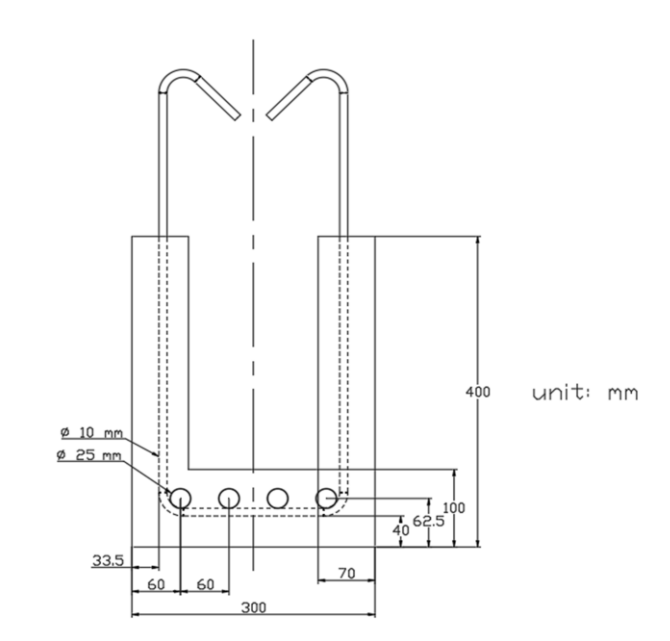
Groove Girder/Beam GGB-400.30

3rd Bureau Construction

- 400mm girder height
- Less than 2 ton self-weight no requirement to crane
- No need for formwork and complex reinforcement reducing the requirements on workers
- The girder reaches the same strength as the cast-in-place construction, and the joints reach more than 83% of the cast-in-place construction.
- Lifting installation time less than 15 minutes.
- Provides an instant working support for slab lifting
- In stock and waiting for transport
- Continuous installation minimizing down time on site
- Proper co-ordination and quick installation allows for a fast-paced construction site

Specification Sheet

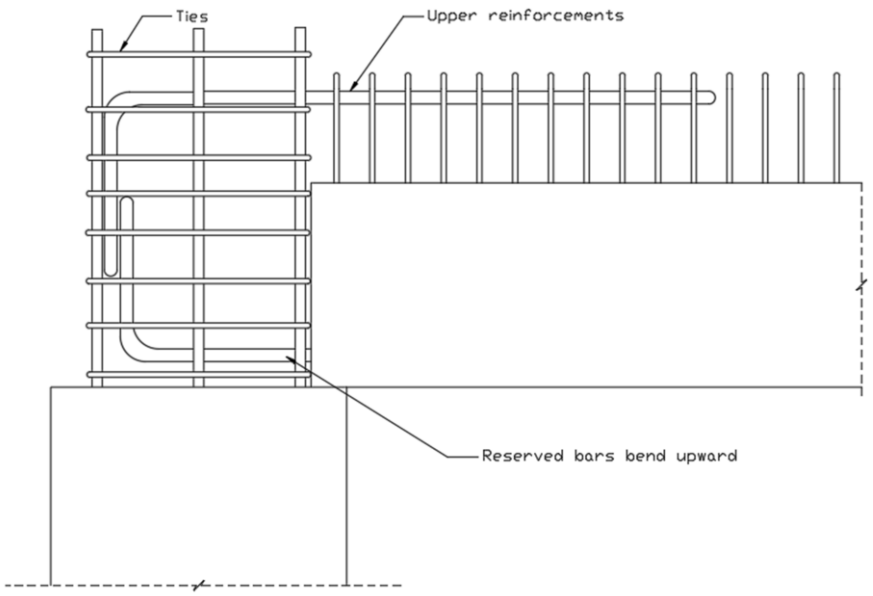
Properties	symbol	Metric
Cross-section Area	A_X	$86000.00mm^2$
Moment of Inertia	I_g	$2.949 \times 10^9 mm^2$
Unit Weight	W	226.867 kg/m
Completed Unit Weight	W_C	380.467 kg/m
Resistance factor for steel	ϕ_s	0.85
Yield stress for steel	f_s	400MPa
Resistance factor for concrete	ϕ_c	0.65
Yield stress for concrete	f_c	25MPa
Stirrup spacing	s	70 mm
Torsional resistance	T_r	28.74 – 42.58 kN · m

