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**MBI** (Morse Bros) has been a prestressed concrete supplier to the state of Oregon and its surrounding states since the early 1950’s. Over those many years the prestressed division has developed many precast solutions for buildings, bridges, docks, architectural cladding, and specialty products including stadium risers and raker beams, dock and ramp panels, marine structures, fish and water flumes, radiation enclosures, retaining walls, abutment walls and foundations. Morse Bros is one of the industries pioneers in spliced girder construction, precast moment frame construction, and long bridge girder production. With help of the Oregon DOT MBI produced and improved a varying spliced tub section that emulates a parabolic arch. Precast structural systems have been integrated with post-tensioned decks.

Morse Bros has along with the bridge and structural building products developed a myriad of architectural finishes using special aggregate and colored additives. These architectural products have also taken on many shapes and forms. Morse Bros has supplied, based on project specifications, many specialty concretes containing fibers, corrosion inhibitors, slag, silica fume, flyash, and viscosity modifiers. Other specialty materials have included epoxy coated and stainless steel reinforcing, stainless steel embeds, all sorts of proprietary connection hardware, and electrical conduit and fixtures. MBI is a member of the Altus Group, an organization of selected US PCI certified precast manufacturers that use state-of-the-art proprietary carbon fiber reinforcing in sandwich panel walls and precast cladding.

Morse Bros is in tune with the precast industry. We are active members in the Precast/Prestressed Concrete Institute to learn, network and understand how to make our precast products better and more economical. Often Morse Bros is at the leading edge in developing innovative solution involving precast/prestressed products. MBI has a commitment to its customers to provide quality, on-time precast products that are long lasting, durable, low maintenance, secure, fire resistant, and pest resistant. We are willing to help our customers develop efficient, low cost precast solutions for a myriad of structures.

**History of MBI**

Morse Bros was started by the three Morse brothers, Joe, Forrest and Bill in 1941 as a supplier of sand and gravel from their first pit in Harrisburg, Oregon. Services and materials offered to the construction industries expanded to include ready-mix, highway construction services and material for roads and highways. In 1958 Morse Bros built its structural prestressing plant in a nearby field in Harrisburg to supply prestressed girders for new highway construction throughout Oregon and the Northwest.

In 1967, Morse Bros became one of PCI’s earliest certified plants and we remain one of the major PCI producers in the Northwest. Dick Imper, general manager in 1994, served as national chairman of PCI. Morse Bros prestressed division has been a leader in the northwest in developing and producing new generations of precast bridge members and other construction products. Morse Bros has also been a leader in designing and producing other concrete products such as frame members and seat riser units for arenas and
outside stadiums, and support structures and enclosures for industrial process facilities.

In 1973 Morse Bros added the current architectural precast and prestressing plant at the 42-acre Harrisburg facility. Morse Bros has and continues to produce architectural precast and/or prestressed concrete building cladding and framing components as well as moment frame beam/column components for buildings and elevated parking garages.
At MBI, total customer satisfaction is our ultimate goal, and total customer service is the key to that goal. Whether it is providing preliminary budget pricing, offering design assistance from one of our qualified staff engineers, or attending project meetings, we realize that the success of your job is directly linked to the services we provide.

Communication is the cornerstone of any successful project; that is communication between the designers, the architects, the contractors, the other trades, and the precaster. MBI believes that early and continuing involvement in all levels of communication on each project yields beneficial results ranging from design-cost reduction, to the on-time delivery of “perfect-fit” precast components.

We have a long history of working with our customers to achieve complete fulfillment of their expectations. Customers expect quality and we pride ourselves on the level of detailing we devote to each and every project. You expect straightforward pricing and we honor our prices at bid time. You expect on-time delivery and we operate an extensive fleet of trucks and hauling equipment, specially outfitted for the rigorous demands of over-width, over-length, and over-weight loads. When necessary, we visit difficult delivery sites to assist our customer with solutions to site access.

We are certified by the Precast/Prestressed Concrete Institute (PCI), a national association that assures adherence to industry standards and practices. Our commitment to and continuing involvement with PCI allows us access to a broad-based resource of industry experts, thus greatly expanding our available knowledge base for time-intensive research of challenging precast projects. In addition, we maintain a comprehensive archive of our past projects, thus placing us in a prime position to be able to assist the design community in the evaluation and upgrade of existing precast structures.

At MBI, we place all of our resources to the job at hand; your job. We believe that once a project is completed, all concerned with its design and construction should feel a sense of pride and accomplishment, knowing that it was a project that was designed to project plans and specifications, delivered on-time, and completed within budget.

We are committed to quality—the quality of the products we produce, the quality of the services we supply, the quality of the business relationships we cultivate. And that’s really “What Sets Us Apart”.

What Sets Us Apart?
Key to Symbols

\( A_c \)  
Area of core of spirally reinforced compression member measured to outside diameter of spiral

\( A_g \)  
Gross area of section

\( A_{ps} \)  
Area of prestressed reinforcement

\( b \)  
Width of compression face of member

\( f'_c \)  
Specified compressive strength of concrete

\( f_{pc} \)  
Average compressive stress in concrete due to effective prestress force only

\( f_{ps} \)  
Stress in prestressed reinforcement at nominal strength

\( f_{pu} \)  
Specified tensile strength of prestressing tendons

\( f_{se} \)  
Effective stress in prestress reinforcement

\( f_y \)  
Specified yield strength of non-prestressed reinforcement

\( h \)  
Overall depth of member

\( I \)  
Moment of inertia of section

\( M_n \)  
Nominal moment strength at section

\( M_u \)  
Factored moment at section

\( N \)  
Design axial load normal to cross section

\( P_n \)  
Nominal axial load strength at given eccentricity

\( P_0 \)  
Nominal axial load strength at zero eccentricity

\( P_u \)  
Factored axial load at given eccentricity

\( r \)  
Radius of gyration of cross section

\( Y_b \)  
Distance from bottom fibre to center of gravity of section

\( Z \)  
Section modulus

\( Z_b \)  
Section modulus with respect to bottom fiber

\( Z_t \)  
Section modulus with respect to top fiber

\( \delta \)  
Moment magnification factor

\( \phi \)  
Strength reduction factor

\( \rho_g \)  
Ratio of total reinforcement area to cross-sectional area of column

Strand Designation 5.8

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Reading the Charts and Tables

The charts and tables presented in the following pages use the symbols defined here. The load tables (derived in accordance with ACI-318), section properties tables, and diagrams are intended to be read by trained professionals. If you need assistance or additional information, don’t hesitate to call us.
Roof or floor components used for long spans or heavy loads. May also be used for load bearing or curtain wall applications.

