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## GUIDE SPECIFICATION FOR NICORE™ PLANK (HOLLOW-CORE SLABS)

This Guide Specification is intended for the use of professional personnel competent to evaluate the significance and limitations of its contents, and who will accept responsibility for the application of the material it contains. It is to be used as a basis for the development of an office master specification or in the preparation of specifications for a particular project. **In either case this Guide Specification must be edited to fit the conditions of use.** Particular attention should be given to the deletion of inapplicable provisions or inclusion of appropriate requirements. Coordinate the specifications with the information shown on the contract drawings to avoid duplication or conflicts. *These guide specifications are subject to change without notice.*

Highlighted portions are Notes to the Specification Writer.

### SECTION 034113 NICORE™ PLANK

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions of the contract. Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the performance criteria, materials, production, and erection of NiCore™ Plank as manufactured by Nitterhouse Concrete Products, Inc., including grouting

of joints between adjacent slab units for the entire project. The work performed under this Section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the NiCore™ Plank shown on the Contract Drawings.

B. Related Sections include the following:

List below only products and construction that the reader might expect to find in this Section but are specified elsewhere. Other sections of the specifications not referenced below, shall also apply to the extent required for proper performance of this work.

1. Division 03 Section "Architectural Precast Concrete."
2. Division 03 Section "Structural Precast Concrete and Structural Precast Concrete with Commercial Architectural Finish (CA)."
3. Division 03 Section "Cast-in-Place Concrete" for installing connection anchors in concrete and structural topping.
4. Division 03 Section "Precast Post-Tensioned Concrete" for connecting precast units.
5. Division 03 Section "Cementitious Floor Underlayment" for floor and roof deck fill.
6. Division 04 Section "Unit Masonry Assemblies" for inserts or anchorages required for slab connections.
7. Division 05 Section "Structural Steel Framing" for structural steel framing and for furnishing and installing connections attached to structural-steel framing.
8. Division 05 Section "Metal Fabrications" for furnishing and installing loose hardware items.
9. Division 07 Section "Through Penetration Firestopping Systems" for joint filler materials for fire-resistance-rated construction.
10. Division 07 Section "Water Repellents" for water-repellent finish treatments.
11. Division 07 Section "Sheet Metal Flashing and Trim" for flashing receivers and reglets.
12. Division 07 Section "Joint Sealants" for elastomeric joint sealants and sealant backings between slab edges at exposed underside of floor and roof members and/or perimeter of members.
13. Division 07 Section "Roof and Deck Insulation" for insulation to meet energy code.
14. Division 09 Section "Carpet and Carpet Cushion" for covering on flooring members.
15. Division 09 Section "Exterior Paints."

### 1.3 PERFORMANCE REQUIREMENTS

Retain this Article and applicable subparagraphs below if delegating design responsibility for structural precast concrete members to contractor. AIA Document A201 requires Owner or Architect to specify performance and design criteria. Revise requirements below to suit Project, and add other performance and design criteria, if applicable.

A. Structural Performance: Provide structural precast concrete members and connections Capable of withstanding the following design loads within limits and under conditions indicated:

For NiCore™ Plank that are to receive concrete topping, state whether all superimposed dead and live loads on the NiCore™ Plank do or do not include the weight of the concrete topping. It is best to list the live load, superimposed dead load, topping weight, and weight of the NiCore™ Plank, all as separate loads. Where roof live loads are considered with snow loads indicate how they are to be combined. Show hanging utility support loads in addition to loads indicated on drawings.

NiCore™ Plank are cast in continuous steel forms. Therefore, connection devices on the formed surfaces must be contained within the member since penetration of the form is unacceptable.

Camber will generally occur in NiCore™ Plank due to eccentricity of the stressing force. If camber considerations are important, check with Nitterhouse Concrete Products, Inc. for estimates of the amount of camber and of camber movement with time and temperature change. Design details must recognize the existence of camber and camber movement in connection with:

1. Closures to interior non-load bearing partitions.
2. Closures parallel to NiCore™ Plank (whether masonry, windows, curtain walls or others) must be properly detailed for camber.
3. NiCore™ Plank receiving cast-in-place topping. The elevation of top of floor and amount of concrete topping must allow for camber of the NiCore™ Plank. Specifications must not be written for NiCore™ Plank to be flat under their self-weight.