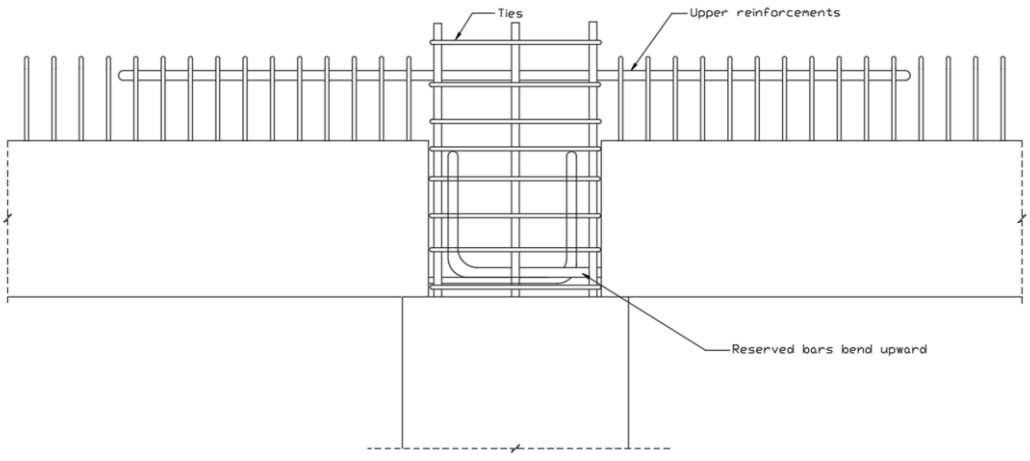


Maximum Load Capacity (kN/m)												
Clear span (m)	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5
Construction	89.53	49.52	31.00	25.28	20.94	17.56	14.87	12.71	10.94	9.47	8.24	7.20
Completed (simply supported)	101.2	75.24	50.74	41.41	34.31	28.78	24.39	20.86	17.96	15.56	13.55	11.85
Completed (fixed ends)	101.2	75.24	59.68	54.02	49.31	45.32	41.90	38.94	36.35	34.06	32.02	30.20

Deflection Δ (mm) under simply supported condition (k=1.0)		
Girder height, H (mm)	400	$\Delta = \frac{1}{1728} \cdot \frac{w_s l^4}{0.9583 + \frac{567661}{w_s^3 l^6}}$
	450	$\Delta = \frac{1}{1728} \cdot \frac{w_s l^4}{1.3233 + \frac{1712653}{w_s^3 l^6}}$
	500	$\Delta = \frac{1}{1728} \cdot \frac{w_s l^4}{1.7530 + \frac{4630607}{w_s^3 l^6}}$
	550	$\Delta = \frac{1}{1728} \cdot \frac{w_s l^4}{2.2488 + \frac{11423387}{w_s^3 l^6}}$
	600	$\Delta = \frac{1}{1728} \cdot \frac{w_s l^4}{2.8118 + \frac{26082593}{w_s^3 l^6}}$