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* Requires additional concrete strength at Transfer.

**Notes:**
- Load Charts are intended for preliminary design only.
- Design criteria ACI 318-02.
- Design charts assume simple span.
- Deflections must be checked according to design criteria.
- Max tension under full loading = 850 psi.
- Concrete strength at 28 days (f'c) = 6000 psi.
- Loading is based on 3 in., 4000 psi composite topping.
Super Tee

Section Properties

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Safe Superimposed Load Capacity (psf)

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Notes: Load Charts are intended for preliminary design only. Design criteria ACI 318-02. Design charts assume simple span. Deflections must be checked according to design criteria. Max tension under full loading = 850 psi. Concrete strength at 28 days (f'c) = 6000 psi. Loading is based on 3 in., 4000 psi composite topping.
Safe Superimposed Load (psf)

| Designation | Strand | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
|-------------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 4CF8        | 5.8    | 620| 530| 460| 330| 250| 190| 140| 100| 70 | 45 |
| 4CF8        | 7.8    | 405| 355| 280| 205| 165| 125| 95 | 65 | 45 |
| 4CF10       | 6.8    | 325| 265| 215| 165| 130| 100| 75 | 50 |
| 4CF10       | 8.8    | 405| 355| 290| 235| 190| 150| 120| 95 | 70 | 50 |
| 4CF12       | 8.8    | 370| 310| 260| 215| 180| 145| 120| 95 | 75 | 55 |
| 4CF12       | 9.8    | 395| 340| 290| 240| 200| 165| 135| 110| 85 | 65 | 50 |
| 4CF12       | 10.8   | 355*| 310| 260| 215| 180| 150| 120| 100| 80 | 60 |
| 4CF12       | 11.8   | 320*| 280| 235| 190| 165| 135| 110| 90 | 70 | 55 |

Based on allowable final tension of 7.5 (f'c) or allowable design strength, whichever governs.

Loading is based on 3 in., 4000 psi composite topping

Deflections must be checked according to design criteria.
Economical extruded concrete members used for floors and roofs. Particularly efficient when spans are short, loads are light, or minimal structural depth is desired.

### 10” CF

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Columns

Prestressed

12 x 12
4 Strands

14 x 14
4 Strands

16 x 16
4 Strands
Load-bearing vertical structural component for one or more stories. Made with or without corbels.

**Criteria**
1. Minimum prestress = 225 psi.
2. Strand assumed 1/2 in. in diameter; $f_{pu} = 270$ ksi.
3. Curves shown for partial development of strand near member end, where $f_p = f_{ce}$.
4. Horizontal portion of curve is the maximum for tied columns: $0.80\Phi P_o$.
5. Varies linearly from 0.9 for tension-controlled section to 0.65 for compression-controlled sections in accordance with ACI 318-05, section 9.3.2.

**Use of Curves**
1. Enter at left with applied factors axial load, $P_u$.
2. Enter at bottom with applied magnified factored moment, $\phi M_u$.
3. Intersection point must be to the left of the curve that indicates required concrete strength.
Criteria
1. Concrete $f'_c = 5000$ psi.
2. Reinforcement $f_y = 60,000$ psi.
3. Curves shown for full development of reinforcement.
4. Horizontal portion of curve is the maximum for tied columns: $0.80 \Phi P_o$.
5. $\Phi = 0.9$ for $\Phi P_n = 0$
   $\Phi = 0.7$ for $\Phi P_n \geq 0.10 f'_c A_g$
   (varies from 0.9 to 0.7 for points between)

Use of Curves
1. Enter at left with applied factors axial load, $P_u$.
2. Enter at bottom with applied magnified factored moment, $\delta M_u$.
3. Intersection point must be to the left of the curve that indicates required reinforcement.
Beams

Inverted Tee

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Notes
- Load Charts are intended for preliminary design only. Other section available. Consult MBI Engineering Department
- Max tension allowed under full loading = 850 psi, therefore, additional top reinforcement is required
- Design criteria ACI 318-02
- Concrete strength at 28 days (f'c) = 6000 psi
- Design charts assume simple span
- Safe loads shown include 50% dead load and 50% live load
- Deflections must be checked according to design criteria
- Beams design includes an additional 3" topping 4000 psi. composite
## Rectangular

### Section Properties

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### Safe Superimposed Load Capacity (psf)

