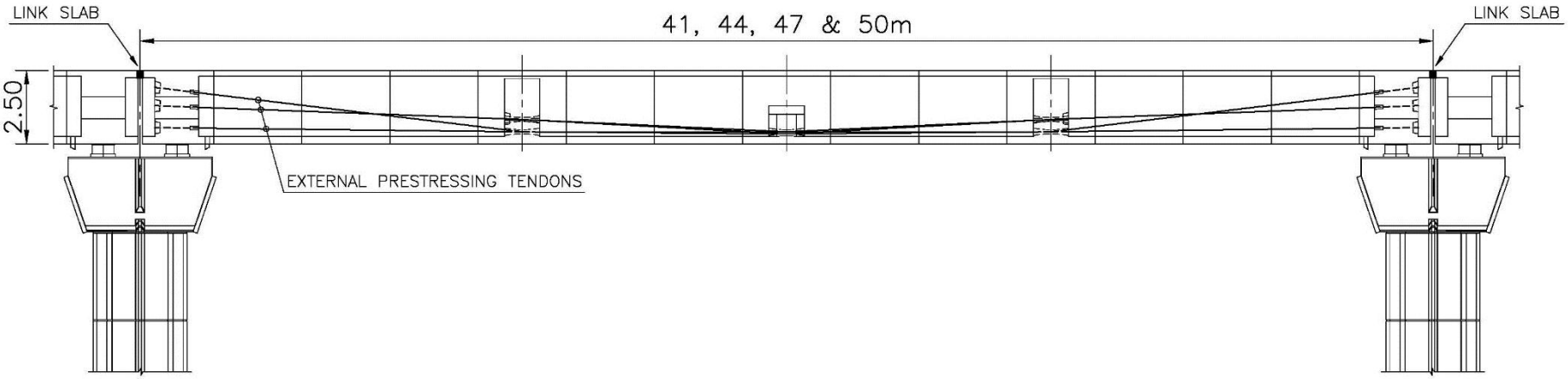
Use match cast PSC box girders

Main Bridge Superstructure

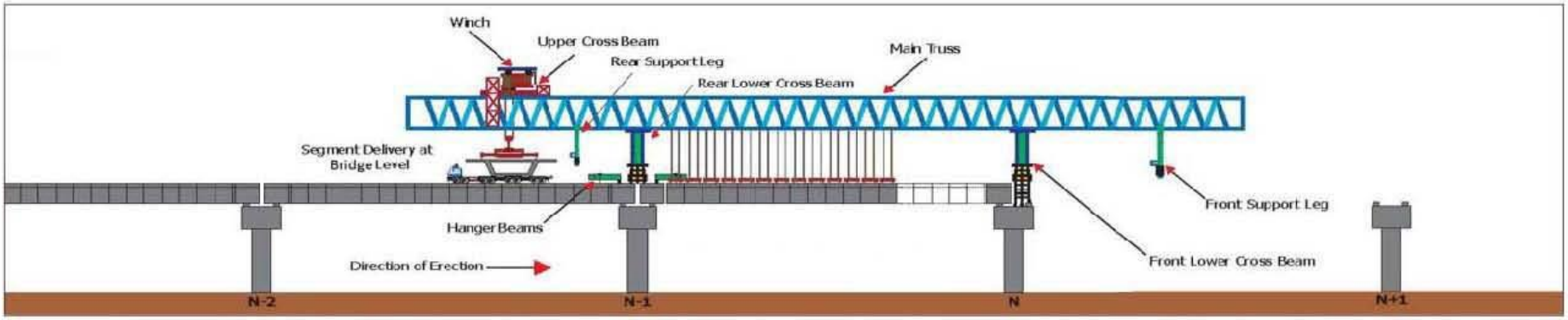
Cross-Section



Longitudinal-Section



Erection Method: Span-by-span



Typical Erection Cycle	Duration: 4-Day Cycle							
Description	1		2		3		4	
	D/S	N/S	D/S	N/S	D/S	N/S	D/S	N/S
Launching of Gantry								
Segment Placing								
Segment Alignment								
Installaton of External P.T.								
Stressing of External P.T.								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Pros & Cons of this Method

Pros:

- High erection speed: average of 3 spans per week (Main Bridge forms 72% of total deck area, so speed is critical)
- No need for access from ground

Cons:

- Needs time for design, fabrication, transport & erection of launching gantries
- Not suitable on tight curves (Our min R=315 m, so in our case it is not a problem)

Means Used to Speed up Construction

Use of simple spans	No need to wait for concrete in insitu joints to gain strength.
Use of external cables	Speeds up casting, no blockage of ducts during cable installation.
Use of dry joints	Eliminates gluing of joints, therefore speeds up erection.