1. Dead Loads: **<Insert applicable dead loads>**
2. Live Loads: **<Insert applicable live loads>**
3. Concrete Topping Thickness: **<Insert applicable thickness>**
4. Basic Ground Snow Load & Flat Roof Snow Load: **<Insert applicable snow loads>**
5. Wind Loads: **<Insert applicable wind loads>**
6. Seismic Loads: **<Insert applicable seismic loads>**

NiCore Plank specific load may include blast loads.

7. Project Specific Loads: **<Insert applicable loads>**

Indicate locations here or on Drawings if different movements are anticipated for different building elements. If deflection limits stricter than ACI 318 are required, the limits must be specified.

- B. Design NiCore™ Plank and their connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Member deflections shall meet the limits of ACI 318.

Differential values in first subparagraph below are applicable to members exposed to the sun on one face. Insert the temperature range to suit local conditions. Temperature data is available from National Oceanic and Atmospheric Administration at [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov).

- C. Thermal Movements: Provide for thermal movements noted.

1. The NiCore™ Plank design shall consider the maximum seasonal climatic temperature change.
2. In-plane thermal movements of NiCore™ Plank directly exposed to the sun shall consider a temperature range of **<Insert temperature range>**

Delete subparagraph below if fire resistance rating is not required. Fire ratings depend on occupancy and building construction type, and are generally a building code requirement. When required, fire-rated products should be clearly identified on the design drawings.

D. Fire Resistance Rating: The fire resistance rating for the NiCore™ Plank is calculated by IBC code-compliant rational means in lieu of U.L. testing and labels. Fire proofing of annular spaces and/or penetrations is by a different trade contractor. Provide NiCore™ Plank to meet the following fire resistance ratings:

1. Floors: <Insert rating>
2. Roof: <Insert rating>

#### 1.4 SUBMITTALS

A. Product Data: Retain quality control records and certificates of compliance for 5 years or period of warranty, whichever is greater.

B. LEED Submittals

Retain subparagraph below if recycled content is required for LEED. Use products that meet at least 25% by cost of the total value of permanent building products on the project. Recycled content is the sum of post-consumer plus one-half of the pre-consumer recycled contents, based on cost. Products meeting recycled content are valued at 100% of their cost for the purpose of credit achievement calculation. Furthermore, products sourced (extracted, manufactured, and purchased) within 100 miles of the project site are valued at 200% of their base contributing cost. For credit achievement calculation, the base contributing cost of individual products compliant with multiple responsible extraction criteria is not permitted to exceed 100% of its total cost (before regional multipliers) and double counting of single product components compliant with multiple responsible extraction criteria is not permitted and in no case is a product permitted to contribute more than 200% of its total actual cost. Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

An alternative method of complying with the recycled content credit is to retain requirement in Division 01 SECTION "Sustainable Design Requirements" that gives the Contractor the option and responsibility for determining how requirements will be met.

1. Submit documentation conforming with LEED BD+C: New Construction v4 dated July 1, 2015 for the MR Credit: Building Product Disclosure and Optimization - Sourcing of Raw Materials, Option 2 (leadership extraction practices).
  - a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of NiCore™ Plank based on availability of materials such as fly ash.
  - b. Indicate relative dollar value of recycled content product to total dollar value of NiCore™ Plank included in project.
  - c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
  - d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

- e. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
- f. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
- g. Indicate dollar value of product containing local/regional materials; include materials cost only.
- h. Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

Retain subparagraph below if environmental data is required in accordance with Table 1 of ASTM E 2129. Concrete is relatively inert once cured. Admixtures, form release agents, and sealers may emit VOCs, especially during the curing process; however, virtually all emissions are eliminated before enclosing the building.

2. Include MSDS product information showing that materials meet any environmental performance goals such as bio-based content.
  3. For projects using FSC certified formwork, include chain-of-custody documentation with certification numbers for all certified wood products.
  4. For projects using reusable formwork, include data showing how formwork is reused.
- C. Design Mixtures: For each NiCore™ Plank mixture, include compressive strength tests.
- D. Shop (Erection) Drawings: Detail fabrication and installation of NiCore™ Plank. Indicate member locations, plan views, elevations, dimensions, shapes, cross sections, openings, extent and location of each finish, connections, edge conditions, support conditions, types of reinforcement, including special reinforcement, and sequence of completing connections.
1. Indicate welded connections by AWS standard symbols and show size, length, and type of each weld. Detail loose and cast-in hardware, lifting inserts, connections, and joints.
  2. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
  3. Indicate plan views and/or elevations showing NiCore™ Plank locations with all openings 10" x 10" or larger shown and located. Sizes and locations of these openings are to be provided to Nitterhouse Concrete Products, Inc. by the respective trades. Include header design where additional structural support is required for large openings. Coordinate and indicate openings and inserts required by other trades.
  4. Indicate location of each NiCore™ Plank by same identification mark placed on unit.
  5. Indicate relationship of NiCore™ Plank to adjacent materials.
  6. Indicate areas receiving toppings and magnitude of topping thickness.
  7. Indicate estimated cambers for NiCore™ Plank receiving cast-in-place topping.
  8. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, notify the Architect and submit design calculations and Shop Drawings. Do not affect the appearance, durability or strength of the NiCore™ Plank when modifying details or materials. Maintain the general design concept when altering size of members and alignment.
- E. Provide handling procedures.