| Design | Strand | 20     | 22     | 24     | 26     | 28     | 30     | 32     | 34     | 36     | 38     | 40     | 42     | 44     | 46     | 48     | 50     | 52     |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 16RB24 | 14.8   | 9050   | 7360   | 6100   | 6130   | 4360   | 3750   | 3240   | 2840   | 2460   | 2150   | 1940   | 1720   | 1540   | 1380   | 1230   | 1100   |
| 16RB28 | 16.8   | 9900   | 8430   | 7100   | 6080   | 5200   | 4500   | 3920   | 3480   | 3060   | 2740   | 2430   | 2170   | 1960   | 1770   | 159    | 1440   |
| 16RB32 | 18.8   | 9350   | 7990   | 6780   | 5960   | 5230   | 4600   | 4050   | 3620   | 3250   | 2900   | 2620   | 2350   | 2130   | 1950   | 1760   | 1590   |
| 16RB36 | 20.8   | 9900   | 8780   | 7620   | 6700   | 5900   | 5230   | 4680   | 4120   | 3690   | 3300   | 2960   | 2620   | 2350   | 2130   | 1950   | 1760   |
| 16RB40 | 22.8   | 9900   | 9520   | 8320   | 7340   | 6530   | 5860   | 5230   | 4730   | 4260   | 3860   | 3500   | 3200   | 2900   | 2620   | 2350   | 2130   |
| 20RB24 | 16.8   | 9900   | 8230   | 6820   | 5730   | 4860   | 4160   | 3600   | 3130   | 2740   | 2400   | 2120   | 1880   | 1670   | 1490   | 1330   | 1150   |
| 20RB28 | 18.8   | 9900   | 9600   | 8100   | 6900   | 5900   | 5100   | 4470   | 3930   | 3450   | 3070   | 2740   | 2430   | 2190   | 1950   | 1760   | 1590   |
| 20RB32 | 20.8   | 9900   | 9100   | 7860   | 6800   | 5980   | 5230   | 4650   | 4120   | 3690   | 3300   | 2960   | 2670   | 2410   | 2180   | 1950   | 1760   |
| 20RB36 | 22.8   | 9900   | 8700   | 7650   | 6720   | 5960   | 5310   | 4730   | 4260   | 3820   | 3460   | 3140   | 2850   | 2620   | 2350   | 2130   |
| 20RB40 | 24.8   | 9900   | 9580   | 8480   | 7500   | 6700   | 6000   | 5400   | 4870   | 4400   | 4000   | 3640   | 3200   | 2960   | 2670   | 2410   | 2180   |
| 24RB28 | 20.8   | 9900   | 9200   | 7830   | 6720   | 5800   | 5060   | 4450   | 3900   | 3470   | 3080   | 2750   | 2460   | 2200   | 1970   | 1780   | 1590   |
| 24RB32 | 22.8   | 9900   | 8950   | 7750   | 6800   | 5960   | 5280   | 4690   | 4170   | 3740   | 3350   | 3020   | 2730   | 2460   | 2180   | 1950   | 1760   |
| 24RB36 | 24.8   | 9900   | 8700   | 7620   | 6770   | 6000   | 5390   | 4830   | 4350   | 3930   | 3540   | 3200   | 2960   | 2670   | 2410   | 2180   | 1950   |
| 24RB40 | 26.8   | 9900   | 9500   | 8400   | 7500   | 6700   | 6020   | 5440   | 4900   | 4430   | 4050   | 3740   | 3460   | 3140   | 2850   | 2620   | 2410   |

**Notes**
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- Concrete strength at 28 days (f’c) = 6000 psi.
- Design charts assume simple span.
- Safe loads shown include 50% dead load and 50% live load.
- Deflections must be checked according to design criteria.
### Section Properties

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**Notes**
- Load Charts are intended for preliminary design only.
- Other section available. Consult MBI Engineering Department
- Max tension allowed under full loading = 850 psi, therefore, additional top reinforcement is required
- Design criteria ACI 318-02
- Concrete strength at 28 days (f’c) = 5000 psi
- Design charts assume simple span
- Safe loads shown include 50% dead load and 50% live load.
- Deflections must be checked according to design criteria
Morse Bros can provide precast components to satisfy various structural systems. These include precast moment frame and shear wall systems that can be fully precast or in conjunction with cast in place structural systems. It can also include a combination of both shear walls and frames. Morse Bros can assist in the possibilities available to meet the space and architectural requirements. The precast components will be designed by Morse Bros with the lateral load resistance system and foundations being designed by the engineer of record.

**Shear Wall System**

Shear wall systems resists lateral loads with either cast-in-place or precast shear walls. The loads are transferred to these shear walls by the floor and roof diaphragms, drag and chord elements. Gravity loads are supported by the shear walls, lite walls, and columns. When precast elements are used in the shear wall the limitations on crane size and panel size for transportation must be considered.
Moment Frame System

Precast moment frame systems resist lateral load by using column and beam frame action. These frames can be done by either cast-in-place reinforced concrete frame emulation or by using a post-tensioned hybrid frame. In the emulated precast frame, the frame is designed as if it were monolithic cast-in-place and then it is broken apart in precast column and beam components. The hybrid frame displacement design under the code specified lateral event using axial post-tensioning concentrically placed through the frame beam and column joints. In both types of moment frames the loads are transferred to the lateral resisting element via diaphragm, drag, and chord elements. The diaphragms can either be cast-in-place mildly reinforced, post-tensioned decks or precast elements with composite cast-in-place topping. All precast frame joints are grouted with high strength non-shrink grout that may contain fibers.
Other Systems

Other structural systems can combine precast with other building materials such as hollow core or double tee floor and roofs with masonry or cast-in-place walls, precast walls with wood or steel joists, precast cladding on steel or cast-in-place structures, and precast platform with a two or three story wood structure above to name a few possibilities.

The use of precast building components allow them to be cast while the foundations are poured and this will help shorten the construction time frame. Precast is produced in controlled environments which allow for improved product quality, a variety of finishes, and a high possibility of obtaining LEED points. Morse Bros is best able to reduce cost on a project by becoming involved early in the design process and suggesting potential cost reductions.
PART 1 – GENERAL

1.01 DESCRIPTION

A. WORK INCLUDED:
Delete if all work to be included is indicated in drawings.
1.____________________________________

B. RELATED WORK SPECIFIED ELSEWHERE:

1. Shop drawings, products data, and samples.
   Section 01340.
   Section 03365.
5. Architectural precast concrete. Section 03450.
6. Tilt-up concrete. Section 03470.
7. Fabricated steel not cast into concrete.
   Section 05500.
8. Waterproofing. Section 071____.
9. Dampproofing. Section 071____.
10. Sheet metal flashing. Section 07620.
11. Sealants and caulkimg. Section 07920.
12. Painting. Section 09900.

C. WORK INSTALLED BUT FURNISHED BY OTHERS:

1. Reglets to receive sheet metal flashing. Section
   07620.
2. Reglets to receive metal windows. Section 08500.
3. Anchoring devices to receive equipment.
   Division 11.
4. Dumbwaiter and elevator guides. Sections 14100
   and 14200, respectively.
5. Anchoring devices to receive mechanical and
   electrical work. Divisions 15 and 16, respectively.
1.02 QUALITY ASSURANCE

A. APPROVED MANUFACTURERS:
Include one of the following manufacturer standards:
1. Morse Bros, Incorporated
   Prestressed Concrete Group
   P.O. Box 181, Harrisburg, OR 97446
   (541)995-6327
**or**
1. The manufacturer shall be certified by the
   Prestressed Concrete Institute.