Connections to column





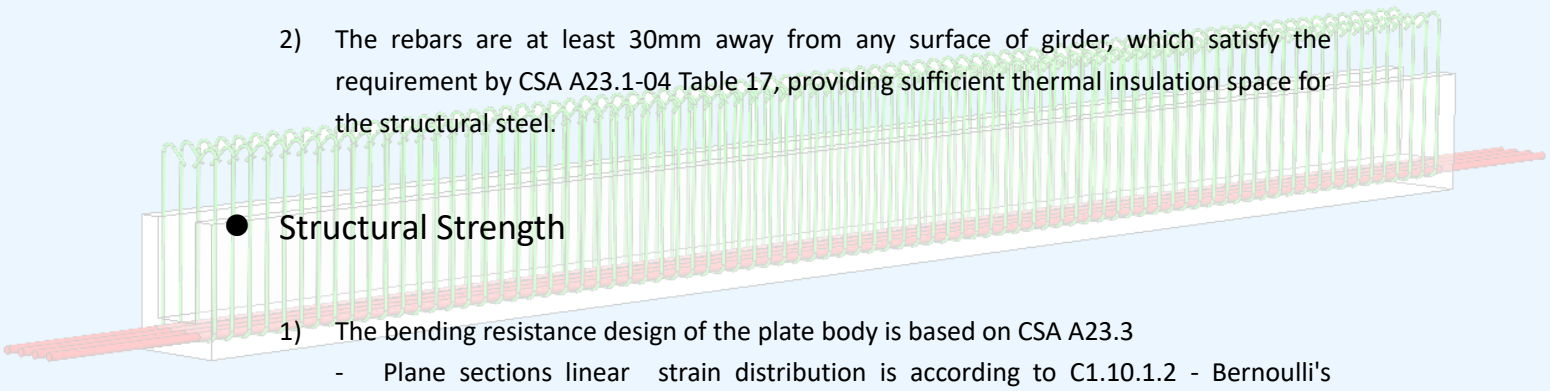
Technical Stats

Fire Protection

According to the requirements for minimum fire-resistance rating of NBC 2020 (National Building Code) Table 2.2.1.4, for Group G Division 1 adjoining Group D and E need at least 1hour, adjoining G-2 and G-3 need minimum 2 hours fire resistance rating.
For Group G Division 2 and 3 adjoining Group A and C need at least 1 hour, adjoining Group G and F-1 require minimum 2 hours fire resistance rating.

1) Based on data of residential fires provided by the U.S. Fire Administration, when a flashover occurs, the peak temperature inside the house is 1,100°F (600°C). Steel and concrete meet AISC and CSA requirements. The rebar core temperature still has 61% of the original strength after reaching 600°C, the concrete strength still has 78% and 69% of the design strength after 1 hour and 2 hours at the peak temperature of 500°C, and 67% and 56% of the design strength after 1 hour and 2 hours at the 600°C peak temperature.

2) The rebars are at least 30mm away from any surface of girder, which satisfy the requirement by CSA A23.1-04 Table 17, providing sufficient thermal insulation space for the structural steel.



Structural Strength

1) The bending resistance design of the plate body is based on CSA A23.3
   - Plane sections linear strain distribution is according to C1.10.1.2 - Bernoulli's hypothesis
   - Equivalent rectangular stress block model is applied according to C1.10.1.7
   - Concrete tensile strength is predicted according to C1.10.1.5
   - The maximum concrete strain is defined as 0.0035 according to C1.10.1.3
   - All bending resistance checked by C1.8.1.3

2) The shear resistance design is based on CSA A23.3
   - Concrete shear resistance calculated by CSA A23.3 C1.11.3.4
   - Stirrups shear resistance calculated by CSA A23.3 C1.11.3.5.1, C1.11.2.8.2 and C1.11.3.8.1
   - The factored shear resistance and load capacity due to shear force determined by C1.11.3.3

3) The torsional resistance designed by CSA A23.3
   - Reinforcement torsional resistance designed by CSA A23.3 C1.11.3.10.3

4) The calculations of deflection are based on CSA standards, and the results meet NBC requirements.
   - The deflection formulas are calculated according to CSA A23.3 C 1.9.8.2.3
   - Deflections meet NBC slab deflection requirement Table C9.4.3.1.

5) Hook and anchor length meet CSA23.3 reinforced concrete beams and slab anchorage requirement
   - Development lengths of straight reinforcing bars in tension in girder are larger than CSA A23.3 C1.12.2.2 and C1.12.2.3 requirements.
   - Hooks dimensions standardized by CSA A23.1 C1.6.6.2.2, and hook development Length designed according to CSAA23.3 C1.12.5.1.
   - Negative reinforcement at beam or girder support according to CSA A23.3 C1.12.12.2.
   - Anchorages of Negative reinforcement at beam or girder satisfied minimum hook development length (Ldh) required by CSA C1.12.5.1 and 12.5.2.