- F. Comprehensive engineering design (signed and sealed) by a licensed design professional responsible for its preparation licensed in the jurisdiction in which the project is located.
- G. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel certification.

The NiCore™ Plank producer shall have a minimum of 15 years of production experience in structural precast concrete work comparable to that shown and specified, in not less than three projects of similar scope with the Owner or Architect determining the suitability of the experience.

- H. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of architects, engineers and owners, and other information specified.
- I. Material Test Reports: Reports on the following, for compliance with requirements indicated upon request.
- J. Material Certificates: Material certificates signed by manufacturers or suppliers upon request certifying that each of the following items complies with requirements.
  - 1. Cementitious materials.
  - 2. Concrete aggregates.
  - 3. Reinforcing materials and prestressing tendons.
  - 4. Admixtures.
  - 5. Bearing pads.
  - 6. Structural steel shapes and hollow structural sections.

Retain paragraph below if Contractor is responsible for field quality control testing. Retain option if Contractor is responsible for special inspections.

- K. Field quality-control test **[and special inspections]** reports.

## 1.5 QUALITY ASSURANCE

Erector should have a minimum of 5 years of experience in precast hollow core slab concrete Work comparable to that shown and specified in not less than three projects of similar scope with the Owner or Architect determining the suitability of the experience. The inclusion of erection in the precast concrete contract should be governed by local practices. Visit the PCI website at [www.pci.org](http://www.pci.org) for current listing of PCI-Qualified and Certified Erectors. Retain first paragraph below if PCI-Certified Erector is not available in project location.

- A. Erector Certification: A precast concrete erector with erecting organization and all erecting crews Certified and designated, prior to beginning work at project site, by PCI's Certificate of Compliance to erect **[Category S1 (Simple Structural Systems) for horizontal decking members]**

Retain paragraph below if PCI- Certified Erector is not available in Project location. Basis of the audit is PCI MNL 127, "PCI Erector's Manual – Standards and Guidelines for the Erection of Precast Concrete Products."

- B. Erector Qualifications: A precast concrete erector that has retained a PCI Certified Field Auditor, at erector's expense, to conduct a field audit of a project in the same category as this Project prior to start of erection. Submits Erectors' Post Audit Declaration.
- C. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in producing precast concrete hollow core slab units similar to those indicated for this Project and with a record of successful in-service performance.
  - 1. Assumes responsibility for engineering structural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
  - 2. Professional Engineer Qualifications: A professional engineer licensed in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast hollow core slab units that are similar to those indicated for this Project in material, design, and extent.
  - 3. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group C2 Category (Prestressed Hollow-Core and Repetitive Products).
  - 4. Has sufficient production capacity to produce required members without delaying the Work.

Delete subparagraph below if fabricators are not required to be registered with and approved by authorities having jurisdiction. List approved fabricators in Part 2 if required.

- 5. Is registered with and approved by authorities having jurisdiction.

Retain first paragraph below if quality assurance testing in addition to that provided by the PCI Certification Program is required. The testing agency, if required, is normally engaged by Owner.

- D. Testing Agency Qualifications: An independent testing agency, **[acceptable to authorities having jurisdiction]** qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated.
- E. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of structural precast concrete members indicated.
- F. Quality-Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for the NiCore™ Plank, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Concrete Products."

1. Comply with camber and dimensional tolerances of PCI MNL 135, "Tolerance Manual for Precast and Prestressed Concrete Construction."

Retain paragraph below to allow drawing details based on one fabricator's product to establish requirements. Exact cross section of precast, prestressed concrete members may vary from producer to producer. Revise below to identify specific proprietary system or indicate on Drawings. Correlate with Division 1 requirements.