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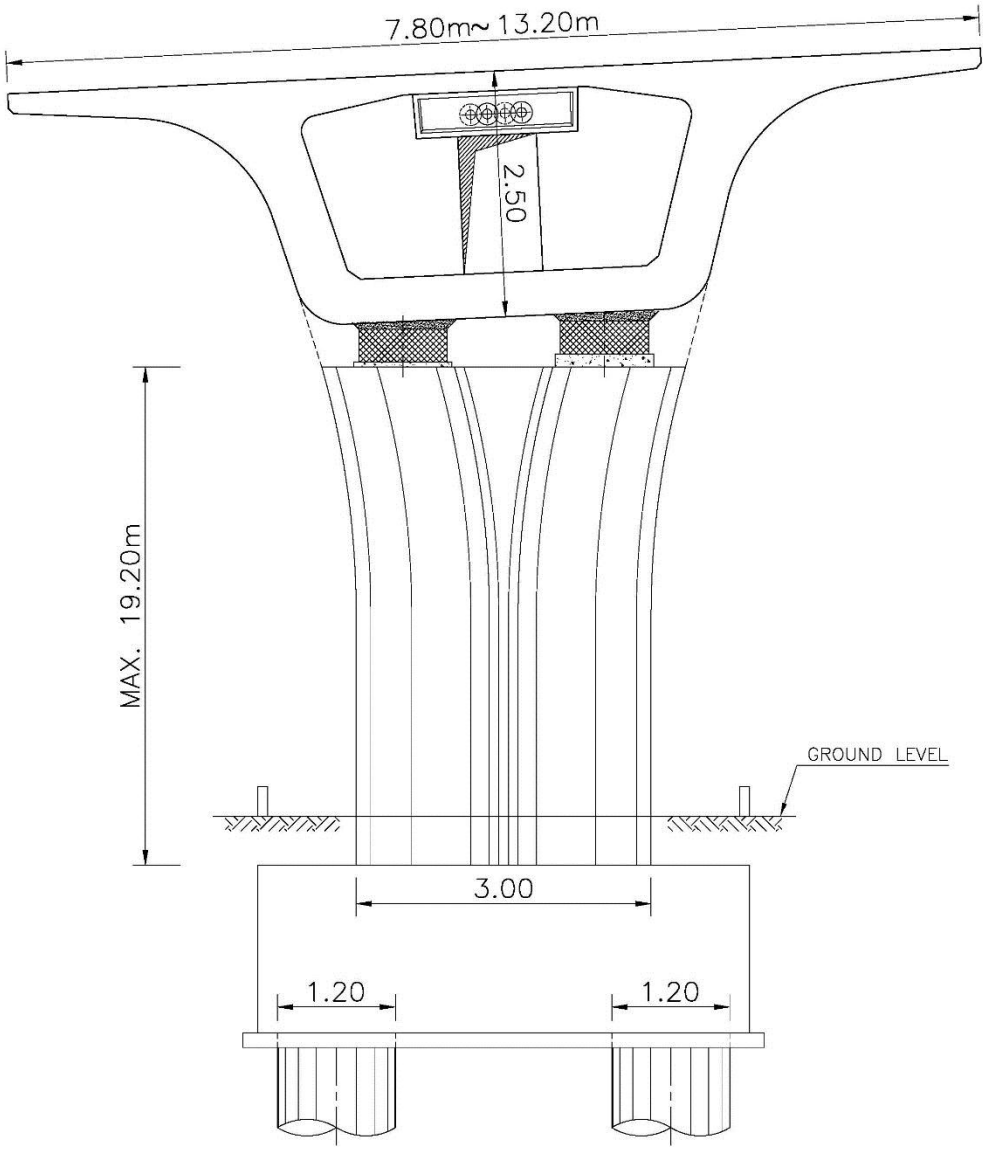
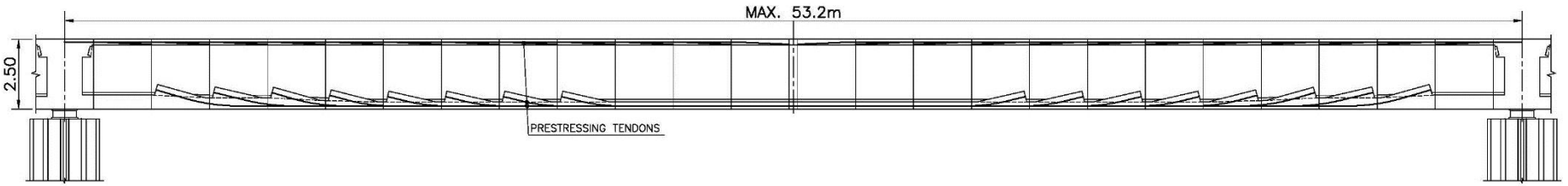
Ramp and Junction Superstructures

