



## Bridge Replaced with Four-Cell Precast Concrete Box Culvert Using Accelerated Precast Construction Method

### Project Need

North Dakota Department of Transportation (NDDOT) is developing a new transportation system in western North Dakota to accommodate the state's agriculture sector and an emerging energy industry.

Upgrading Highway 1804 two miles north of New Town included replacement of a bridge. The first option was a precast concrete box culvert and the second a cast-in-place (CIP) box culvert. Both options accommodated a wide clear zone to eliminate guard rails allowing snow to blow across the highway without being trapped. The benefit is reduced snow removal and improved highway safety. No bids were received for the cast in place option.

### Factors contributing to the contractor's precast preference

1. Less exposure to risk
  - High water tables
  - Precast Boxes produced in controlled environment
  - QCast Certification
  - Less installation time meant less exposure to bad weather
2. Contractor able to self-perform
  - Easier to schedule crews and installation crane
  - Better time control of project
3. Lower labor cost
  - Less per diem cost
  - Can use common labor
4. Less crane time
5. Fewer hours on equipment



### Project Quick Notes

- ⇒ ND-Job No. 3 SS-SIOB-7-804
  - Owner: North Dakota Department of Transportation
  - Engineer: North Dakota Department of Transportation
  - Contractor: Central Specialties Inc.
  - Manufacturer: Hancock Concrete
- ⇒ Installation Contractor: Central Specialties
- ⇒ Installation was quick and efficient allowing traffic to move from the temporary bypass back to ND 1804
- ⇒ Staging delivery of box sections went according to plan
- ⇒ Boxes were quickly installed with a tight connection in a fully-prepared excavation
- ⇒ The District prefers installation of box culverts (where applicable) compared to a bridge installation
- ⇒ Box culverts do not require a guardrail, which can cause snow/ice conditions
- ⇒ Little to no maintenance with a box culvert compared to a bridge.

## Logistics and Installation

The box sections were delivered from Devils Lake, ND, 175 miles one way. The wing walls and drop walls were delivered from Hancock, MN, 440 miles one way; both a logistical challenge.

Central Specialties self-performed the installation using their own labor, crane and equipment. Unexpected situations like water infiltration into the excavation were resolved quickly. Once the base was prepared, they ordered delivery of 100 truckloads of boxes. Three to four trucks were on-site ready for unloading over a four-day period. Just-in-time delivery kept the site clean and safe, while the boxes were unloaded and placed directly into the excavation where they were connected with 1-inch U-bolts. Installation was completed in about 7 days.

## Culvert Structure

- ⇒ Four rows of 14 foot x 12 foot boxes 110 feet long plus wing walls.
- ⇒ Box sections were 5 feet long weighing 32,050 lb. per section.
- ⇒ The box sections along with the wing walls and drop walls totalled 1,710 tons.

## Why Choose Concrete Box Culverts?

### Cost effective:

Precast concrete box culverts are competitively priced due to faster construction, and competitive off-site labor.

### Quick installation:

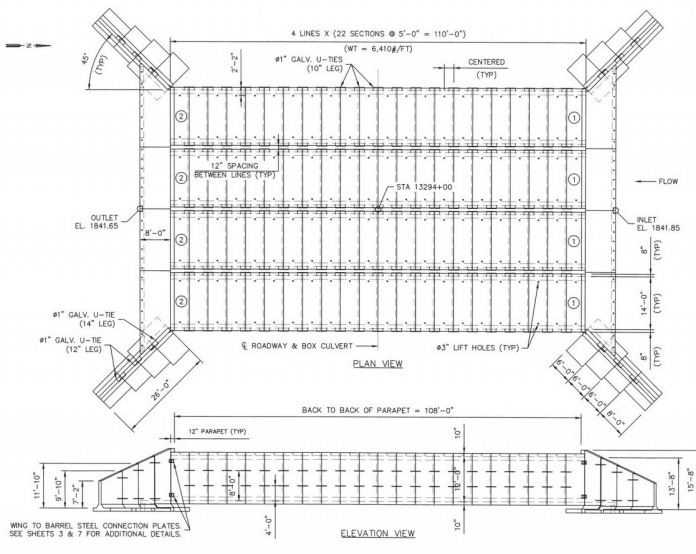
Precast culverts have a quick installation time, reducing environmental and traffic impact.

### Design flexibility:

The box culvert concept has been modified over the years to solve many job-site problems.

### Quality:

Controlled environments allow for increased concrete quality over the cast-in-place alternative.



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