- G. Product Options: Drawings indicate size, profiles and dimensional requirements of hollow core slabs and are based on NiCore™ Plank as indicated. Other fabricators' precast concrete members complying with requirements may be considered. Refer to Division 1 Section "Substitutions".
- H. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel"; and AWS D1.4, "Structural Welding Code – Reinforcing Steel."
- I. Fire Resistance: Where indicated, provide NiCore™ Plank whose fire resistance meets the prescriptive requirements of the governing code or has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete,"

## 1.6 PRODUCT STORAGE, DELIVERY AND HANDLING

- A. Store NiCore™ Plank with adequate dunnage and bracing, and protect units to prevent contact with the ground, to prevent staining, and to control cracking, distortion, warping or other physical damage.
- B. Unless otherwise specified or shown on Shop Drawings, store NiCore™ Plank with dunnage across full width of each bearing point.
- C. Place stored members so identification marks are clearly visible, and units can be inspected.
- D. Place dunnage of even thickness between each member.
- E. Deliver all NiCore™ Plank in such quantities and at such times to assure compliance with the agreed upon project schedule and setting sequence to ensure continuity of installation.
- F. Handle and transport NiCore™ Plank in a position consistent with their shape and design in order to avoid excessive stresses that could cause cracking or other damage.
- G. Lift and support NiCore™ Plank only at designated points indicated on the Shop Drawings.
- H. Do not use upper members of stacked tiers as storage for shorter members or heavy equipment.

## 1.7 SEQUENCING

Coordination and responsibility for supply of items to be placed on or in the structure to allow placement of NiCore™ Plank depends on type of structure and varies with local practice. Clearly specify responsibility for supply and installation of hardware. If not supplied by precast concrete fabricator, supplier should be listed and requirements included in related trade sections. Ensure that type and quantity of hardware items to be cast into precast concrete members for use by other trades are specified or detailed in Contract Drawings and furnished to fabricator, with instructions, in a timely manner in order not to delay the Work.

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

## PART 2 – PRODUCTS

### 2.1 FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide products by Nitterhouse Concrete Products, Inc. in Chambersburg, PA

### 2.2 FORM MATERIALS

- A. Formwork: Rigid, dimensionally stable, steel material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; not reactive with concrete and suitable for producing required finish surfaces.
  - 1. Form-Release Agent: Commercially produced bio-based oil form-release agent that will not bond with, stain or affect hardening of NiCore™ Plank and will not impair subsequent surfaces of NiCore™ Plank.

### 2.3 REINFORCING MATERIALS

Retain first paragraph below only if recycled content is required for LEED. Most of our cement and aggregates are produced locally within a 500-mile radius, and up to 60% of the prestressing strand may be composed of recycled steel for the precast to contribute to LEED participation.

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than **[25][60] <Insert number>** percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60 deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706 deformed when welded to hardware assemblies.

## 2.4 PRESTRESSING STRANDS

- A. Prestressing Strand: ASTM A 416, Grade 270, uncoated, 7-wire, low-relaxation strand.

## 2.5 CONCRETE MATERIALS

- A. Standard Gray Portland Cement: ASTM C 150, Type I or III.
- B. Supplementary Cementitious Materials
  - 1. Fly Ash (as available): ASTM C 618, Class C or F with maximum loss on ignition of 3%.
- C. Normal weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33 or C330, with coarse, non-reactive aggregates complying with **Class [4S] [4M] [5S] [5M]**.
- D. Fine Aggregates: Selected, natural or manufactured sand of a material
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- F. Air Entraining Admixture: NiCore™ Plank are cast with zero slump concrete (commonly referred to as dry mix concrete) using a slip former. There are no standardized test procedures for measuring the air content of zero slump concrete. PCI Manual MNL 126-98 entitled *Manual For The Design Of Hollow Core Slabs* in Section 1.2 reads, "Air entrained admixtures are not effective in the dry mix concrete. With the low water-cement ratios and compaction placing method, air is difficult to disperse well and maintain". A nominal amount of air entraining admixture may be used to improve workability in conformance with ASTM C 260, and certified by manufacturer to be compatible with other required admixtures.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
  - 1. Water-Reducing and Retarding Admixture: ASTM C 494 Type D.
  - 2. Corrosion Inhibiting Admixture: ASTM C 1582
  - 3. Viscosity Modifying Admixture: ASTM C 494 Type S
  - 4. Manufacturing Aid Surfactant Admixture

## 2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36
- B. Carbon-Steel Headed Studs: ASTM A 108, Grades 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with the minimum mechanical properties of PCI MNL 116, Table 3.2.3.
- C. Carbon-Steel Structural Tubing: ASTM A 500, Grade B or C.