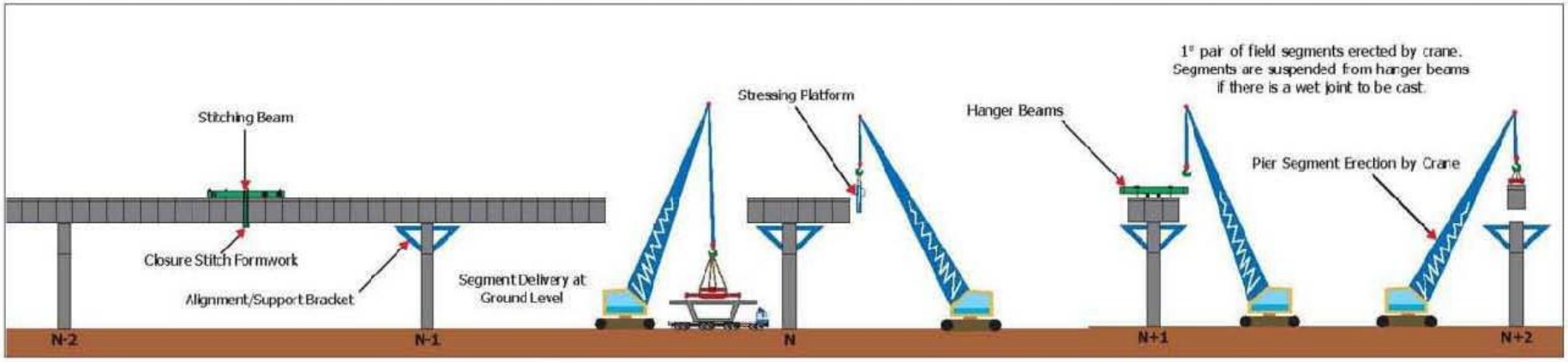
Cross Section



Longitudinal Section



Erection Method: Balanced cantilever using cranes from ground



Typical Erection Cycle	Duration: 8 Shifts							
Description	1	2	3	4	5	6	7	8
Installation of Pier Segment Support Brackets								
Installation of Pier Segment								
Segment Erection - Pair 1-3								
Segment Erection - Pair 4-6								
Segment Erection - Pair 7-9								
Segment Erection - Pair 10-12								

Pros & Cons of this Method

Pros:

- All machinery available, so construction can start immediately
- Can cope with tight curves (Our min R=40 m)

Cons:

