Prefabricated Reinforcement – a “Better, Faster, Cheaper” solution to fastrack your project!

The unrelenting pressure from the tightening supply and rising cost of labour have resulted in many projects falling way behind schedule.

Increasingly we, at BRC, have been called upon by contractors to convert rebar to mesh or prefabricated reinforcement to speed up their projects.

We are pleased to showcase several of these residential projects wherein our new innovative mesh solutions have resulted in tremendous productivity improvements for floor slabs, walls and storey shelters.

Also featured is a dormitory project where close to 100% of reinforcement were prefabricated for the basement raft foundation, walls and columns to overcome manpower shortage and to catch up on lost time.

On the back page, we provide several illustrations of consultants’ specifications for prefabricated reinforcement. These specifications are generic as different fabricators have varying degree of expertise and capabilities. This gives us the flexibility to propose and provide the most effective solution for a “Better, Faster, Cheaper” outcome for the contractor.

Lim Siak Meng
Group Managing Director
13m long wall for industrial factory measuring 7.6m high x 0.3m thick.
Total weight – 2.7 MT.
Each panel took about 10 minutes to hoist into position.
3 workers took 2 hours to complete the full installation.
Productivity is 2.3 manhour/MT.

Original reinforcement detail for cargo lift wall.

1. Newly fabricated wall mesh panel.

3. 13m long x 7.6m high wall reinforcement completed for inspection.
Faster

• Conventional steel fixing will take 5 workers 8 hours to prefab on the ground and install or 14.8 manhour/MT.
• Productivity improvement of more than 80%.
• Manually tied wall panels cannot achieve the rigidity of factory welded panels hence can only go up to a maximum of 4m in height instead of the full 7.6m.

2. Hoisting of wall mesh panel in place.
• Residential unit slab reinforcement of T10-200 both ways, top and bottom with additional bars at certain locations.
• Reinforcement converted to mesh incorporating additional bars.
• 4 workers took 4 hours to lay bottom and 6 hours to lay top mesh covering 4 units

Original bottom reinforcement detail.

Bottom reinforcement converted to mesh.
Yishun Ave 9 - Slab Mesh

Original top reinforcement detail.

80% Time Savings

Large sheets of mesh used for top reinforcement.

- The mesh weigh a total of 6.0MT.
- Productivity is 6.7 manhour/MT.
- Tying of rebar conventionally will take 6 workers 4 days to complete or 48 manhour/MT.
- Time savings of 80%.

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1. Prefab wall panel stored on site, ready for installation.

- Storey shelter wall of nominal size 8.6m (L) x 3.3m (W).
- Reinforcement - T13-100 + T13-100.
- Total weight – 5.6 MT.
- Installation of 17 prefab panels took 3 workers 6 hours to complete or 3.2 manhour/MT.
Ave 9  - Storey Shelter Wall

2. Installation of prefab panels in progress.

3. Completed reinforcement for storey shelter using prefab panels.

- Tying of rebar manually will take 5 workers 3 days to complete or 32 manhour/MT.
- Time savings of 2 days.
Dormitory Blocks at Pung…

1. E13 mesh in large sheets ready for laying on site.

3. Workers laying a 250 kg sheet of top mesh.

- Raft foundation slab measuring 30m x 60m x 0.35m.
- Reinforcement – E13 mesh + additional bars.
- Mesh manufactured in large sheets of 7.0m x 2.4m to minimise lapping and allow for workers to carry without the use of crane.
2. Bottom mesh partially completed.

4. 70MT of mesh for an area of 30m x 60m completed.

- 290 sheets of bottom and top mesh took 8 workers 2 days of 10 hours work to complete laying.
- Productivity is 2.3 manhour/MT.
- Shorten construction duration by at least 2 days.
1. Light prefab column workers can install without the use of machinery.

2. Rigidly welded columns installed in double quick time.

- Internal columns 0.4m x 0.4m, each weighing about 80 kg.
- Each column took about 5 minutes to install.
- 3 workers took 8 hours to complete the installation of 74 columns.
- Prefab Column and Wall

1. Originally specified rebar converted to wall mesh panels.

2. Each wall mesh panel installed in 10 minutes by 3 workers.

- Wall reinforcement of T16-150 +T13-150 converted to mesh panels to speed up the reinforcing work.
- Each panel weighing about 400 kg installed in 10 minutes by 3 workers.
- Prefab wall panels for the full perimeter wall of 180 meter run took 6 workers 1 day to complete.
- Tying loose bars for the wall will take 6 workers 4 days to complete.
- Productivity improvement of more than 70%.
19 Storey Condominium Block at Upper Serangoon Road

Bottom reinforcement completed using single directional mesh.