B. APPROVED ERECTORS:
1. The erector shall have been regularly engaged
   for at least________ years in erection of precast
   structural concrete similar to that required by
   this project. (Usually 2-5 years)

C. APPROVED WELDERS:
1. The welder shall be certified by the American
   Welding Society in accordance with AWS D1.1
   for welds to be encountered on this project.

D. REFERENCED STANDARDS:
1. Unless otherwise specified herein, comply with
   requirements specified in MNL-116, Manual for
   Quality Control for Plants and Production of
   Prestressed Concrete Products, published by the
   Prestressed Concrete Institute. Copies may be
   obtained from the Institute at 209 W. Jackson
   Blvd. Ste 500, Chicago, IL 60606,
   (312) 786-0300.

E. REQUIREMENTS OF REGULATORY
AGENCIES:
1. Follow local building code requirements if they
   are more stringent than the requirements in these
   specifications. Notify the architect / engineer of
   differences prior to starting work.

F. TESTING:
1. Comply with applicable provisions of the
   referenced standards (see 1.02.D above).
1.03 SUBMITTALS

A. SAMPLES:
1. Submit two samples of specified exposed surfaces, no less than 12 x 12 inches in size, showing texture and color, final approval is based on 4’ x 4’ samples.

B. PRODUCT DESIGN CRITERIA:
1. Submit ________ copies of the following design loadings, in accordance with Section 01340:
   a. initial handling and erection stresses
   b. dead and live loads specified on the contract drawings
   c. other specified loads
2. Design calculations of products not shown on the contract drawings shall be performed by an engineer experienced in precast, prestressed concrete design and registered in the state where the project is located. These calculations shall be submitted for approval upon request.
3. The design shall comply with applicable ACI 318 requirements.
4. Design deviations will be permitted only with the written approval of the architect / engineer, and any such deviations shall provide for an installation equivalent to that originally intended, without additional cost to the owner. Requests for deviations shall be submitted with complete design calculations and drawings.

C. SHOP DRAWINGS:
1. Submit______ copies of shop drawings including the following information, in accordance with Section 01340:
   a. plans and / or elevations locating and defining all products to be furnished by the manufacturer.
   b. sections and details showing connections and cast-in items, and their relation to the structure
   c. descriptions of all loose, cast-in, and field hardware
   d. location drawings for field-installed anchors
   e. erection sequences and handling requirements
   f. dead, live, and other applicable design loads

Inclusion of the following information may add to the contract summand should be required only if necessary:
   g. an elevation view of each member
   h. sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, etc.
   i. lifting and erection inserts
   j. dimensions and finishes
   k. prestress force and concrete strengths
   l. estimated cambers
   m. transportation methods

D. MANUFACTURER’S INSTRUCTIONS:
1. Prior to product delivery to the jobsite, submit handling and erection instructions to the general contractor, with a copy to the architect / engineer.

E. TEST REPORTS:
1. Submit one copy of each required test report to the general contractor.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. DELIVERY:
1. Comply with contractor’s erection sequence schedule.

B. STORAGE AND HANDLING:
1. Protect members against damage, distortion, and discoloration.
2. Store members off the ground.
3. Place stored members so that identification marks are discernible.
4. Do not handle until stresses are released. If stress release is not performed in a continuous operation, do not handle the members until they are sufficiently stressed to sustain handling forces.
5. Store product as required by precast manufacturer.
6. Lift and support near member ends, unless otherwise approved.
7. Storage area shall be stable and provided with foundations that will prevent differential settlement or twisting of members.
8. Separate and support stacked members with battens placed across the full width of the bearing points.
The contract drawings will normally be prepared using a local precast, prestressed concrete manufacturer's design data and load tables. Dimensional changes which would not materially affect architectural and structural properties or details are usually permissible.

Connection devices on formed surfaces of precast, prestressed concrete must be contained within the member since most members are cast in continuous steel forms that are impractical to penetrate.

Eccentricity of stressing force will generally result in camber in prestressed concrete members. If camber considerations are important, check with your local manufacturer to secure estimates of the amount of camber and of camber movement with time and temperature change.

Camber movement must be taken into account when it affects such features as:

1. Closures to interior non-load bearing partitions.
2. Closures parallel to prestressed concrete members. Whether involving masonry, windows, curtain walls, or others, these must be properly detailed for appearance.
3. Floor slabs receiving cast-in-place topping. The elevations of the top of the floor and the amount of concrete topping must allow for camber of prestressed members.

Camber less than those obtained under normal design practices are possible but they usually require the addition of tendons or non-prestressed steel reinforcement. Price should be checked with the local manufacturer.

As the exact cross section of precast, prestressed members may vary somewhat from producer to producer, permissible deviations in member shape from that shown on the contract drawings might enable more manufacturers to quote on the project. Manufacturing procedures also vary between plants and permissible modifications to connection details, inserts, etc., will allow the manufacturer to use devices he can best adapt to his manufacturing procedure.

Be sure that the loads shown on the contract drawings are easily interpreted. For instance, on members which are to receive concrete topping, be sure to state whether all superimposed dead and live loads on precast, prestressed members do or do not include the weight of the concrete topping. It is best to list the live load, superimposed dead loads, topping weight, and weight of the member, all as separate loads. Where there are two different live loads (e.g., on the roof level of a parking structure) indicate how they are to be combined.

9. Locate battens no farther from the designated lifting points than a distance equal to the depth of the member.
10. When stacking stemmed members, do not extend battens continuously over more than one stack.
11. Keep lifting devices accessible and undamaged.
12. Do not store shorter members or heavy equipment on upper members of a stacked tier.

1.05 JOB CONDITIONS

A. SEVERE WEATHER PRECAUTIONS:
1. Comply with requirements specified in referenced standards (see 1.02.D above).

B. COORDINATION:
1. Coordinate through the general contractor with other trades affecting or affected by work of this Section.