- Needs access from ground
- Slower than span by span method
- Interferes with traffic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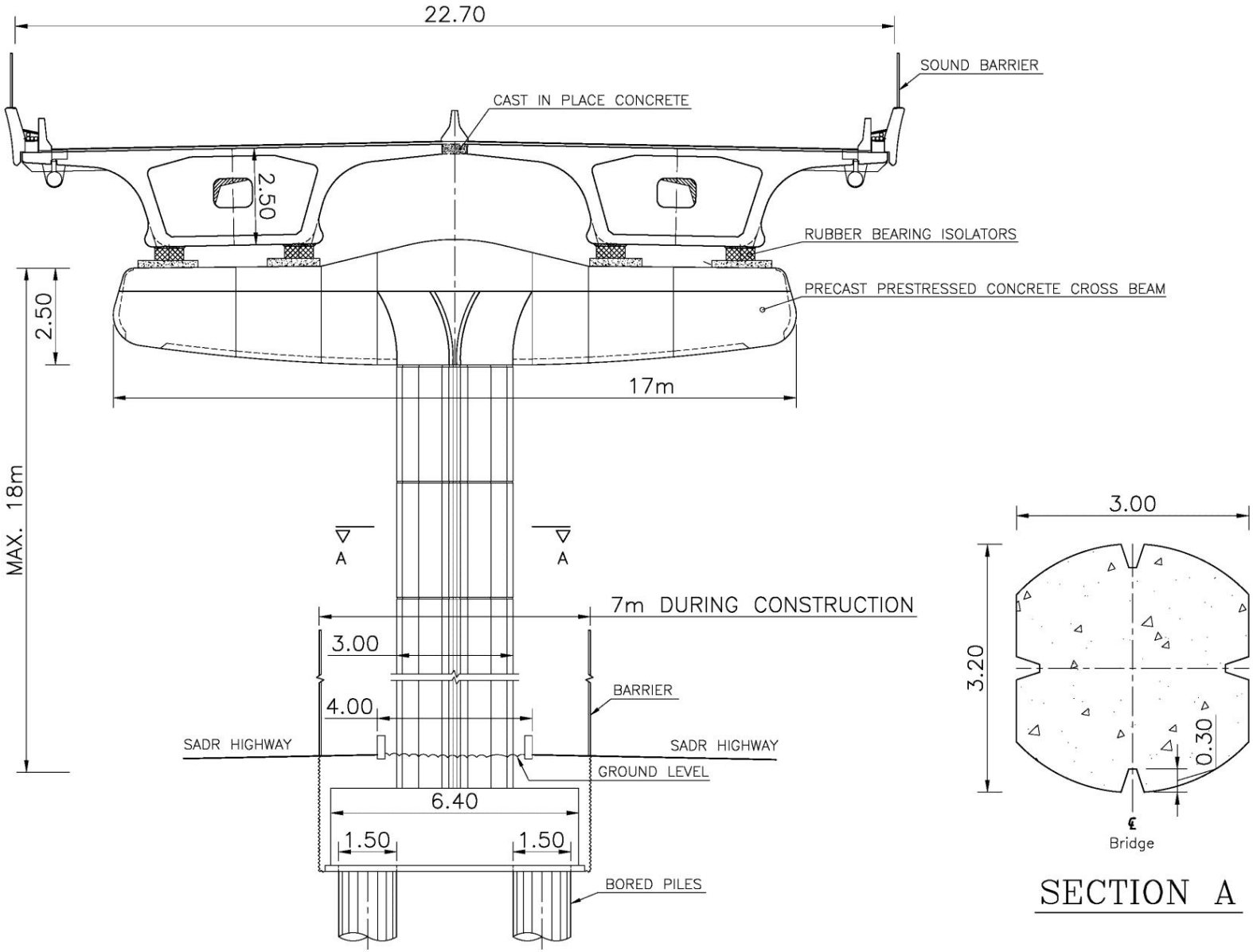
Main Bridge Piers



Requirements and Solutions

Problem	Solution
Region of high seismic activity	Impossible to design by conventional methods ⇩ **Use Seismic Isolation**
Tall piers	
Single columns	
Restriction on column dimensions	
High column loads during erection & service	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Pier Cross-Beams

