

SPECIFICATIONS FOR
ERECTION OF PRECAST PRESTRESSED CONCRETE GIRDERS

1.0 DESCRIPTION

The Work shall consist of:

- .1 Transportation, unloading, and erection of precast prestressed concrete girders;
- .2 Supply and installation of bearings, including grout pads (where applicable);
- .3 Design, supply, fabrication, installation, maintenance and removal of temporary falsework; and
- .4 Design, supply, delivery, installation, and removal of erection bracing, temporary wind bracing, lateral stability bracing, longitudinal ties and other temporary works for the girders.

The Fabricator shall notify the Department of any Subcontractors that have been contracted in respect of this Specification. The Fabricator shall remain responsible for the work of such Subcontractors. All requirements of this Specification, such as right of access, shall apply to such Subcontractor.

2.0 REFERENCES AND RELATED SPECIFICATIONS

All reference standards and related specifications shall be current issue or the latest revision at the date of tender advertisement.

2.1 Related Specifications

- Specifications for Fabrication of Precast Prestressed Concrete Girders
- Specifications for Lateral Stressing and Miscellaneous Grouting

3.0 SUBMITTALS

The Contractor shall submit the following to the Engineer, in accordance with this Specification:

- (a) A Girder Transportation Plan identifying the loading and transportation procedures, including the proposed route, schedule and traffic control procedures. The Transportation Plan shall be sealed, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba:
- (b) A Girder Erection Plan comprised of a schedule and detailed procedure clearly illustrating the method and sequence by which the Contractor proposes to unload and erect the precast prestressed concrete girders. The Girder Erection Plan shall include detailed design notes and Shop Drawings that are sealed, signed and dated by a Professional Engineer, registered or licensed to practice in the Province of Manitoba, necessary to describe the following and assume full responsibility that the design is being followed:
 - i) Access to Work, including earth berms, work bridges, and/or rock platforms;
 - ii) Type and capacity of equipment;
 - iii) Sequence of operation, including position of cranes, trucks with girders, and traffic accommodation for all stages of unloading and erection;
 - iv) Detailed crane position on the ground, particularly adjacent to substructure elements, such as piers and abutment backwalls, with details of load distribution on wheels/tracks and outriggers.

If approved by the Engineer, details of crane position on the structure showing wheel loads and axle spacing of equipment (stationary and moving);

- v) Loads and their position from crane wheels/tracks and outriggers during all positions of lifting when crane is on or adjacent to the structure;
- vi) Details of temporary falsework and release procedures (if applicable), including proposed methods to be used to ensure structure stability and the required splice elevations and structure shape prior to grouting and/or placing concrete;
- vii) Method of providing temporary supports for stability;
- viii) Details of lifting units, showing vertical forces at and rated capacities of lifting devices;
- ix) Provisions for control and adjustment of errors for width and positioning of curbs or exterior units (if applicable);
- x) Complete details of blocking for bearings where necessary to constrain movement due to horizontal forces and/or gravity effects;
- xi) For NU girders, complete details of longitudinal ties between the ends of girders at locations where the bridge will be made continuous. These ties shall be capable of resisting tension or compression that will develop due to temperature change, creep and shrinkage. These shall be kept in place until the diaphragms and a majority of the bridge deck concrete have been cast and reached the specified strength;
- xii) Grout pad construction, if applicable; and
- xiii) Provide an "As Constructed" detailed survey of the substructure units showing the following:
 - a) Location and elevation of all bearing seats;
 - b) Shim height at each bearing location (if applicable); and
 - c) Top of girder elevations at each bearing (and each splice location where applicable).
- (c) A Safety Plan complying with the Manitoba Workplace Safety and Health Act and Regulations shall be prepared integral with the Girder Transportation and Erection Plans.
- (d) Detailed design notes and Shop Drawings for the proposed temporary works including work bridges and platforms, barges, erection bracing, temporary wind bracing, and lateral stability bracing for I and NU girders that are sealed, signed and dated by a Professional Engineer, registered or licensed to practice in the Province of Manitoba.