C. PROTECTION:
1. Protect other work against damage and discoloration caused by work of the Section.

1.06 FIELD MEASUREMENTS

A. PRIOR TO FABRICATION:
1. The general contractor shall verify and submit field measurements to the fabricator prior to fabrication in a timely manner.

B. MEASUREMENT DISCREPANCIES:
1. If field measurements differ slightly from drawing dimensions, modify the work as required for an accurate fit. If measurements differ substantially, notify the architect/engineer in a timely manner prior to the fabrication.
PART 2 – PRODUCTS

2.01 MATERIALS
Delete or add materials to the following list as required for the particular job.

A. PORTLAND CEMENT:
1. ASTM C150 – Type I or III.

B. ADMIXTURES:

C. AGGREGATES:
1. ASTM C33 or C330.

D. WATER:
1. Potable and free from amounts of foreign materials harmful to concrete and embedded steel.

E. REINFORCING STEEL:
1. Bars:
   a. deformed billet steel: ASTM A615
   b. where bar welding is required, bars shall conform to AWS D1.4
2. Wire:
   a. cold drawn steel: ASTM A82
3. Wire fabric:
   a. welded steel: ASTM A185
   b. welded deformed steel: ASTM A497

F. PRESTRESSING STRAND:
1. Uncoated seven-wire, stress-relieved: ASTM A416, Grade 270K.

G. ANCHORS AND INSERTS:
1. Materials:
   a. structural steel ASTM A36
   b. malleable iron (usually specified by type and manufacturer)
   c. stainless steel: ASTM A666
2. Finish:
   a. shop primer: manufacturer’s standards
   b. hot dipped galvanized: ASTM A153
   c. zinc-rich coating: MIL-P-2135, self-curing, one component, sacrificial
   d. cadmium coating

H. GROUT:
4. Minimum 28-day compressive strength: ______ psi. (Check with local suppliers to determine compressive strength)

I. BEARING PADS:
1. Elastomeric: conform to Division 2, Section 25 of AASHTO Standard Specifications for Highway Bridges.

   The pads specified have a strength of 2500 psi. For many applications, commercial grade pads are adequate and are more economical, but strengths vary and should be determined in advance by the specifier. Bearing strips of hard plastic or pressed, nonstaining hardboard are acceptable for Hollowcore or solid slabs and are more economical than elastomeric bearing pads.
2. Tetrafluoroethylene (TFE) reinforced with glass fibers and applied to stainless or structural steel plates.
3. ________________________________.
   (Manufacturer and type to be specified)

J. WELDED STUDS:
1. Comply with AWS D1.1.

2.02 CONCRETE MIXES

A. COMPRESSIVE STRENGTH:
1. Minimum release strength:______psi. (Normally 5000 psi. Verify with local manufacturer.)

B. RELEASE STRENGTH:
1. Minimum release strength:______ psi. (Normally 3500 psi. Verify with local manufacturer.)

C. USE OF SALTS:
1. Use of calcium chloride, chloride ions, or other salts is not permitted.
2.03 MANUFACTURE

A. STANDARDS:
   1. Comply with referenced standards (see 1.02.D above).

B. FORMING AND FINISHING:
   1. Concealed surfaces:
      a. remove fins and large protrusions; fill large holes and rock pockets
      b. formwork surface texture, air bubble holes, form joint marks, and minor chips, spalls, and color variations are acceptable
   2. Surfaces to receive concrete topping:
      a. roughen for mechanical bond
   3. Exposed vertical ends:
      a. recess strand ends, fill recesses with non-shrink material, and finish to match other adjacent exposed surfaces
   4. All other surfaces:
      a. remove fins and large projections
      b. fill large holes and rock pockets
      c. grind smooth form off-sets over 1/8 inch
      d. remove any ragged edges
   5. Exposed sandblasted surfaces:
      a. blast concrete where indicated with coarse, sharp aggregate to remove matrix approximately 1/16 inch in a depth in accordance with approved sample
      b. small, unobjectionable imperfections will be accepted
      c. mix patching, where allowed, as dry as possible; match color of adjacent hardened concrete, ad determined by approved trial patch
   6. Exposed surfaces to receive plaster:
      a. leave surfaces straight and clean, to the satisfaction of the plastering contractor
   7. Exposed surfaces not cast against formwork:
      a. match adjacent exposed surfaces
   8. All other exposed surfaces:
      a. fill holes larger than ¼ inch with sand-cement paste
      b. coat exposed surfaces with neat cement paste; after the paste has dried, rub surface vigorously with burlap to remove loose particles (finishing costs can be reduced by deleting this process)

C. MANUFACTURING TOLERANCES:

1. Standard tolerances:
   a. length ±3/4 inch, or ±1/8 inch per 10 feet of length, whichever is greater
   b. cross sectional dimensions:
      1. less than 24 inches: ±3/8 inch
      2. 24 to 36 inches: ±1/2 inch
      3. over 36 inches: ±5/8 inch
   c. flange thickness (thin sections): ±1/4 inch
   d. position of anchors and inserts: ±1 inch from center line location shown on drawings
   e. horizontal alignment (sweep): ±1/2 inch, or 1/8 inch per 10 feet of length, whichever is greater; maximum of 1 inch gap between two adjacent members due to sweep
   f. end squareness: ½ inch maximum
   g. blockouts: ±1 inch from center line location shown on drawings
   h. midspan camber deviation from design: ±3/16 inch per 10 feet of length, ±3/4 inch maximum
   i. midspan camber differential between adjacent members after installation: ¼ inch per 10 feet of length, ¾ inch maximum
   j. position of reinforcement designed primarily for connections: between +1/2 inch and – ¼ inch (minus represents a reduction in cover)

2. Special tolerances specified below involve additional expense to the manufacturer and will result in higher costs for the project. If special tolerances are required for some or all of the products, special notes should be made on the drawings or in the specifications noting which pieces or dimensions require special tolerances. Tolerances tighter than the special tolerances indicated can only be obtained through the use of nonstandard special forms and will involve considerable additional cost. Please consult the manufacturer before specifying such tolerances.
   a. length: ±1/8 inch per 10 feet, ± ¼ inch maximum
   b. cross sectional dimensions:
      1. less than 24 inches: ±¼ inch
      2. 24 to 36 inches: ±3/8 inch
      3. over 36 inches: ±1/2 inch
   c. thickness: ±¼ inch
d. position of anchors and inserts: ±1/2 inch from center line location shown on drawings

e. horizontal alignment (sweep): 1/4 inch, or 1/8 inch per 10 feet of length, whichever is greater; maximum of 1/2 inch gap between two adjacent members due to sweep

f. end squareness: 3/8 inch maximum

g. blockouts: +1/2 inch from center line location shown on drawings

h. out of square: 1/8 inch per 6 feet diagonal measurement

i. warpage, after installation: 1/8 inch per 6 feet of length, or 3/8 inch, whichever is greater

D. OPENINGS:

1. 100 square inch or larger and shown on drawings: cast in plant following approved shop drawings.