Same requirements as for superstructure

Use precast prestressed cross-beams

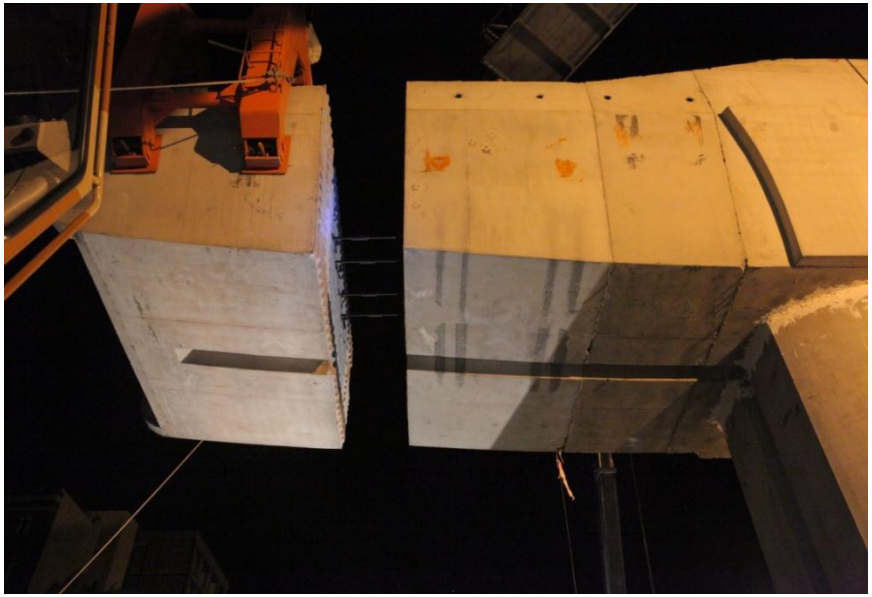


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Photo by: Rasool Safizade