- D. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A or C (ASTM F 568M, Property Class 4.6) carbon-steel, hex-head bolts and studs; carbon-steel nuts (ASTM A 563, Grade A); and flat, unhardened steel washers (ASTM F 844).

High-strength bolts are used for friction-type connections between steel members and are not recommended between steel and concrete because concrete creep and crushing of concrete during bolt tightening reduce effectiveness. ASTM A 490 bolts should not be galvanized.

- E. High-Strength Bolts and Nuts: ASTM A193/A193M, Grade B5 or B7, ASTM A 325 or ASTM A 490, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, (ASTM A 563) and hardened carbon-steel washers (ASTM F 436).

Structural plate and shape steel connection hardware enclosed in wall cavities is provided uncoated in non-corrosive environments. Protection is required by painting or galvanizing on steel connection hardware when the corrosive environment is high or when connections are exposed to exterior weather conditions. Retain paragraph below if shop-primed finish is required. Indicate locations of priming, if required. MPI 79 in first option below provides some corrosion protection while SSPC-Paint 25, without top-coating, provides minimal corrosion protection. The need for protection from corrosion will depend on the actual conditions to which the connections will be exposed to in service. Select coatings that do not contain toxic chemicals and with less than 250 g/l VOCs.

- F. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 (SSPC-Paint 25) according to SSPC-PA 1.

Retain paragraph and subparagraph below if galvanized finish is required. Indicate locations of galvanized items if required. Field welding should generally not be permitted on galvanized elements, unless the galvanizing is removed or acceptable welding procedures are submitted. Hot-dip galvanized finish provides greater corrosion resistance than electrodeposited zinc coating. Electrodeposition is usually limited to threaded fasteners.

- G. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123 after fabrication, or ASTM A 153 as applicable (electrodeposition according to ASTM B 633, SC 3, Type 1).
1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon content and 2.5 times phosphorous content to 0.09 percent.
  2. Galvanizing Repair Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

Retain paragraph below when more protection than a paint finish is required, but galvanizing is not required.

- H. Galvanizing Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20. Comply with manufacturer's requirements for surface preparation.

## 2.7 STAINLESS-STEEL CONNECTION MATERIALS

Delete this Article if not required. Use when resistance to staining merits extra cost in high moisture or corrosive environments.

- A. Stainless-Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
  - 1. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.
- C. Stainless-Steel Headed Studs: ASTM A 276, with minimum mechanical properties for studs as indicated under MNL 116, Table 3.2.3.

## 2.8 BEARING PADS AND OTHER ACCESSORIES

Plastic pads are typically used with NiCore™ Plank. Compression stress in use is not normally over a few hundred psi and proof testing is not considered necessary. No standard guide specifications are available. On rare occasions elastomeric pads or ROF pads are used, so coordinate selection with structural engineer if required for bearing loads and rotation requirements.

- A. Provide one of the following bearing pads for hollow core slabs:
  - 1. High-Density Plastic: Multimonomer, nonleaching, plastic strip capable of supporting loads with no visible overall expansion.
  - 2. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D 2240, minimum tensile strength 2,250 psi per ASTM D 412.
  - 3. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 3,000 psi with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used in the Project.
  - 4. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D 2240. Conforming to Division II, Section 18.10.2 of AASHTO LRFD Bridge Design Specifications or Military Specification, MIL-C-882E.
  - 5. Frictionless Pads: Polytetrafluoroethylene (PTFE), glass-fiber reinforced, bonded to stainless or mild-steel plates, or random-oriented, fiber-reinforced elastomeric pads, of type required for in-service stress.
- B. Erection Accessories: Provide clips, hangers, high density plastic or steel shims, and other accessories required to install structural precast concrete members.
- C. Welding Electrodes: Comply with AWS standards for steel type and/or alloy being welded.

## 2.9 GROUT MATERIALS

Sand-cement grout is commonly used in keyed joints between NiCore™ Plank floor and roof members. Indicate required strengths on Contract Drawings.