2. Smaller than 100 square inches or not shown on drawings: field cut or core drill neatly, without chipping, by the trade requiring the opening. (This requires other trades to field cut or drill holes needed for their work, and such trades should be alerted to these requirements through proper notation in their sections of the specifications. Some manufacturers prefer to install openings smaller than 10 inches square; this is acceptable if the locations are properly identified on the drawings.)

3. Do not cut reinforcement.

E. INSERTS:

1. Cast in structural inserts, bolts, and plates, as shown on drawings.

F. DETENSIONING:

1. Prevent shock, overloading, or unbalanced loading.

PART 3 – EXECUTION

3.01 INSPECTION

A. VERIFICATION OF EXISTING CONDITIONS:

1. The erection contractor shall verify that the structure and surfaces to receive prestressed concrete members are accurately sized and located, sound, true, and otherwise properly prepared.

2. The general contractor shall be notified prior to the start of work of any conditions requiring correction.

3. Work shall not be started until conditions are satisfactory.

3.02 PREPARATION

A. PREPARATORY WORK:

1. Place anchor bolt, plates, and dowels accurately to receive prestressed concrete members.

3.03 INSTALLATION

A. ERECTION:

1. Erect members plumb, level, true, in accurate alignment, and without cumulative dimensional error. Abut members with uniform joint width.

2. Stabilize members securely during erection.

3. Anchor members securely and permanently as indicated on approved shop drawings.

4. Remove any temporary bracework upon completion.

5. Fill holes and sinkages with mortar matching the adjacent surface finish.

B. WELDING:

1. Comply with AWS D1.1.

2. Exercise care to prevent chipping or cracking of concrete.

3. Clean exposed welds; apply touch-up paint as required.

4. Leave exposed surfaces clean.

C. ATTACHMENTS:

1. Members may be drilled or “shot” provided no contact is made with prestressing steel, subject to the approval of the precast manufacturer.
3.04 FINISHING

A. PATCHING:
1. Patching will be acceptable providing structural adequacy and appearance are not impaired.
2. Field patching materials shall be furnished by the prestressed concrete manufacturer. Use of patching materials from other sources is not permitted.
3. Match the color and texture of the surrounding concrete.
4. Apply a bonding agent prior to patching.
5. Minimize shrinkage.
6. Replace defective work if patching is ruled unacceptable.

B. PRODUCT CLEANING AND REPAIRING:
1. Clean, repair, and touch up (or replace when directed) any and all products that have been soiled, discolored, or damaged by work of this Section.
2. Remove debris from the project site upon completion of work (or sooner, if directed).
See the note at the beginning of the Guide Specification section of this catalog regarding the use of the following specifications.

PART 1 – GENERAL

1.01 DESCRIPTION

A. WORK INCLUDED:
Delete if all work to be included is indicated in drawings.
1.____________________________________

1.02 QUALITY ASSURANCE:

A. APPROVED MANUFACTURERS:
Include one of the following manufacturer standards:
1. Morse Bros, Incorporated
   Prestressed Concrete Group
   P.O. Box 181, Harrisburg, OR 97446
   (541) 995-6327
**or**
1. The manufacturer shall be certified by the Prestressed Concrete Institute.

B. REFERENCED STANDARDS:

1. Unless otherwise specified herein, comply with requirements specified in MNL-116, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products, published by the Prestressed Concrete Institute. Copies may be obtained from the Institute at 209 W. Jackson Blvd., Ste 500, Chicago, IL 60604, (312) 786-0300.

1.03 SUBMITTALS

A. PRODUCT DESIGN CRITERIA:
1. Submit _________ copies of the following design loadings:
   a. dead and live loads specified on the contract drawings
   b. other specified loads
2. Design calculations of products not shown on the contract drawings shall be performed by an engineer experienced in precast hollowcore concrete slab design and registered in the state where the project is located. These calculations shall be submitted for approval upon request.
3. The design shall comply with applicable ACI 318 requirements.

B. SHOP DRAWINGS:
1. Submit the following:
   a. dimensioned plans locating all products to be furnished by the manufacturer and indicating the identity mark for each slab
   b. sections and details showing connections, attached items, and their relations to the structure
c. descriptions of all attached items
d. erection sequences and handling requirements

1.04 PRODUCT DELIVERY, STORAGE,
AND HANDLING

A. GENERAL:
1. Protect against damage, distortion, and
discoloration.

B. STORAGE:
1. Place stored slabs so identification marks are
discernible.
3. Separate and support stacked slabs with battens
placed across the full width of the bearing point.
Locate battens no further from designated pick-up
points than a distance equal to the depth of the
slab.

C. HANDLING:
1. Pick up and support slabs near the ends, unless
otherwise approved.

1.05 FIELD MEASUREMENTS

A. PRIOR TO FABRICATION:
1. If field measurements differ slightly from drawing
dimensions, modify the work as required for an
accurate fit. If measurements differ substantially,
notify the architect/engineer prior to fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

Delete or add materials to the following list as required for
the particular job.

A. PORTLAND CEMENT:
1. ASTM C150 – Type I or III.

B. AGGREGATES:
1. ASTM C33.

C. WATER:
1. Potable and free from amounts of foreign materials
harmful to concrete and embedded steel.

D. PRESTRESSING STRAND:
1. Uncoated, seven-wire, stress-relieved: ASTM A416,
Grade 270K.
E. GROUT:
1. One part Portland cement.
2. Three parts sand.
3. Water: minimum amount necessary to fill joints without seepage through joints.