- Residential unit slab reinforcement with T10-200 + T10-300 base and T10 and T13 additional bars at certain locations.
- Reinforcement converted to single directional mesh incorporating additional bars to minimise steel fixing work on site.
- 5 workers took 12 hours over 2 days to lay 9.2 MT of bottom and top mesh for 4 residential units.
**Upp Serangoon Road - Slab Mesh**

- Productivity is 6.5 manhour/MT.
- Tying of rebar conventionally will take 5 workers 4 days to complete or 26 manhour/MT.
- Time savings of at least 2 days.

*Original top reinforcement detail.*

*Additional bar required incorporated into top mesh.*

*Reduce 2 Days Per Floor*
Slab reinforcement with T10-200 bothways top and bottom. T10 and T13 bars are added at a few locations.

Reinforcement converted to A10 mesh for easy laying.

3 workers took 3 hours to lay the bottom mesh and 4 hours to complete the top mesh for 2 units total weight of 2.7 MT.

Productivity is 7.8 manhour/MT.

Cantilever balcony slab – bottom reinforcement in a single sheet of mesh.

Top mesh with 1.5m long anchorage installed with ease.
Gateway - Balcony / Slab Mesh

- Tying loose bars will take 4 workers 3 days to complete or 53 manhour/MT.
- Time savings of more than 80%.
Specifications for Prefabrication

Some examples of notes used by consultants to specify prefabrication:

**BUILDABILITY REQUIREMENTS:**

1. All reinforcements in cast-in-situ components shall be in prefabricated steel. The contractor shall submit details and shop drawings of the following for approval:
   - Slab – WSFR Mesh
   - Beam – Prefabricated steel beam cage
   - Column – Prefabricated column rebar cage
   - Wall – WSFR mesh or wall rebar cage

**PREFABRICATED REINFORCEMENT**

1. THE CONTRACTOR SHALL **PREFABRICATE ALL STEEL REINFORCEMENT** TO FACILITATE EASE OF INSTALLATION ON SITE. ALL WALL AND COLUMN REINFORCEMENT, SLAB REINFORCEMENT AND BEAM CAGES SHALL BE **PREFABRICATED IN A FACTORY** APPROVED BY THE ENGINEER.

2. THE CONTRACTOR SHALL SUBMIT TOGETHER WITH HIS TENDER, THE NAME/S OF THE FACTORY PREFABRICATING THE CAGE REINFORCEMENT. THE CONTRACTOR SHALL OBTAIN THE WRITTEN APPROVAL OF THE ENGINEER IF HE WISH TO CHANGE TO ANOTHER FACTORY.

3. THE CONTRACTOR MAY PROPOSE ALTERNATIVE BAR SIZES AND SPACING TO SUIT THE PREFABRICATING PROCESS, SUBJECT TO THE APPROVAL OF THE ENGINEER. THE ALTERNATIVE PROPOSAL SHALL NOT COMPROMISE THE ORIGINAL AREA OF STEEL REINFORCEMENT SHOWN ON THE ENGINEER’S DRAWINGS.

**PREFABRICATED REINFORCEMENT**

J.1 UNLESS OTHERWISE DIRECTED BY THE ENGINEER, ALL BEAM, COLUMN, WALL AND SLAB TO BE **PREFABRICATED MESH/REBAR OFF-SITE** TO AT LEAST 60% OF THE OVERALL STEEL QUANTITY TO COMPLY TO BUILDABILITY SCORE.

J.2 THE CONTRACTOR SHALL **PREFABRICATE ALL STEEL REINFORCEMENT FOR WALL, COLUMN, BEAM AND SLAB**. ALL WALL AND COLUMN REINFORCEMENT, SLAB REINFORCEMENT AND BEAM CAGES SHALL BE PREFABRICATED IN A FACTORY APPROVED BY THE ENGINEER.

**NOTES:**

1. BASIC REINFORCEMENT FOR BOTTOM LAYER OF SLAB SHALL BE T10–200 BOTHWAYS THROUGHOUT.
2. ALL REINFORCEMENT SHOWN ON PLAN SHALL BE ADDITIONAL TO BASIC REINFORCEMENT AS STATED IN NOTE 1.
3. ALL SLAB REINFORCEMENTS ARE TO BE **WELDED STEEL FABRIC REINFORCEMENT.**
4. ALL SLAB TO BE 250mm THK U.O.S.