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144, or ASTM C 404. Typically mix at ratio of 1 part cement to 2 ½ to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content of grout less than 0.06% chloride ion by weight of cement

when tested in accordance with ASTM C 1218. Grouting of NiCore™ Plank topside, butt & end joints with a grout mixture having sufficient consistency to not require end core dams and having a minimum 28-day compressive strength of 3,000 psi. The ambient temperature must be at least 40°F and rising for the grouting operation. Alternatively, NiCore™ Planks need to be at least 32°F and held above freezing for a minimum of 24 hours. NCP is able to grout in ambient temperatures below 40°F if this is achieved by the general contractor heating the units and blanketing the grouted joints to assure the grout is not subjected to freezing for a 24 hour period, all other weather conditions permitting.

## 2.10 CONCRETE MIXTURES

- A. Prepare design mix to achieve the required properties.
- B. Design mixes may be prepared by qualified precast plant personnel at the precast hollow core slab fabricator's option.
- C. Normal weight Concrete Mix: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211, with materials to be used on Project, to provide normal weight concrete with the following properties:
1. Release Strength: 3,800 psi minimum.
  2. Compressive Strength (28 Days): 6,000 psi minimum
  3. Density (Unit Weight): Calculated equilibrium density of 145 lb/ft.<sup>3</sup>, ± 5 lb/ft.<sup>3</sup>.
  4. Maximum Water-Cementitious Materials Ratio: 0.45.
  5. Permissible use of fly ash is between 15 to 25 percent replacement of Portland cement by weight as available.
  6. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested in accordance with ASTM C 1218.
  7. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

8. Concrete Mixture Adjustments: Concrete mixture design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

## 2.11 FORM FABRICATION

- A. Form: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placement and vibration operations and temperature changes, and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
- B. Maintain forms to provide completed NiCore™ Plank of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
- C. Edge and Corner Treatment: As built-in on standard forms.

## 2.12 FABRICATION

When required for anchorage or lateral bracing to structural steel members NiCore™ Plank are limited in the use of anchors and inserts. Coordinate with other trades for installation of cast-in items.

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during casting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
- B. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."

Coordinate paragraph below with Division 05 Section "Metal Fabrications" for furnishing and installing loose hardware items.

- C. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast concrete members to supporting and adjacent construction.
- D. Cast-in openings larger than 10" in each dimension as shown on the architectural and/or structural drawings at the time of bidding. Do not drill or cut openings or prestressing strand without Engineer's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
  1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy coated

reinforcing exceeds limits specified in ASTM A 775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

2. Accurately position, support, and secure reinforcement against displacement during concrete placement and consolidation operations. Locate and support reinforcement by metal or plastic chairs, runners, bolsters, spacers, hangers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.
  3. Place reinforcing steel and prestressing strand to maintain at least  $\frac{3}{4}$  in. (19 mm) minimum concrete cover. Provide cover requirements in accordance with ACI 318 when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
- F. Reinforce structural precast concrete members to resist handling, transportation, erection stresses, and specified in-place loads, whichever governs.
- G. Prestress strands for NiCore™ Plank by pre-tensioning. Comply with PCI MNL 116.
1. Delay detensioning of NiCore™ Plank until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete member.
  2. Detension pre-tensioned strands by cutting strands, using a sequence and pattern to prevent shock or unbalanced loading.
  3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
- Retain the following subparagraph only when ends of NiCore™ Plank are exposed to severe environment and field installed grout or other building materials do not provide adequate corrosion protection.
4. Protect strand ends and anchorage exposed to severe environments with bitumastic, zinc-rich or epoxy paint.
- H. Comply with requirements in PCI MNL 116 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in NiCore™ Plank.
1. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.
  2. Comply with PCI MNL 116 procedures for hot and cold-weather concrete placement.

3. Identify pickup points of precast concrete members and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark the Mark Number and I.D. Number on each precast concrete member on a surface that will not show in finished structure.
4. Cure concrete, according to requirements in PCI MNL 116, by accelerated heat curing using radiant heat. Cure members until the compressive strength is high enough to ensure that stripping does not have an effect on the performance or appearance of the final product.

### 2.13 FABRICATION TOLERANCES

Usually retain paragraph below unless tolerances for Project deviate from PCI recommendations. PCI MNL 135 product tolerances are standardized throughout the industry. Revise product tolerances if additional costs of more exacting tolerances are justified.