F. BEARING PADS:
1. Hard plastic, pressed, non-staining hardboard, or rubber-fabric masticord, or as approved.

G. SEALANT:
1. Contractor’s choice. Satisfy conditions of use.

2.02 CONCRETE MIXES

A. COMPRESSIVE STRENGTH:
1. Minimum 28-day compressive strength: 6000 psi.

B. RELEASE STRENGTH:

C. USE OF SALTS:
1. Use of calcium chloride, chloride ions, or other salts is not permitted.

2.03 MANUFACTURE

A. FORMING AND FINISHING:
1. Slab size:
   a. width: 48 inches
   b. thickness: _______ inches (8, 10, or 12 inches)
2. Concealed surfaces:
   a. fill any large holes and rock pockets
   b. air bubble holes and minor chips and spalls are acceptable
3. Surfaces to receive concrete topping:
   a. roughen for mechanical bond
4. Exposed surfaces – general:
   a. remove large projections
   b. fill large holes and rock pockets
   c. smooth any ragged edges
5. Exposed surfaces to be painted:
   a. fill holes larger than ¼ inch with spackle
   b. leave surfaces straight and clean,
6. Exposed surfaces to receive plaster:
   a. leave surfaces straight and clean

B. OPENINGS:
To maintain the structural integrity of slabs, openings through slabs must be a maximum of six inches in diameter and be placed through the hollowcore opening of the slab, unless otherwise approved by the manufacturer. Drilled holes up to and including six inches in diameter can be core-drilled. Openings larger than six inches in diameter must be chisel-cut, which produces a ragged appearance.
1. Openings of six inches or less in diameter shown on drawings:
   a. where exposed to view, core-drill neatly following approved shop drawings
   b. where concealed, chisel-cut following approved shop drawings
2. Openings of six inches or less in diameter not shown on drawings:
   a. to be core-drilled neatly by the trade requiring the opening
3. Openings larger than six inches in diameter shown on drawings:
   a. chisel-cut following approved ship drawings
4. Openings larger than six inches in diameter not shown on drawings:
   a. to be saw-cut by the trade requiring the opening
5. Do not cut reinforcement without the manufacturer’s approval.

C. MANUFACTURING AND ERECTION TOLERANCES:
1. All work shall be true, with straight sides and sharp corners, in accordance with drawings and within the following maximum allowable tolerances:
a. slab width: ±¼ inch
b. slab length: ±½ inch
c. thickness: ±¼ inch
d. center of gravity of strand group: ±¼ inch
e. opening locations: ±2 inches
f. opening dimension: ±1 inch
g. differential from design camber:
   ±1/8 inch per 10 feet of length,
   ±½ inch maximum
h. differential camber between adjacent
   members of same design: ¼ inch per
   10 feet of length, ¾ inch maximum

PART 3 – EXECUTION

3.01 INSPECTION

A. VERIFICATION OF EXISTING CONDITIONS:
   1. The erection contractor shall verify that the structure and surfaces to receive prestressed concrete are accurately sized and located, sound, true, and otherwise properly prepared.
   2. The general contractor shall be notified prior to the start of work of any conditions requiring correction.
   3. Work shall not be started until conditions are satisfactory.

3.02 INSTALLATION

A. ERECTION:
   1. Follow the manufacturer’s directions and approved shop drawings.
   2. Locate slabs accurately within allowable tolerances.
   3. Stabilize slabs securely during erection.
   4. Anchor slabs securely and permanently as indicated on approved shop drawings.
   5. Remove any temporary bracework upon completion.

B. ATTACHMENTS:
   1. Secure as shown on drawings.
   2. Members may be drilled or “shot” provide no contact is made with prestressing steel, subject to the approval of the architect / engineer.

3.03 FINISHING

A. PATCHING:
   1. Patching will be acceptable providing structural adequacy and appearance are not impaired.

B. JOINT GROUTING:
   1. After the installation of any attachments or hangers that pass through joints between slabs, fill the joints completely with grout.

3.04 PREPARATION FOR TOPPING SLABS

A. PRIOR TO PLACING TOPPING:
   1. Clean and wet the top surface to surface saturated dry condition (SSD).

See the note at the beginning of the Guide Specification portion of this catalog (p.24) regarding the use of the following specifications.
PART 1 – GENERAL

1.01 DESCRIPTION

A. RELATED WORK SPECIFIED ELSEWHERE:

   Edit for project conditions. Revise section numbers if they differ from those used in the project manual.
   1. Shop drawings, product data, and samples. Section 01340.
   5. Architectural precast concrete. Section 03450.
   6. Fabricated steel not cast into concrete. Section 05500.
   7. Waterproofing. Section 071___.
   8. Dampproofing. Section 071___.
   10. Sealants and caulking not specified herein. Section 07920.
   11. Painting. Section 09900.

B. WORK FURNISHED BUT INSTALLED BY OTHERS:

1. Steel connection plates and anchoring devices for embedding into cast-in-place concrete. (Specify elsewhere, if appropriate, that foundation plates must be installed within the following tolerances: alignment, 3/8 inch; levelness, 1/4 inch.)

C. WORK INSTALLED BUT FURNISHED BY OTHERS:

   1. Reglets to receive sheet metal flashing. Section 07620.
   2. Reglets to receive metal windows. Section 08500.
   3. Anchoring devices to receive equipment. Division 11.
   4. Anchoring devices to receive mechanical and electrical work. Divisions 15 and 16, respectively.

1.02 QUALITY ASSURANCE

A. APPROVED MANUFACTURER:

   Morse Bros, Incorporated
   Prestressed Concrete Group
   P.O. Box 181, Harrisburg, OR 97446
   (541) 995-6327

B. REFERENCED STANDARDS:

   1. Unless otherwise specified herein, comply with requirements specified in MNL-116, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products, published by the Prestressed Concrete Institute at 209 W. Jackson Blvd., Ste 500, Chicago, IL 60606, (312) 786-0300
1.03 SUBMITTALS

A. DESIGN DATA:
   1. Submit design calculations prepared by an engineer registered in the state where the project is located, in accordance with Section 01340.