4.0 MATERIALS

4.1 Precast Prestressed Concrete Girders

Precast Prestressed Concrete Girders will be supplied to the Contractor f.o.b. Contractor's truck at the precast Fabricator's yard. The precast Fabricator will load the girders onto the Contractor's hauling equipment. Pick up of girders shall be during the Fabricator's normal working hours unless other mutually satisfactory arrangements are made between the Contractor and the Fabricator. The Contractor will be responsible for any premium charged for any girders picked up outside of the Fabricator's normal working hours.

The Contractor shall be responsible for the security and integrity of the girders during transportation to site, and during unloading, storage and erection on site. Girders damaged during any of these operations shall be replaced or repaired to the satisfaction of the Engineer before final approval is granted. The decision to repair or replace the damaged girders will be entirely at the discretion of the Department.

4.2 Bearings

The Contractor shall supply bearings in accordance with the requirements and details on the Drawings. Bearings must be approved as identified in MIT's Approved Products List and shall be to the satisfaction of the Engineer. Any bearings that are not in MIT's Approved Products List will be subject to approval by the Engineer.

4.3 Non-Shrink Grout

Non-shrink grout for the grout pads must be approved as identified in MIT's Approved Products List and shall be to the satisfaction of the Engineer. Any non-shrink grout that is not in MIT's Approved Products List will be subject to approval by the Engineer.

5.0 CONSTRUCTION METHODS

5.1 General

Transportation, unloading and erection of the precast prestressed concrete girders shall be under the direction of a Professional Engineer, registered and licensed to practice in the Province of Manitoba. The Professional Engineer shall be experienced in bridge girder transportation and erection and be present for all stages of girder loading, unloading and erection.

The precast prestressed concrete girders shall be picked up only by the lifting devices installed by the Fabricator.

During storage and transportation, the girders shall be maintained in an upright position and shall be supported within 500 mm of the bearing areas. The machined surfaces of steel bearing components cast into the girders shall be protected from damage at all times.

5.2 Handling and Transportation of Girders

The Fabricator shall load and the Contractor shall transport all of the girders in accordance with the following:

- i) The Contractor shall be responsible for the design, supply, installation and removal of temporary bracing for girders as may be required during the Contractor's handling and transportation of the girders. Should the Contractor choose to transport the girders to a temporary storage location, he shall be responsible for additional loading, transporting, unloading and storage procedures. The submission of design calculations and Shop Drawings for the temporary bracing to the Engineer shall in no way relieve the Contractor of the full responsibility for the success or failure of the design.
- ii) The Contractor shall submit his proposed route for transporting the girders including traffic control procedures as part of the proposed Transportation Plan. In all traffic control situations, the flagman must be trained and properly attired in flagman's vest and approved headgear with approved flagman's stop/slow paddle or fluorescent red flag. The proper advance signing must also be in place. For an example of traffic control procedures at an intersection see Drawing S-TMP-6 of the Work Zone Traffic Control Manual.
- iii) When transporting bridge girders using equipment other than a flatbed trailer, the Contractor shall be responsible for ensuring the following:

- i) Pilot vehicles meet the requirements of Part 9, Highway Traffic Act, Regulation 575/88;
 - ii) Travel speed not to exceed 80 kph;
 - iii) Travel only in daylight between sunrise and sunset; and
 - iv) Travel will not be allowed on weekends or statutory holidays unless authorized by the Engineer.
- iv) When transporting bridge girders, the Contractor shall be responsible for ensuring that all of the required permits have been acquired and the conditions of all permits are met.
 - v) Extreme care shall be exercised during the handling and transportation of the precast girders to avoid twisting, cracking or other distortion that may result in damage to the girder. The Contractor shall be responsible for protecting the girders at restraint points on the vehicle. All damaged corners or surfaces of the girders will be regarded as honeycomb and shall be repaired as directed by the Engineer.
 - vi) No loose timber blocking will be permitted for use in temporary works for any aspect of girder handling and transportation.
 - vii) It is the Contractor's responsibility to ascertain the actual weight of the girders. The concrete in the precast prestressed girders may be denser than regular concrete and the girders contain a high percentage of reinforcing steel and stressing strands which also tend to increase the weight of the girders.