- A. Fabricate NiCore™ Plank of shapes, lines and dimensions indicated, so each finished member complies with PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

### 2.14 FINISHES

- A. Bottom Standard Grade Steel Form Commercial Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete as defined in PCI MNL 116, Appendix C. Surface holes smaller than 1/2" caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are acceptable. Fill air holes greater than 1/4" in width that occur in high concentration (more than one per 2 sq. in. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Allowable joint offset limited to 1/8". Any surface preparation for painting is by other trades.
- B. Top Screed Finish For Unformed Surface: Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. No major imperfections, honeycombing, or defects are permitted.
- C. Apply broom-roughened surface finish in accordance with ACI 318 to precast concrete members that will receive a structurally composite concrete topping after installation.

### 2.15 SOURCE QUALITY CONTROL

Always retain paragraph below because it establishes the minimum standard of plant testing and inspecting. PCI MNL 116 mandates source testing requirements and a plant "Quality Systems Manual." PCI certification also ensures periodic auditing of plants for compliance with requirements in PCI MNL 116.

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.

Delete first paragraph and subparagraph below if not required. PCI certification may be acceptable to authorities having jurisdiction without further monitoring of plant quality-control and testing program by Owner.

- B. In addition to PCI Certification, Owner will employ an accredited independent testing agency to evaluate structural precast concrete fabricator's quality-control and testing methods.
  - 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- C. Strength of NiCore™ Plank will be considered deficient if units fail to comply with ACI 318 concrete strength requirements.

Review acceptance criteria with structural engineer. In paragraph below, add criteria for load tests if required.

- D. Defective Work: Structural precast concrete members that do not comply with acceptability requirements in PCI MNL 116, including concrete strength, manufacturing tolerances, and texture range are unacceptable. Chipped, spalled or cracked members may be repaired. The Architect reserves the right to reject any member if it does not match the accepted samples. Replace unacceptable units with precast concrete members that comply with requirements.

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- A. Deliver anchorage devices for NiCore™ Plank that are embedded in or attached to the building structural frame or foundation before start of such work. Provide locations, setting diagrams, and templates for the proper installation of each anchorage device.

### **3.2 EXAMINATION**

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surfaces tolerances, and other conditions affecting NiCore™ Plank performance.
- B. Proceed with NiCore™ Plank installation only after unsatisfactory conditions have been corrected.
- C. Do not install NiCore™ Plank until supporting cast-in-place concrete building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is structurally ready to receive loads from precast concrete members.

### 3.3 ERECTION

- A. Site Access: The General Contractor shall be responsible for providing suitable access to the building, proper drainage, and firm level bearing for the hauling and erection equipment to operate under their own power.
- B. Site Preparation: The General Contractor shall be responsible for...
  - 1. Providing true, level bearing surfaces on all field-constructed bearing walls and other field-constructed supporting members.
  - 2. All pipes, stacks, conduits, and other such items shall be stubbed-off at a level lower than the bearing plane of the hollow core slabs until after the latter are set.
- C. Install loose clips, hangers, bearing pads, and other accessories required for connecting the hollow core slabs to supporting members and backup materials.
- D. Erect NiCore™ Plank level, plumb and square within the specified allowable erection tolerances. Provide temporary structural framing, supports and bracing as required to maintain position, stability, and alignment of members until permanent connections are completed.
  - 1. Install bearing pads as NiCore™ Plank are being erected.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  - 3. Use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
  - 4. Provide and install headers of structural-steel shapes for openings larger than one slab width according to NiCore™ Plank fabricator's written recommendations.
- E. Connect NiCore™ Plank in position by bolting, welding, grouting, or as otherwise indicated on approved Shop (Erection) Drawings. Remove temporary shims, and spacers as soon as practical after connecting and/or grouting are completed.
- F. Welding: Comply with applicable AWS D1.1 and AWS D1.4 requirements for welding, welding electrodes, appearance of welds, quality of welds, and methods used in correcting welding work.
  - 1. Protect NiCore™ Plank and bearing pads from damage during field welding or cutting operations and provide noncombustible shields as required.
  - 2. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS D1.1 or D1.4.
  - 3. Clean-weld-affected metal surfaces with chipping hammer followed by brushing or power tool cleaning and then re-prime damaged painted surfaces in accordance with manufacturer's recommendations.