B. SHOP DRAWINGS:
   1. Submit _____ copies of shop drawings including the following information, in accordance with Section 01340:
      a. elevation view, plan view, and location of each panel; include panel identity numbers
      b. dimensions and finishes
      c. sections and details showing connections, cast-in items, and their relations to the structure
      d. descriptions of all loose, cast-in, and field hardware
      e. field installed anchor locations
      f. erection sequences and handling requirements

1.04 PRODUCT STORAGE AND HANDLING

A. GENERAL:
   1. Protect panels against damage, distortion, and discoloration.

B. STORAGE:
   1. Store panels off the ground.
   2. Place stored panels so that identification marks are discernible.
   3. Store panels on edge.
   4. Storage areas shall be stable and provide with foundations that will prevent differential settlement or twisting of panels.

C. HANDLING:
   1. Handle only with the lifting devices provided.

1.05 FIELD MEASUREMENTS

A. PRIOR TO FABRICATION:
   1. The general contractor shall verify and submit field measurements to the fabricator prior to fabrication.

B. MEASUREMENT DISCREPANCIES:
   1. If field measurements differ slightly from drawing dimensions, modify the work as required for an accurate fit. If measurements differ substantially, notify the architect / engineer prior to fabrication.
PART 2 – PRODUCTS

2.01 MATERIALS

Delete or add materials to the following list as required for the particular job.

A. PORTLAND CEMENT:
   1. ASTM C150 – Type I or III.

B. AGGREGATES:
   1. ASTM C33.

C. WATER:
   1. Potable and free from amounts of foreign materials harmful to concrete and embedded steel.

D. PRESTRESSING STRAND:
   1. Uncoated, seven-wire stress relieved: ASTM A416, Grade 270K.

E. THERMAL INSULATION:
   1. Material: rigid polystyrene.
   2. Density: 1½ PCF.
   3. Thickness: 2 inches. (3 inches may be used for increased R-value. This will increase overall panel thickness by 1 inch.)

F. GROUT:

G. JOINT SEALANT:
   1. Designer’s choice. Specify brand name.

2.02 PANEL MANUFACTURE

A. STANDARDS:
   1. Comply with applicable provisions of the referenced standards (see 1.02.A above).
   2. Design and fabricate panels to withstand stresses induced by applied loads, wind loads, air temperature changes, and handling.
   3. Design and fabricate panels to permit structural frame movement caused by air temperature changes and applied loads.

4. Prestress both panel faces to minimize panel cracking and ensure panel straightness.
5. Cast panels with openings shown on drawings.
6. Recess lifting hooks in panel edges.
7. Mark each panel edge with the appropriate identity number in the locations shown on the shop drawings.

B. MANUFACTURING TOLERANCES:
   1. Manufacture panels within the following dimensional tolerances:
      a. panel width: ±1/8 inch
      b. panel length: ±1/2 inch
      c. panel thickness: ±1/4 inch
      d. opening locations: ±1 inch from centerline location on drawing
      e. insert location: ±1 inch from centerline location on drawings
      f. panel and opening squareness: ¼ inch per 10 feet maximum difference between two opposite diagonal measurements
      g. maximum bowing or warpage: 1/360 of span
      h. maximum warpage of one corner compared to other three: 1/8 inch per 10 feet

C. SHOP PAINTING OF EXPOSED METAL WORK:
   1. Cover with 1.0 mil dry film thickness of shop primer.
PART 3 – EXECUTION

3.01 PREPARATION

A. PREPARATORY WORK:
   1. Place anchor bolts, plates, and dowels accurately to receive panels.

3.02 INSTALLATION

A. PANEL ERECTION:
   1. Erect panels within specified erection tolerances and without cumulative dimensional error.
   2. Stabilize panels securely during erection.
   3. Anchor panels securely and permanently as indicated on approved shop drawings.
   4. Remove any temporary bracework upon completion.

B. MAXIMUM ERECTION TOLERANCES:
   1. Erect panels within the following dimensional tolerances:
      a. joint widths: ±¼ inch
      b. adjacent panel alignment: ±¼ inch

C. WELDING:
   1. Comply with AWS D1.1.

3.03 GROUTING

A. SILL JOINTS:
   1. Saturate concrete contact surfaces prior to grouting. Remove excess water.
   2. Compact grout thoroughly to eliminate air pockets. Do not vibrate.
   3. Cure with moisture for at least 24 hours.
   4. Do not retemper grout once set.

3.04 CAULKING

A. PROTECTION:
   1. Mask surfaces adjacent to joints as required for complete protection.

B. SEALANT INSTALLATION:
   1. Mix and apply in accordance with the manufacturer’s directions.

C. CLEANING:
   1. Remove material as work progresses and leave surfaces neat, smooth, and clean.

3.05 PATCHING

A. CONCRETE PATCHING:
   1. Concrete patching will be acceptable providing structural adequacy and appearance are not impaired.

3.06 PAINTING

Due to variations in materials and manufacturing, some variation in panel color must be anticipated. If uniformity of panel color is essential, the application of a concrete stain to the complete structure should be considered.
Quality is an essential ingredient in precast prestressed concrete or architectural precast concrete products. Certification by the Prestressed Concrete Institute (PCI) is your assurance that your producer maintains the highest standards in the industry. That’s why Morse Bros has been proud to display the PCI’s symbol of certification since 1967.

To maintain certification, Morse Bros must pass two rigid inspections each year. Every phase of the precasting operation is evaluated, from the raw materials to the mixing and placing of the concrete. Tensioning and detensioning procedures, curing, stripping, and product storage are all carefully observed. Engineering, drafting, record keeping, and many other practices indispensable to high quality production are closely examined.

PCI certification is specified by many architectural and engineering firms as well as federal and state agencies throughout the United States. The International Conference of Building Officials recognizes PCI as a quality control agency for products manufactured in accordance with the requirements of the Uniform Building Code.

Look to Morse Bros for quality you can depend on!