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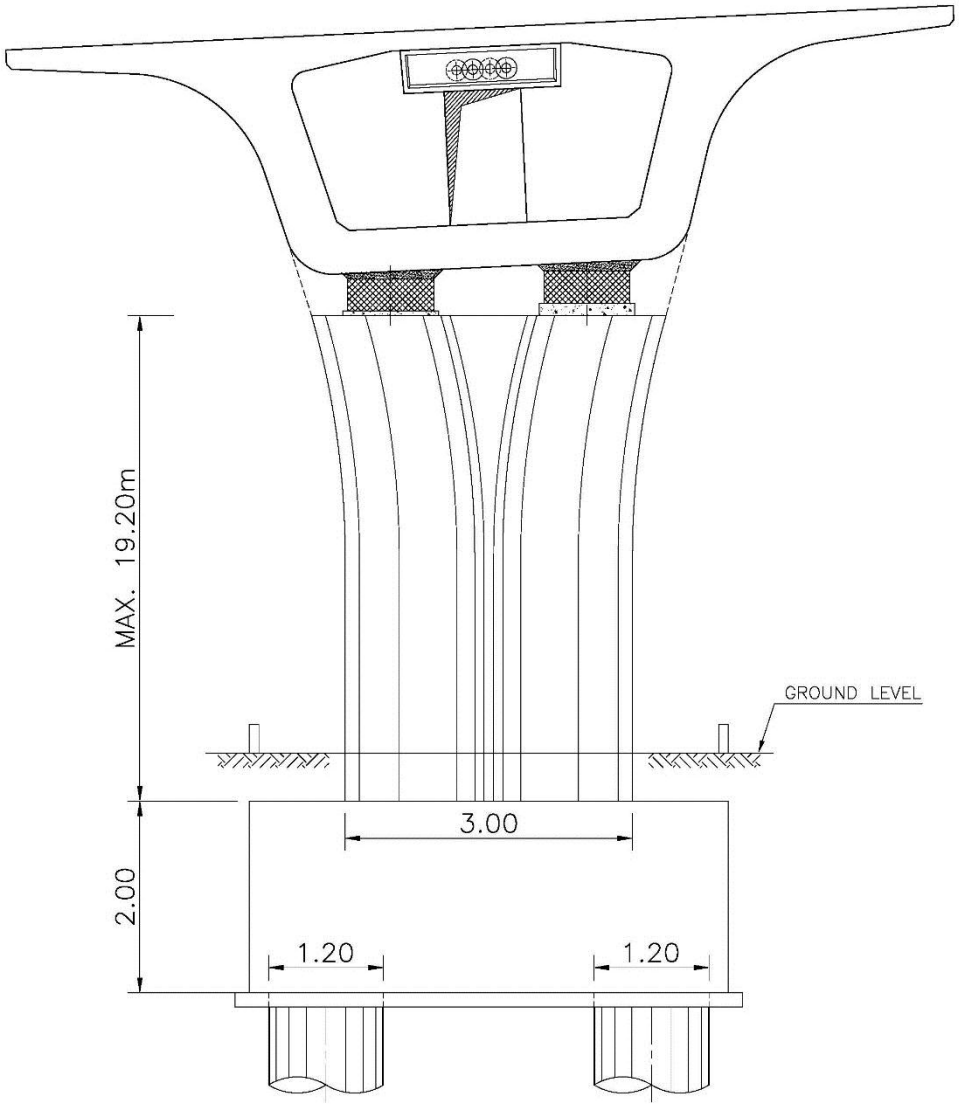
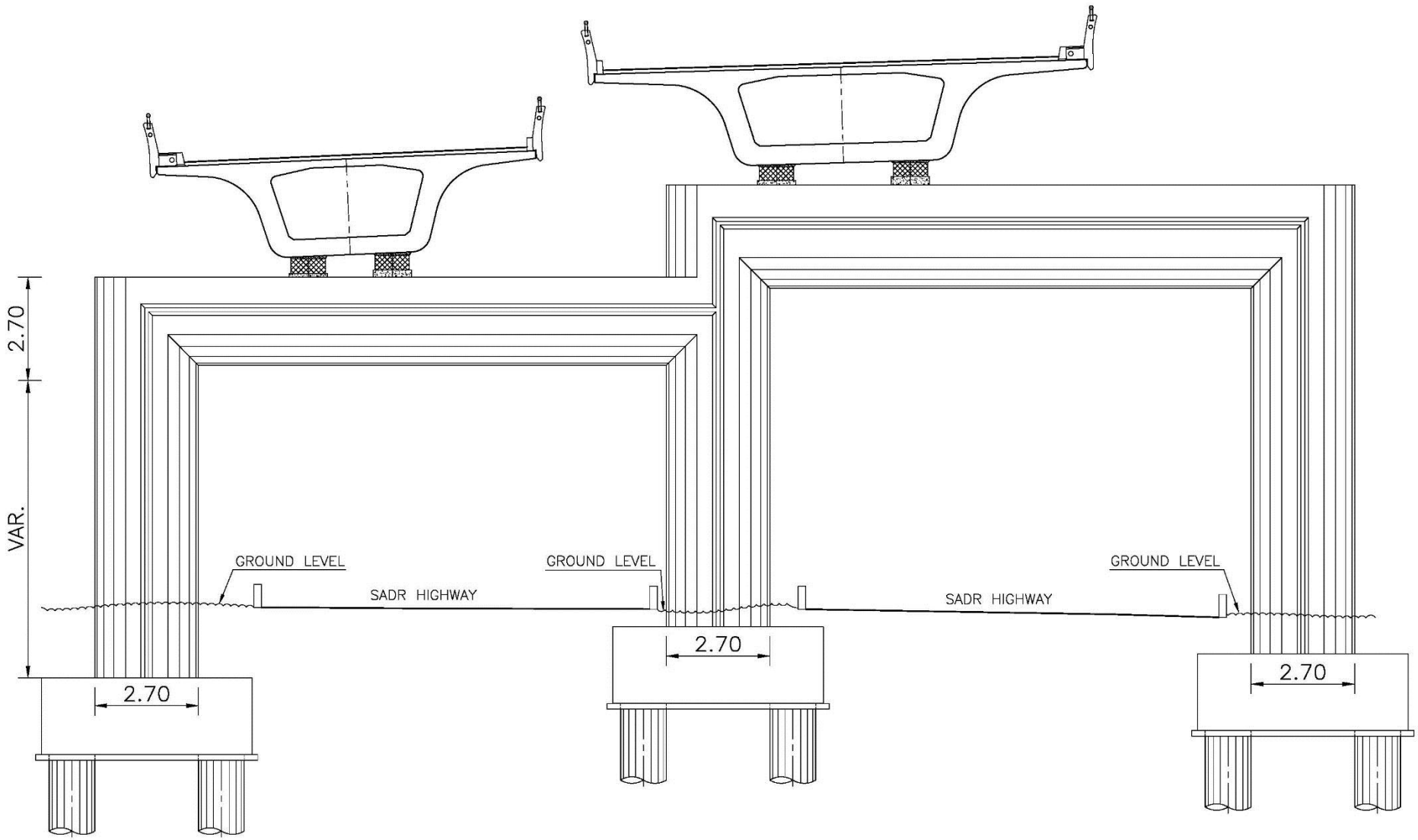
Ramp & Junction Piers