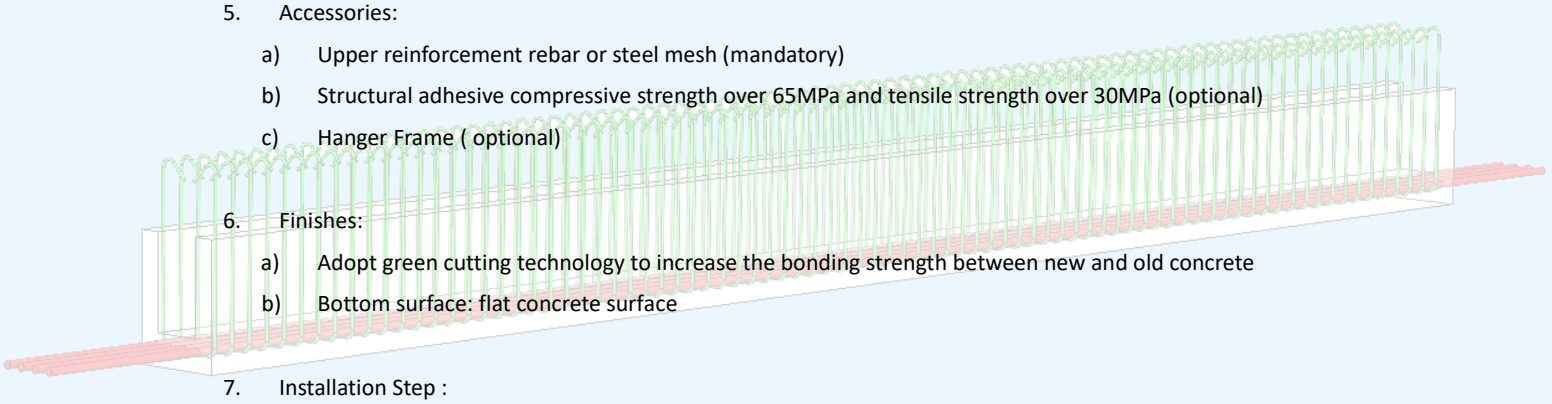
1. Price Included
   - Precast Groove Girder/Beam

2. Reference Material:
   a) CSA A23.3-19: Design of Concrete Structures.
   b) CSA A23.4-09: Precast Concrete Material & Construction.
   c) Precast Concrete Institute (PCI): Manual on Design of Connections for Precast.
   d) Precast Concrete Institute (PCI): Design Handbook – Precast & Pre-stressed Concrete.

3. Quality Assurance:
   - Conformity to PCI manual on design of connection for Precast Pre-stressed Concrete, PCI Design Handbook – Precast &Pre-stressed Concrete, CSA A23.4.

4. Designs:
   - The connection design details are for reference only and can be installed according to the design of professional engineers. But, the approved design drawings with PENG seal or signature should be reviewed and recorded.

5. Accessories:
   a) Upper reinforcement rebar or steel mesh (mandatory)
   b) Structural adhesive compressive strength over 65MPa and tensile strength over 30MPa (optional)
   c) Hanger Frame (optional)



6. Finishes:
   a) Adopt green cutting technology to increase the bonding strength between new and old concrete
   b) Bottom surface: flat concrete surface

7. Installation Step :
   a) Place Structural adhesive or roughened bottom connection area.
   b) Lifting and placing precast girder.
   c) Place upper reinforcement.
   d) Pouring with minimum 25MPa concrete.
   e) Floor preparation will vary depending on final flooring material and finish.

Warning

- GGB-400.30 Precast Groove Girder/Beam shall be stacked properly to avoid cracking and collapse.
  - The distance between the support and the plate end shall not be greater than 600 mm.

- GGB-400.30 Precast Groove Girder/Beam has no lifting loops and must be packed up with wire rope or sling chokers. Locate sling no more than 600mm from end. Be sure all erecting equipment is sized by a competent rigger.