5.3 Temporary Works

Temporary works including work bridges and platforms, barges, erection bracing, wind bracing and lateral stability bracing required for handling, transportation and erection of precast prestressed concrete girders shall be installed and constructed in accordance with the Contractor's approved design and Shop Drawings.

5.4 Installation of Bearings

.1 Grout Pads

When shown on the Drawings or described in the Special Provisions, the Contractor shall construct grout pads using flowable, high strength, non-shrink grout. Construction of grout pads shall be done by workers competent in this work.

Grouts shall be packaged in waterproof containers with the production date and shelf life of the material shown. The grout shall be mixed, placed and cured in strict accordance with the Manufacturer's recommendations.

The method of forming and pouring the grout shall be submitted to the Engineer for review and approval prior to the work being undertaken. Dry-pack methods of constructing grout pads will not be accepted.

When the daily minimum air temperature or the temperature of the girders, bearings or substructure concrete in the immediate area of the grouting falls below 5°C, or when there is a probability of it falling below 5°C within 24 hours of grouting, the following provisions for cold weather grouting shall be implemented:

- (a) Before grouting, adequate preheat shall be provided to raise the temperature of the adjacent areas of the girders, bearings and substructure concrete to at least 10°C.

- (b) Temperature of the grout during placing shall be between 10°C and 25°C.
- (c) The grout pads (and girders where appropriate) shall be enclosed and kept at 15°C to 25°C for at least five (5) days. The system of heating shall be designed to prevent excessive drying out of the grout.
- (d) Cold weather protection measures shall be maintained at least 12 hours after moisture curing of concrete has been terminated during periods of freezing weather.

.2 Anchor Bolts

The Contractor shall remove all anchor bolt void forming materials prior to grouting. Any residues on the concrete surface, such as oils, grease, or other contaminants that can reduce bonding characteristics, shall be removed by sandblasting.

Anchor bolts shall be set accurately and grouted with non-shrink grout accepted by the Engineer. All methods and materials for setting anchor bolts and constructing bearing pads shall be submitted to the Engineer for review and acceptance. The location of the anchor bolts, in relation to the slotted holes in the expansion shoes, shall correspond with the temperature at the time of erection. The nuts on the anchor bolts, at the expansion end of spans, shall be adjusted to permit free movement of the spans.

.3 Bearings

The Contractor shall accurately assemble and install the bearings as specified on the Drawings and as directed by the Engineer. The stainless steel surface of the bearings, the teflon coated bearing pads and the machined surfaces of steel bearings that have been cast into the girders shall be protected from damage at all times. The plywood and polyethylene covers shall not be removed until immediately prior to the positioning of the bearings over the bearing seats.

When steel bearings are employed in conjunction with grout pockets in the substructure, the bearings shall be set accurately on galvanized steel shims, and grouted as detailed on the Drawings, after the girder erection has been completed. The shims must be located so that a minimum of 75 mm grout coverage is provided. When the grout pockets are not detailed, the bearing plates shall be set on the properly finished bearing areas in exact position and shall have a full and even bearing on the concrete.

Where the design requires that the girders bear on neoprene pads placed directly on pier or abutment seat concrete, the Contractor shall supply and install shims cut from lead sheeting as determined by the Engineer to ensure full and uniform bearing.

Any bearings that in the opinion of the Engineer have been damaged or otherwise rendered unusable by improper storage or handling by the Contractor shall be replaced by the Contractor at his expense.

5.5 Erection of Girders

Before erecting the girders, the Contractor shall verify that the lengths of the girders, the layout of the substructure units, the elevations of the bearing seats, and the location of the anchor bolts are as shown on the Drawings. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Engineer.