Same concept used as for main bridge piers

Single Piers



Portal Piers

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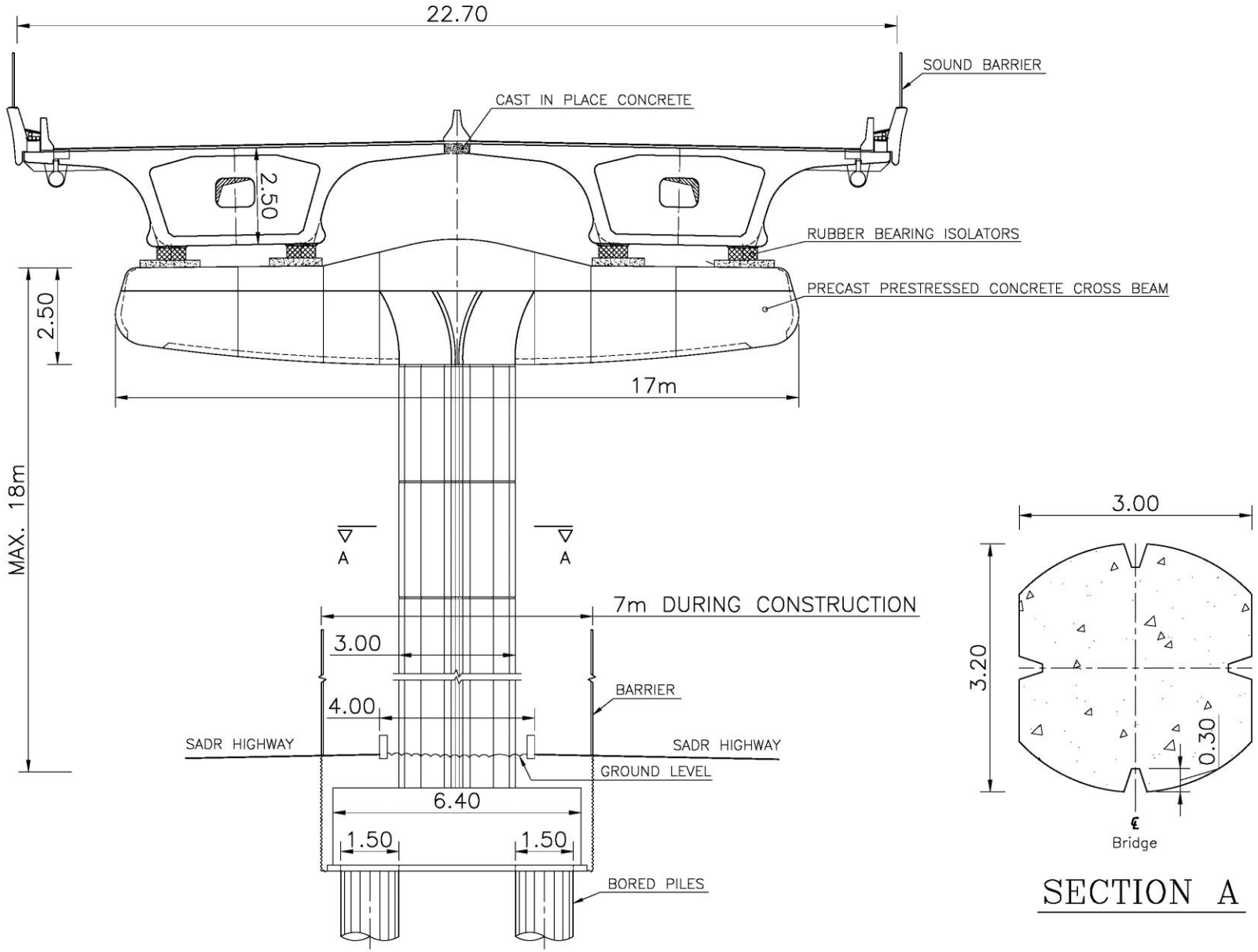
Foundations

- Roughly 80% of foundations situated on deep alluvium: Designed as piled foundations / single shaft foundations.