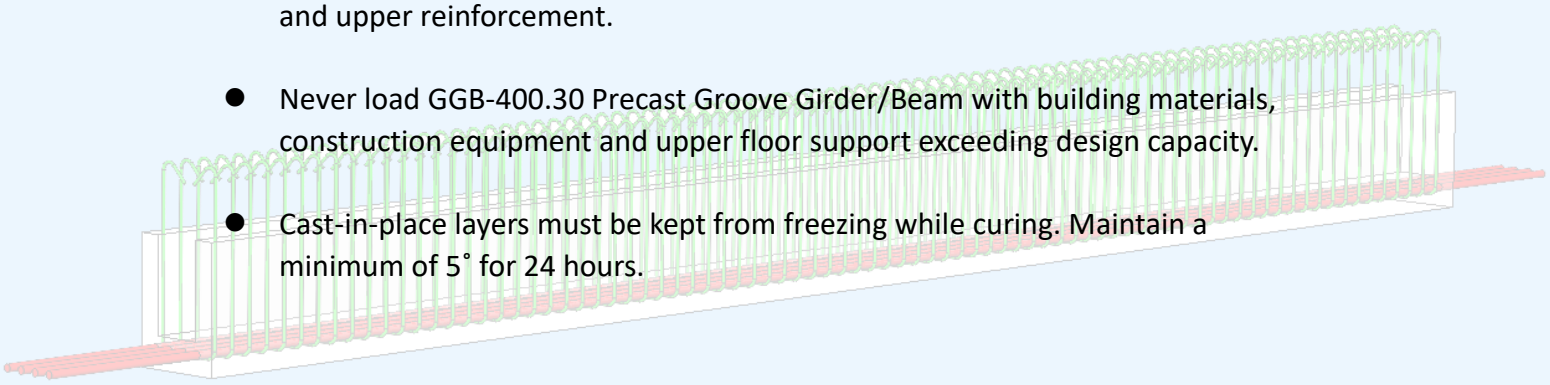
- Never cantilever the GGB-400.30 Precast Groove Girder/Beam.

- Never install the GGB-400.30 Precast Groove Girder/Beam by forklift unless it has been confirmed by our engineer.

- GGB-400.30 Precast Groove Girder/Beam must be used with cast-in-place layers and upper reinforcement.

- Never load GGB-400.30 Precast Groove Girder/Beam with building materials, construction equipment and upper floor support exceeding design capacity.

- Cast-in-place layers must be kept from freezing while curing. Maintain a minimum of 5˚ for 24 hours.



Warranty Policy

This document sets forth the warranty policy of the 3rd Bureau Construction from which you purchase your GGB-400.30 Precast Groove Girder/Beam.

This policy is applicable only to 3rd Bureau Construction GGB-400.30 described in the agreement extended to the Purchaser along with the correlated invoice.

This warranty policy is subject to the provisions as set forth herein and is subject to the terms and conditions as attached to this document ('Warranty Terms and Conditions').

This warranty policy only applies if referred to in a sales agreement between the 3rd Bureau Construction and the Purchaser and it will replace the standard warranty clause provided in the 3rd Bureau Construction general terms and conditions of sale.

Warranty period

This product does not accept returns for non-quality issues.
This product comes with 5 years of free structural warranty including free replacement if well stored for more than 2 years from the date of production.
The warranty period starts on the date the products are produced.
By default, Purchaser receives above mentioned 'standard warranty'.
On request, an 'extended warranty' or 'customized project warranty' can be agreed upon after evaluation of the specific.
Application conditions
Purchaser shall not rely upon any other information or documentation.
Within the warranty period, the 3rd Bureau CEC will repair any defective girders/beams or replace fixture with equal working model in the same conditions or better if applicable.

Summary Warranty Terms and Conditions (non-exhaustive)

This warranty policy is valid only for products sold in Canada only.
Products have been purchased directly from 3rd Bureau Construction Inc.
Proof of purchase is available for inspection by 3rd Bureau Construction Inc.
Products have been properly installed and operated in accordance with the manufacturer's instructions.
A 3rd Bureau Construction Inc. representative will have access to the defective Products.
If the Products or other parts become suspect, the representative shall have the right to invite other representatives of manufacturers or suppliers to evaluate the structure.
Labor costs for installation of the Products are not covered under this warranty.