It is essential that the girders be erected with utmost attention being given to girder positioning, alignment and elevation. The Contractor shall adjust girder position, bearing location, and bearing elevation in order to achieve as closely as possible the lines and grades shown on the Drawings. The

Contractor shall minimize any differential camber (girder to girder), and the sweep of the girders by jacking, loading of girders, winching, or whatever means are necessary, and shall provide the necessary temporary attachments to hold the girders in position. The Engineer shall approve of all proposed methods of jacking, loading, winching, etc. prior to the work being undertaken.

The maximum dimensional deviation in mm, of erected precast prestressed concrete girders from that as detailed on the Drawings shall not exceed the following:

Sweep (NU Girders)	1 mm/m
Sweep (Other Girders)	Deviation from true, 20 mm x length (m) / 50

After the Engineer has approved the erected positions of the girders, all lifting hooks shall be cut off 50 mm below the top surface of the girder and all lifting hook pockets shall be filled with an approved high strength non-shrink grout. In cases where a concrete deck is going to be cast over the lifting hook locations, the lifting hooks are to be cut off flush with the top of the girders. All lifting holes shall be filled with an approved high strength non-shrink grout.

Temporary erection bracing, wind bracing and lateral stability bracing shall be designed and installed in order that it will not interfere with the forming and pouring of the diaphragms and deck and shall remain in place until seven (7) days after the pouring of the diaphragms

5.6 Channel and Box Girders

All channel and box girders shall be placed tightly against each other in order to obtain virtually no lateral movement of the bearings when the girders are pulled together during lateral stressing operations.

The total erected width of the channel and box girders shall not exceed the sum of the individual widths of the girders by more than 25 mm for each span. The Contractor shall attempt to distribute the discrepancy equally on either side of the centreline of structure.

Care shall be exercised to prevent dirt from falling in between the girders. The Contractor shall remove all dirt that does fall in between the girders.

The Contractor shall ensure that the foam rubber pads around the lateral stress ducts are placed correctly to prevent the leakage of grout during grouting operations. In the event that any leakage occurs, it shall be the responsibility of the Contractor to carry out all required remedial measures at his own cost.

The Contractor shall supply and install an approved treated fibre board between the ends of abutting precast girders as shown on the Drawings.

6.0 QUALITY MANAGEMENT

Girder transportation and erection shall not commence until the Department's acceptance of the Girder Transportation Plan and Girder Erection Plan, respectively, has been obtained. The Contractor's project manager, site superintendent, and temporary works designer may be required to attend a pre-job meeting with the Engineer at a location determined by the Department prior to commencement of any field work.

Before erection begins, the Contractor shall do a complete superstructure layout by means of chalk lines and markings applied to all substructure units and bearings showing all girder positions in accordance with the layout plan.

All concrete, bearing installation and backfill works, including correction of deficiencies, shall be completed to the satisfaction of the Engineer prior to erection of the girders.

The Contractor is fully responsible for the results obtained by use of the Girder Transportation Plan and the Girder Erection Plan. The Department's acceptance shall not be considered as relieving the Contractor of the responsibility for the safety of its methods or equipment, nor from carrying out the work in full accordance with the Drawings and the Special Provisions.

After all precast prestressed concrete girders have been erected, the Contractor and the Engineer shall conduct a final inspection to locate any damage or deficiencies. All visible damage or deficiencies shall be repaired by the Contractor to the satisfaction of the Engineer and acceptable to the Department before final approval is granted.

7.0 METHOD OF MEASUREMENT

The delivery of precast prestressed concrete girders will be measured on a unit basis and the number to be paid for will be the total number of girders delivered and accepted by the Engineer.

The erection of precast prestressed concrete girders will be measured on a unit basis and the number to be paid for will be the total number of girders erected and accepted by the Engineer.

8.0 BASIS OF PAYMENT

Delivery of precast prestressed concrete girders will be paid for at the Contract Unit Price per girder for "Delivery of Precast Prestressed Concrete Girders", measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the work including in this Specification.

Erection of precast prestressed concrete girders will be paid for at the Contract Unit Price per girder for "Erection of Precast Prestressed Concrete Girders", measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the work including in this Specification.