4. For galvanized metal, clean weld affected metal surfaces with chipping hammer followed by brushing or power tool cleaning, and apply a minimum 0.004" thick coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A 780.
  5. Visually inspect all welds critical to NiCore™ Plank connections. Visually check all welds for completion and remove, re-weld or repair all defective welds, if the services of an AWS-certified welding inspector are not furnished by Owner.
- G. At bolted connections, use tack welding or other approved means to prevent loosening of nuts after final adjustment.
1. Unless indicated otherwise, all bolts to be installed to a snug-tight condition in accordance with AISC at a minimum.
  2. For connections utilizing high-strength bolts and slip critical connections verify bolt position and tightness at installation. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For slip critical connection, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench. If inadequate bolt torque is found, test all bolts.
- H. Grouting Connections and Joints: Indicate joints to be grouted and any critical grouting sequences on Shop (Erection) Drawings. Grout open spaces at keyways, connections and joints where required or indicated. Where required at the bearings provide a grout mixture having sufficient consistency to not require end core dams. Provide reinforcing steel where indicated. Retain flowable grout in place until strong enough to support itself. Grout shall extend to at least the bottom of the shear keys without seepage to other surfaces. Settlement of the grout is structurally acceptable and can be feather leveled by others, if required. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Finish transitions due to different surface levels not steeper than 1 to 12.
- I. Field cutting or coring of NiCore™ Plank is not permitted without approval of the Engineer.
- J. Subject to approval of the Architect/Engineer, NiCore™ Plank may be drilled or "shot" with powder actuated fasteners provided no contact is made with the prestressing steel. If spalling should occur it shall be repaired by the trade installing the fasteners.

### 3.4 ERECTION TOLERANCES

- A. Erect NiCore™ Plank level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 135.
- B. "Level out" variations between adjacent NiCore™ Plank by jacking, loading, or any other feasible method as required by the approved shop drawings. Variations between adjacent members shall be reasonably "leveled-out" to within 3/8".

### 3.5 FIELD QUALITY CONTROL

Retain first option in paragraph below if Owner engages a special inspector. If authorities having jurisdiction permit Contractor to engage a special inspector, retain second option and retain option for submitting special inspection reports in Part 1 "Submittals" Article.

- A. Special Inspections: **[Owner will engage][Contractor will engage]** a qualified special inspector to perform the following special inspections and prepare reports:
1. Erection of loadbearing precast concrete members.
  2. **<Insert special inspections>**

Retain first paragraph below if field testing and inspecting are required, with or without paragraph above, to identify who shall perform tests and inspections. If retaining second option, retain requirement for field quality-control test reports in Part 1 "Submittals" Article.

- B. Testing: Owner will engage accredited independent testing and inspecting agency to perform field tests and inspections and prepare reports.
1. Field welds will be subject to visual inspections and nondestructive testing in accordance with ASTM E 165 or ASTM E 1444 and ASTM E 709.
  2. Testing agency will report test results promptly and in writing to Contractor and Architect.
- C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Erector's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.6 REPAIRS

Production chips, cracks, and spalls should have been corrected at fabricator's plant. Defects occurring after delivery are normally repaired before final joint sealing and cleaning as weather permits.

- A. Repairs and patches will be permitted provided structural adequacy, serviceability and durability of members and appearance are not impaired as evaluated by Nitterhouse Concrete Products' Engineering Department.
- B. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

Retain paragraph above if using galvanized anchors, connections, and other items; retain first paragraph below if items are prime painted.

- C. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- D. Remove and replace damaged hollow core slabs when repairs do not comply with specified requirements.

### **3.7 CLEANING**

- A. As work progresses all excess or deleterious materials which would become difficult to remove from finished surfaces, or which would harden on finished surfaces, shall be removed immediately by the hollow core slab erector.
- B. Upon completion of the work, all surplus materials, tools, equipment, and debris leaving the building in a clean condition shall be removed to the satisfaction of the Owner.
- C. After the NiCore™ Plank have been erected it is the responsibility of the respective trade contractor(s) to clean exposed surfaces and to remove mortar splatter, weld marks, other markings, dirt, and stains. Final cleaning of all material is the responsibility of the general contractor or construction manager of the Project.
- D. The top surface must be clean and free of deleterious materials prior to application of leveling coats or cast-in-place composite toppings.
- E. Perform cleaning procedures, if necessary, according to Nitterhouse Concrete Products' recommendations. Protect adjacent work from staining or damage due to cleaning operations.
- F. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials. Biodegradable or bio-based cleaning products are preferred.

### **3.8 WARRANTY**

- A. The precast fabricator shall guarantee the NiCore™ Plank against defects in material and workmanship, for a period of one (1) year, after acceptance of the units by the owner.

**END OF SECTION 034113**