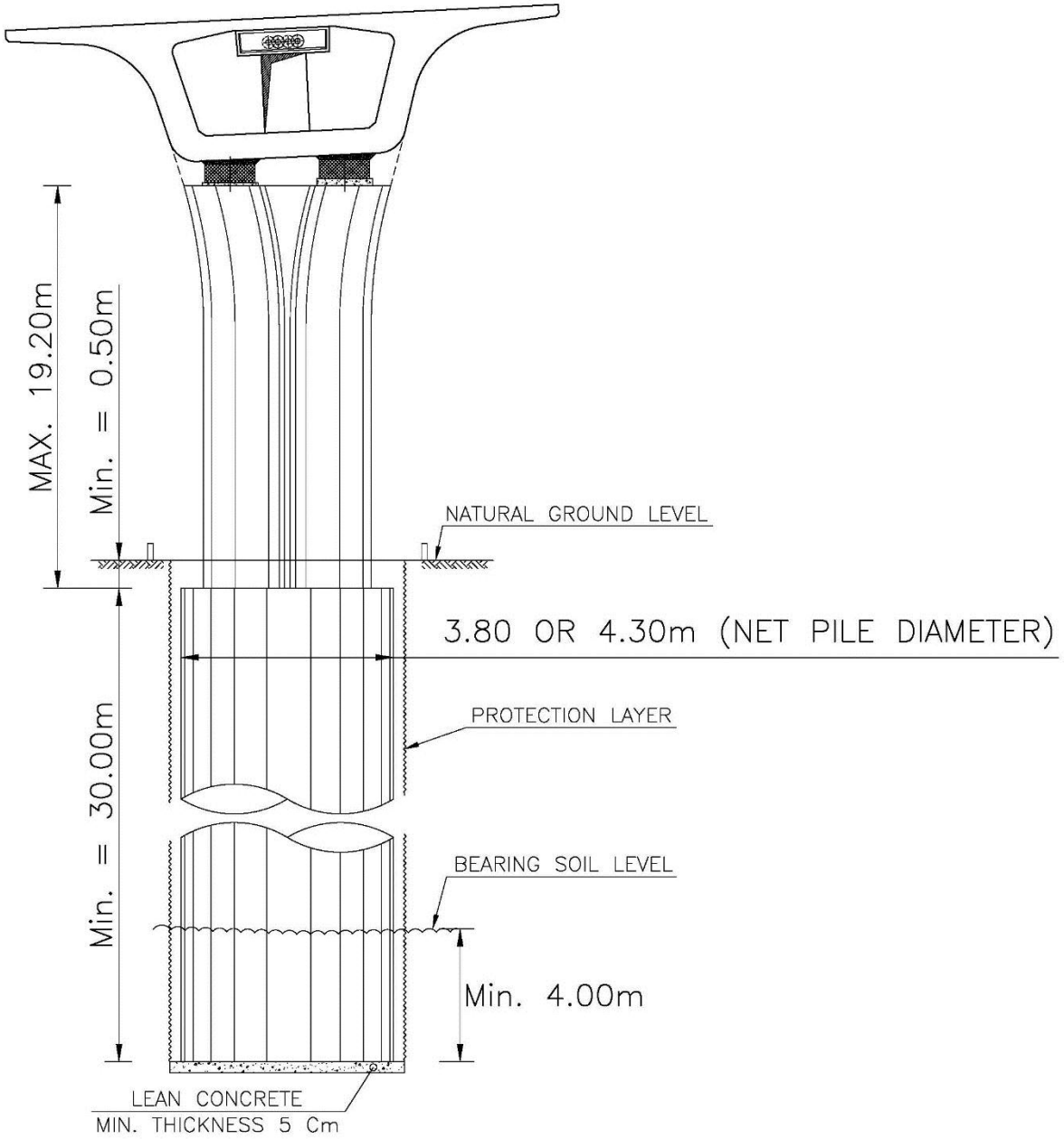
- For the other 20%, alternative spread footing designs were prepared, but their widths were wider than the central reserve, so special construction techniques would have been needed to build them.

- The contractor decided to use piles / single shafts on all foundations.

Multiple Pile Foundation



Single Shaft Foundation




Thank You